

PROPOSED Resource Management Plan and FINAL Environmental Impact Statement for the Lander Field Office Planning Area



**Volume 2 of 2
Chapters 4 - 6,
Glossary, Appendices and Maps**

February 2013

The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

**Proposed Resource Management Plan and
Final Environmental Impact Statement
for the
Lander Field Office Planning Area**

**Volume 2 of 2
Chapters 4 - 6,
Glossary, Appendices and Maps**

**U.S. Department of the Interior
Bureau of Land Management
Lander Field Office, Wyoming**

February 2013

This page intentionally
left blank

Table of Contents

VOLUME 2 OF 2

4. Environmental Consequences.....	589
4.1. Physical Resources.....	593
4.1.1. Air Quality	593
4.1.1.1. Summary of Impacts	594
4.1.1.2. Methods and Assumptions.....	596
4.1.1.3. Detailed Analysis of Alternatives	598
4.1.2. Geologic Resources.....	629
4.1.3. Soil	629
4.1.3.1. Summary of Impacts	630
4.1.3.2. Methods and Assumptions.....	630
4.1.3.3. Detailed Analysis of Alternatives	634
4.1.4. Water	648
4.1.4.1. Summary of Impacts	651
4.1.4.2. Methods and Assumptions.....	651
4.1.4.3. Detailed Analysis of Alternatives	653
4.1.5. Cave and Karst Resources.....	667
4.1.6. Lands with Wilderness Characteristics	668
4.1.6.1. Summary of Impacts	668
4.1.6.2. Methods and Assumptions.....	668
4.1.6.3. Detailed Analysis of Alternatives	669
4.2. Mineral Resources	674
4.2.1. Locatable Minerals.....	674
4.2.1.1. Summary of Impacts	674
4.2.1.2. Methods and Assumptions.....	677
4.2.1.3. Detailed Analysis of Alternatives	679
4.2.2. Leasable Minerals – Coal.....	690
4.2.3. Leasable Minerals – Geothermal.....	691
4.2.3.1. Summary of Impacts	691
4.2.3.2. Methods and Assumptions.....	691
4.2.3.3. Detailed Analysis of Alternatives	692
4.2.4. Leasable Minerals – Oil and Gas	693
4.2.4.1. Summary of Impacts	694
4.2.4.2. Methods and Assumptions.....	695
4.2.4.3. Detailed Analysis of Alternatives	697
4.2.5. Leasable Minerals – Oil Shale-Tar Sands	718
4.2.6. Leasable Minerals – Other Solid Leasable Minerals.....	718
4.2.6.1. Summary of Impacts	718
4.2.6.2. Methods and Assumptions.....	719
4.2.6.3. Detailed Analysis of Alternatives	721
4.2.7. Salable Minerals.....	729
4.2.7.1. Summary of Impacts	729
4.2.7.2. Methods and Assumptions.....	729
4.2.7.3. Detailed Analysis of Alternatives	731

4.3.	Fire and Fuels Management.....	742
4.3.1.	Unplanned/Wildfire.....	743
4.3.1.1.	Summary of Impacts.....	743
4.3.1.2.	Methods and Assumptions.....	743
4.3.1.3.	Detailed Analysis of Alternatives.....	744
4.3.2.	Planned/Prescribed Fires and Other Fuels Treatments.....	755
4.3.2.1.	Summary of Impacts.....	755
4.3.2.2.	Methods and Assumptions.....	755
4.3.2.3.	Detailed Analysis of Alternatives.....	755
4.3.3.	Stabilization and Rehabilitation	765
4.4.	Biological Resources	766
4.4.1.	Vegetation – Forests, Woodlands, and Aspen Communities	766
4.4.1.1.	Summary of Impacts.....	766
4.4.1.2.	Methods and Assumptions.....	767
4.4.1.3.	Detailed Analysis of Alternatives.....	768
4.4.2.	Vegetation – Grassland and Shrubland Communities.....	782
4.4.2.1.	Summary of Impacts.....	783
4.4.2.2.	Methods and Assumptions.....	784
4.4.2.3.	Detailed Analysis of Alternatives.....	785
4.4.3.	Invasive Species and Pest Management.....	800
4.4.3.1.	Summary of Impacts.....	801
4.4.3.2.	Methods and Assumptions.....	801
4.4.3.3.	Detailed Analysis of Alternatives.....	802
4.4.4.	Riparian-Wetland Resources.....	819
4.4.4.1.	Summary of Impacts.....	819
4.4.4.2.	Methods and Assumptions.....	819
4.4.4.3.	Detailed Analysis of Alternatives.....	821
4.4.5.	Fish and Wildlife Resources – Fish.....	836
4.4.5.1.	Summary of Impacts.....	836
4.4.5.2.	Methods and Assumptions.....	836
4.4.5.3.	Detailed Analysis of Alternatives.....	837
4.4.6.	Fish and Wildlife Resources – Wildlife	850
4.4.6.1.	Summary of Impacts.....	851
4.4.6.2.	Methods and Assumptions.....	851
4.4.6.3.	Detailed Analysis of Alternatives.....	853
4.4.7.	Special Status Species – Plants	901
4.4.7.1.	Summary of Impacts.....	902
4.4.7.2.	Methods and Assumptions.....	902
4.4.7.3.	Detailed Analysis of Alternatives.....	903
4.4.8.	Special Status Species – Fish	917
4.4.8.1.	Summary of Impacts.....	917
4.4.8.2.	Methods and Assumptions.....	918
4.4.8.3.	Detailed Analysis of Alternatives.....	919
4.4.9.	Special Status Species – Wildlife.....	922
4.4.9.1.	Summary of Impacts.....	923
4.4.9.2.	Methods and Assumptions.....	923
4.4.9.3.	Detailed Analysis of Alternatives.....	924
4.4.10.	Wild Horses.....	971
4.4.10.1.	Summary of Impacts.....	972
4.4.10.2.	Methods and Assumptions.....	972
4.4.10.3.	Detailed Analysis of Alternatives.....	973

4.5.	Heritage and Visual Resources	992
4.5.1.	Cultural Resources	992
4.5.1.1.	Summary of Impacts	993
4.5.1.2.	Methods and Assumptions.....	993
4.5.1.3.	Detailed Analysis of Alternatives	995
4.5.2.	Paleontological Resources.....	1006
4.5.2.1.	Summary of Impacts	1007
4.5.2.2.	Methods and Assumptions.....	1007
4.5.2.3.	Detailed Analysis of Alternatives	1007
4.5.3.	Visual Resources.....	1014
4.5.3.1.	Summary of Impacts	1014
4.5.3.2.	Methods and Assumptions.....	1017
4.5.3.3.	Detailed Analysis of Alternatives	1018
4.6.	Land Resources.....	1023
4.6.1.	Lands and Realty.....	1023
4.6.1.1.	Summary of Impacts	1024
4.6.1.2.	Methods and Assumptions.....	1025
4.6.1.3.	Detailed Analysis of Alternatives	1026
4.6.2.	Renewable Energy	1026
4.6.2.1.	Summary of Impacts	1027
4.6.2.2.	Methods and Assumptions.....	1027
4.6.2.3.	Detailed Analysis of Alternatives	1029
4.6.3.	Rights-of-Way and Corridors.....	1038
4.6.3.1.	Summary of Impacts	1038
4.6.3.2.	Methods and Assumptions.....	1038
4.6.3.3.	Detailed Analysis of Alternatives	1039
4.6.4.	Comprehensive Trails and Travel Management	1048
4.6.4.1.	Summary of Impacts	1049
4.6.4.2.	Methods and Assumptions.....	1050
4.6.4.3.	Detailed Analysis of Alternatives	1052
4.6.5.	Livestock Grazing Management	1061
4.6.5.1.	Summary of Impacts	1061
4.6.5.2.	Methods and Assumptions.....	1062
4.6.5.3.	Detailed Analysis of Alternatives	1063
4.6.6.	Recreation	1087
4.6.6.1.	Summary of Impacts	1088
4.6.6.2.	Methods and Assumptions.....	1090
4.6.6.3.	Detailed Analysis of Alternatives	1091
4.7.	Special Designations	1103
4.7.1.	Congressionally Designated Trails – Cultural and Historic Resources.....	1103
4.7.1.1.	Summary of Impacts	1104
4.7.1.2.	Methods and Assumptions.....	1105
4.7.1.3.	Detailed Analysis of Alternatives	1106
4.7.2.	Congressionally Designated Trails – Recreation and Visual Resources.....	1116
4.7.2.1.	Summary of Impacts	1116
4.7.2.2.	Methods and Assumptions.....	1118
4.7.2.3.	Detailed Analysis of Alternatives	1118
4.7.3.	Wilderness Study Areas	1123
4.7.3.1.	Summary of Impacts	1123
4.7.3.2.	Methods and Assumptions.....	1123
4.7.3.3.	Detailed Analysis of Alternatives	1123

4.7.4.	Wild and Scenic Rivers	1126
4.7.4.1.	Summary of Impacts	1126
4.7.4.2.	Methods and Assumptions	1127
4.7.4.3.	Detailed Analysis of Alternatives	1128
4.7.5.	Areas of Critical Environmental Concern	1134
4.7.5.1.	Summary of Impacts	1134
4.7.5.2.	Methods and Assumptions	1135
4.7.5.3.	Detailed Analysis of Alternatives	1135
4.8.	Socioeconomic Resources	1240
4.8.1.	Social Conditions	1240
4.8.1.1.	Summary of Impacts	1241
4.8.1.2.	Methods and Assumptions	1242
4.8.1.3.	Detailed Analysis of Alternatives	1242
4.8.2.	Economic Conditions	1251
4.8.2.1.	Summary of Impacts	1253
4.8.2.2.	Methods and Assumptions	1255
4.8.2.3.	Detailed Analysis of Alternatives	1256
4.8.3.	Health and Safety	1263
4.8.3.1.	Summary of Impacts	1263
4.8.3.2.	Methods and Assumptions	1263
4.8.3.3.	Detailed Analysis of Alternatives	1264
4.8.4.	Environmental Justice	1266
4.8.4.1.	Summary of Impacts	1266
4.8.4.2.	Methods and Assumptions	1266
4.8.4.3.	Detailed Analysis of Alternatives	1267
4.8.5.	Tribal Treaty Rights	1267
4.9.	Climate Change	1267
4.9.1.	Summary of Impacts	1267
4.9.2.	Methods and Assumptions	1268
4.9.3.	Detailed Analysis of Alternatives	1271
4.9.3.1.	Impacts Common to All Alternatives	1271
4.9.3.2.	Alternative A	1272
4.9.3.3.	Alternative B	1273
4.9.3.4.	Alternative C	1274
4.9.3.5.	Alternative D	1275
4.10.	Cumulative Impacts	1276
4.10.1.	Cumulative Impacts to Greater Sage-Grouse from Management Actions	1282
4.10.2.	Cumulative Impacts to Air Quality with regard to Public Health and Welfare from Management Actions	1295
4.10.3.	Cumulative Impacts to Water from Management Actions	1299
4.10.4.	Cumulative Impacts to Riparian-Wetland Areas from Management Actions	1307
4.10.5.	Cumulative Impacts to Vegetative Communities from Surface-Disturbing Activities and Other Management Actions	1313
4.10.6.	Cumulative Impacts to the Continental Divide National Scenic Trail from Development Activities	1318
4.10.7.	Cumulative Impacts to National Historic Trails from Development Activities	1322
4.11.	Irreversible and Irretrievable Commitment of Resources	1332
4.12.	Unavoidable Adverse Impacts	1333

5. Public Involvement, Consultation, and Coordination	1335
5.1. Introduction.....	1337
5.2. Public Involvement	1338
5.2.1. Scoping Period	1339
5.2.2. Public Comment Period on the Draft RMP and EIS	1339
5.2.3. Other Public Involvement	1340
5.2.4. Future Public Involvement.....	1341
5.3. Consultation and Coordination	1341
5.3.1. Cooperating Agencies	1342
5.3.2. Section 7 Consultation	1343
5.3.3. Native American Interests.....	1343
5.4. Distribution List.....	1344
5.5. Consultation Letters.....	1349
5.6. List of Preparers.....	1360
 6. References.....	 1363
 Glossary	 1399
 Appendix A. Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority	 1427
 Appendix B. Maps.....	 1445
 Appendix C. Recreation Management Area Forms	 1453
 Appendix D. Reclamation Objectives and Standards	 1477
 Appendix E. Exception, Modification, and Waiver Criteria, Avoidance Criteria, and Special Management for Designated Corridors.....	 1483
E.1. Introduction.....	1483
E.2. Exceptions, Modifications, and Waivers	1484
E.3. Standard Exception	1484
E.4. Resource Specific Exceptions.....	1485
E.4.1. Wildlife	1485
E.4.2. Cultural Resources	1486
E.4.3. Oil and Gas Actions	1486
E.5. Procedures for Exceptions	1487
E.6. Rights-of-Way.....	1488
 Appendix F. Lander Air Resources Management Plan.....	 1491
F.1. Purpose.....	1491
F.2. Air Quality Issues	1491
F.2.1. Magnitude of Emissions.....	1491
F.2.2. Pollutants of Concern.....	1492
F.2.3. Air Emission Generating Activities	1493

F.2.4. Geographic Areas of High Potential for Development	1493
F.2.5. Summary of Air Quality Issues.....	1495
F.3. Field Office Air Resource Management Requirements	1496
F.3.1. Authorization of Air Emission Generating Activities.....	1496
F.3.2. Monitoring	1497
F.3.3. Modeling	1497
F.3.4. Mitigation.....	1498
F.4. Project Specific Requirements	1498
F.4.1. Emissions Inventory	1499
F.4.2. Monitoring	1499
F.4.3. Modeling	1499
F.4.4. Mitigation.....	1500
Appendix G. Example Detailed, Multi-phased, Reclamation Plan	1505
Appendix H. Required Design Features and Best Management Practices.....	1521
Appendix I. Stipulations and Conditions of Approval in Designated Development Areas and in Non-Designated Development Areas	1535
Appendix J. Wyoming Standards for Healthy Rangelands	1537
Appendix K. Livestock Grazing Allotments and Range Improvements.....	1547
Appendix L. Economic Impact Analysis Methodology.....	1583
L.1. Introduction.....	1583
L.2. The IMPLAN Model.....	1583
L.3. Oil and Gas	1584
L.4. Livestock Grazing	1589
L.5. Recreation	1592
Appendix M. Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities.....	1595
Appendix N. Standard Oil and Gas Stipulations.....	1601
Appendix O. Fire Management	1605
Appendix P. Species Mentioned in the Lander Field Office Resource Management Plan and Environmental Impact Statement	1611
Appendix Q. Fire Regime and Vegetation Condition.....	1617
Appendix R. Lands Identified for Land Tenure Adjustment(s)	1623
Appendix S. Lands Identified for Disposal.....	1629
Appendix T. Surface Disturbance and Reasonable Foreseeable Actions.....	1641

Appendix U. Technical Support Document for Air Resources	1651
U.1. Introduction.....	1651
U.1.1. Study Area	1651
U.1.2. Pollutants Addressed in the Analysis.....	1651
U.1.3. Thresholds of Significance.....	1652
U.1.4. Emissions Generating Activities Included in Analysis	1655
U.2. Methodology	1657
U.2.1. Emission Calculations by Category	1658
U.3. Mitigation and BMPs.....	1662
U.4. Summary of Emissions	1665
Appendix V. Wild Horse Management in the Lander Planning Area.....	1805
Appendix W. Travel Management Planning.....	1813
Appendix X. Comment Analysis	1829
X.1. Introduction.....	1829
X.2. Comment Analysis Process.....	1830
X.2.1. Analysis Process	1830
X.3. Commenter Demographics	1831
X.3.1. Geographic Representation	1832
X.3.2. Organizational Affiliation.....	1834
X.3.3. Public Comment Document Method of Delivery	1835
X.3.4. Form Letters.....	1835
X.4. Analysis of Comments	1836
X.4.1. Comment Submittals by Issue Category	1837
X.4.2. Substantive Comment Summary and Response.....	1840
X.4.3. Non-Substantive Comments	1870
X.5. Conclusion	1870

List of Figures

Figure 4.1.	Estimated Annual Emissions by Alternative from BLM Activities in the Lander Planning Area, 2018	595
Figure 4.2.	Estimated Annual Emissions by Alternative from BLM Activities in the Lander Planning Area, 2027	596
Figure 4.3.	Contribution of Each Category to Total PM ₁₀ Emissions under Alternative A, 2018	608
Figure 4.4.	Contribution of Each Category to Total NO _x Emissions under Alternative A, 2018	609
Figure 4.5.	Contribution of Each Category to Total VOCs Emissions under Alternative A, 2018	610
Figure 4.6.	Contribution of Each Category to Total HAPs Emissions under Alternative A, 2018.....	611
Figure 4.7.	Contribution of Each Category to Total CO Emissions under Alternative B, 2018	616
Figure 4.8.	Contribution of Each Category to Total SO ₂ Emissions under Alternative B, 2018	617
Figure 4.9.	Contribution of Each Category to Total PM ₁₀ Emissions under Alternative C, 2018	622
Figure 4.10.	Contribution of Each Category to Total PM _{2.5} Emissions under Alternative C, 2018.....	623
Figure 4.11.	Contribution of Oil and Gas Development Emissions to Total Emissions by Alternative, 2018	628
Figure 4.12.	Contribution of Non-Oil and Gas Mineral Development Emissions to Total Emissions by Alternative, 2018.....	629
Figure 4.13.	Fremont County Subdivisions, 1985-2010.....	1303
Figure 4.14.	Acres under Subdivision Development in Fremont County, 1985-2010	1304
Figure K.1.	Range Infrastructure Development.....	1582
Figure X.1.	Number of Comment Documents by Geography	1834
Figure X.2.	Number of Comment Documents by Affiliation	1835
Figure X.3.	Number of Individual Comments by Issue Category.....	1839

List of Tables

Table 4.1.	Estimated Annual Emissions Summary for BLM Activities in the Lander Planning Area....	594
Table 4.2.	Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for BLM Activities in the Lander Planning Area	599
Table 4.3.	Lander Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions.....	600
Table 4.4.	Estimated Annual Emissions by Activity – Base Year 2008.....	603
Table 4.5.	Estimated Emissions by Activity (tons per year) under Alternative A, 2018	605
Table 4.6.	Estimated Emissions by Activity (tons per year) under Alternative A, 2027	606
Table 4.7.	Estimated Annual Emissions by Activity (tons per year) under Alternative B, 2018	612
Table 4.8.	Estimated Annual Emissions by Activity (tons per year) under Alternative B, 2027	614
Table 4.9.	Estimated Annual Emissions by Activity (tons per year) under Alternative C, 2018	618
Table 4.10.	Estimated Annual Emissions by Activity (tons per year) under Alternative C, 2027	620
Table 4.11.	Estimated Annual Emissions by Activity (tons per year) under Alternative D, 2018	624
Table 4.12.	Estimated Annual Emissions by Activity (tons per year) under Alternative D, 2027	626
Table 4.13.	Acres of the Planning Area Managed to Protect Wilderness Characteristics	668
Table 4.14.	Acres of Subsurface Mineral Estate Closed to Locatable Minerals (Segregation and Withdrawals)	676
Table 4.15.	Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values.....	681
Table 4.16.	Areas and Acreage Closed to Motorized Travel	681
Table 4.17.	Acres of Mineral Estate Open, Open with Constraints, and Closed to Geothermal Leasing .	692
Table 4.18.	Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative.....	699
Table 4.19.	Phosphate Potential	719
Table 4.20.	Visual Resources Inventory and Management Classes by Alternative	1016
Table 4.21.	VRM Class Designation of Sensitive and Unique Scenic Features in the Lander Planning Area by Alternative	1017
Table 4.22.	Acreage of Withdrawals in the Lander Planning Area	1025
Table 4.23.	Wind Power Classification	1028
Table 4.24.	Travel Designations by Alternative.....	1049
Table 4.25.	Areas Closed to Motorized Vehicles by Alternative.....	1050
Table 4.26.	Acres Designated for Over-Snow Travel	1050
Table 4.27.	Acres Designated for Mechanized (Bicycle) Travel	1050
Table 4.28.	Travel Management Focus under Alternative A	1053
Table 4.29.	Travel Management Focus under Alternative B	1056
Table 4.30.	Travel Management Focus under Alternative C	1058
Table 4.31.	Estimated Reduction in AUMs by Alternative	1068
Table 4.32.	Impacts to Recreation Setting by Alternative.....	1088
Table 4.33.	Acreage Available to Consumptive, Non-Consumptive, Motorized, and Nonmotorized Recreation Activities.....	1089
Table 4.34.	Recreation-Specific Beneficial Outcomes by Alternative	1089
Table 4.35.	Wildlife-Dependent Recreation Acreage by Alternative	1090
Table 4.36.	Energy-Related Impacts to Recreation Areas under Alternative A.....	1094

Table 4.37.	Energy-Related Impacts to Recreation Areas under Alternative C	1099
Table 4.38.	Energy-Related Impacts to Recreation Areas under Alternative D	1103
Table 4.39.	Congressionally Designated Trail Recreation Areas Managed for Beneficial Outcomes	1117
Table 4.40.	VRM Classes as Percent of Congressionally Designated Trails Landscape	1117
Table 4.41.	Waterways Eligible for Inclusion in the National Wild and Scenic River System.....	1127
Table 4.42.	Impacts to Eligible WSRs under Alternative A from Resource Uses	1130
Table 4.43.	Impacts to Eligible WSRs from Other Special Designation Management.....	1131
Table 4.44.	Impacts to Eligible WSRs under Alternative C	1133
Table 4.45.	Overall Impacts to Social Conditions by Alternative	1241
Table 4.46.	Comparison of Projected Earnings and Employment	1254
Table 4.47.	Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area.....	1258
Table 4.48.	Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area	1258
Table 4.49.	Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area.....	1259
Table 4.50.	Cumulative Surface Disturbance from BLM and Non-BLM Reasonable Foreseeable Actions.....	1278
Table 4.51.	Summary of Reasonably Foreseeable Future Actions	1280
Table 4.52.	Percent Composition by Land Ownership of Greater Sage-Grouse Core Area and Non-Core Area	1285
Table 4.53.	BLM Contribution to Cumulative Annual Statewide Emissions	1296
Table 4.54.	Cumulative Annual Emissions Summary for BLM and Non-BLM Activities in the Lander Planning Area	1298
Table 4.55.	Wyoming Basin CDNST Management Miles by BLM Field Office.....	1321
Table 4.56.	Number of Miles of Wyoming Basin CDNST Projected to be Impacted by Human Intrusion and Resource Uses.....	1321
Table 4.57.	High Potential Trail Segments in the General Assessment Area.....	1324
Table 4.58.	High Potential Trail Segments in the Specific Assessment Area	1328
Table 5.1.	Public Involvement, Coordination, and Consultation Events	1337
Table 5.2.	List of Preparers	1360
Table A.1.	Federal Laws and Statutes	1427
Table A.2.	Bureau of Land Management Regulations and Policies	1432
Table A.3.	Applicable Wyoming State Laws and Regulations.....	1438
Table A.4.	Memoranda and Agreements	1438
Table C.1.	Lander Field Office Recreation and Visitor Services Objectives.....	1453
Table C.2.	Difference in Recreation Management Areas	1454
Table C.3.	Existing Recreation Management (Alternative A).....	1454
Table C.4.	Special Recreation Management Areas.....	1455
Table C.5.	Distinct Extensive Recreation Management Areas.....	1456
Table C.6.	Alkali Basin Recreation Management Zone	1457
Table C.7.	Sweetwater Mining Recreation Management Zone.....	1458
Table C.8.	Designated Trails Recreation Management Zone	1460
Table C.9.	Dubois Mill Site Recreation Management Zone (Alternatives B and D)	1461
Table C.10.	Dubois Mill Site Recreation Management Zone (Alternative C).....	1463
Table C.11.	Johnny Behind the Rocks Recreation Management Zone	1465

Table C.12.	Sinks Canyon Recreation Management Zone	1466
Table C.13.	The Bus @ Baldwin Creek Recreation Management Zone.....	1468
Table C.14.	National Historic Trails Auto Tour Route Recreation Management Zone	1469
Table C.15.	Group Use Recreation Management Zone	1471
Table C.16.	Sweetwater Canyon Recreation Management Zone	1472
Table C.17.	Sweetwater Rocks Recreation Management Zone.....	1474
Table F.1.	Class I and Class II Areas in the Vicinity of the Planning Area.....	1495
Table F.2.	Emission Reduction Strategies for Oil and Gas Development	1501
Table I.1.	Activities for Oil and Gas and ROW Operations, and Short-Term Operation and Maintenance Activities Subject to COAs/Stipulations	1535
Table I.2.	Maintenance and Operation Activities for Oil and Gas and ROW Operations Outside DDAs Subject to COAs/Stipulations.....	1536
Table K.1.	Grazing Allotments, Acres, Season of Use, and Animal Unit Months	1551
Table K.2.	Allotment Categorization – Current and Proposed	1563
Table K.3.	Lander Field Office Grazing Allotments Assessed for Meeting Standards	1569
Table K.4.	Allotment Management Plans and Rangeland Management Agreements Developed	1573
Table K.5.	Summary of Range Improvements Lander Field Office, 1986-2009	1576
Table K.6.	Animal Unit Months Authorized, 1989-2008	1581
Table L.1.	Oil and Gas Well Numbers	1584
Table L.2.	Projected Oil and Gas Production (Federal Surface)	1585
Table L.3.	Projected Oil and Gas Production (Federal, State, and Fee Surface)	1586
Table L.4.	Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type	1587
Table L.5.	Assumptions for Analysis of Economical Impacts on Output for Oil and Gas Production..	1588
Table L.6.	Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type	1588
Table L.7.	Assumptions for Employment Impacts Analysis for Oil and Gas Production.....	1589
Table L.8.	Estimated AUMs by Alternative	1591
Table L.9.	Assumptions for Analysis of Impacts on Output for Livestock Grazing	1592
Table L.10.	Assumptions for Analysis of Employment Impacts for Livestock Grazing.....	1592
Table L.11.	Estimated Nonresident Recreation Visitor Days.....	1593
Table L.12.	Assumptions for Analysis of Impacts on Output for Recreation Activities.....	1594
Table L.13.	Assumptions for Employment Impacts Analysis for Recreation Activities.....	1594
Table O.1.	Fire Management by Fire Management Unit	1606
Table P.1.	Common and Scientific Names of Plant and Wildlife Species	1611
Table Q.1.	Fire Regime Groups and Descriptions	1617
Table Q.2.	Fire Regime Condition Classifications.....	1617
Table Q.3.	Forest and Woodland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area	1618
Table Q.4.	Grasslands and Shrubland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area	1620
Table S.1.	Lands Identified for Disposal.....	1630
Table T.1.	Summary of Projected Acres of Surface Disturbance by Resource	1642
Table T.2.	Oil and Gas Reasonable Foreseeable Development Assumptions	1649
Table U.1.	National and Wyoming Ambient Air Quality Standards.....	1652

Table U.2.	Prevention of Significant Deterioration Increments.....	1654
Table U.3.	Number of Existing and Proposed Wells by Alternative	1658
Table U.4.	Basis for Emissions Calculations for Land Resources Projects	1661
Table U.5.	Emission Reduction Strategies for Oil and Gas Development	1662
Table U.6.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Base Year – 2008).....	1666
Table U.7.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2018).....	1668
Table U.8.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2027).....	1670
Table U.9.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2018).....	1672
Table U.10.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2027).....	1674
Table U.11.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2018).....	1676
Table U.12.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2027).....	1678
Table U.13.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2018).....	1680
Table U.14.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2027).....	1682
Table U.15.	Leasable Minerals – CBNG Development – Federal Wells (Base Year – 2008).....	1684
Table U.16.	Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2018).....	1686
Table U.17.	Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2027).....	1688
Table U.18.	Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2018).....	1690
Table U.19.	Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2027).....	1691
Table U.20.	Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2018).....	1693
Table U.21.	Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2027).....	1694
Table U.22.	Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2018).....	1696
Table U.23.	Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2027).....	1697
Table U.24.	Locatable Minerals – Bentonite Mining (Base Year – 2008).....	1699
Table U.25.	Locatable Minerals – Bentonite Mining (Alternative A – 2018).....	1700
Table U.26.	Locatable Minerals – Bentonite Mining (Alternative A – 2027).....	1701
Table U.27.	Locatable Minerals – Bentonite Mining (Alternative B – 2018).....	1702
Table U.28.	Locatable Minerals – Bentonite Mining (Alternative B – 2027).....	1703
Table U.29.	Locatable Minerals – Bentonite Mining (Alternative C – 2018).....	1704
Table U.30.	Locatable Minerals – Bentonite Mining (Alternative C – 2027).....	1705
Table U.31.	Locatable Minerals – Bentonite Mining (Alternative D – 2018).....	1706
Table U.32.	Locatable Minerals – Bentonite Mining (Alternative D – 2027).....	1707
Table U.33.	Locatable Minerals – Gold Mining (Base Year – 2008).....	1708
Table U.34.	Locatable Minerals – Gold Mining (All Alternatives – 2018)	1709
Table U.35.	Locatable Minerals – Gold Mining (All Alternatives – 2027)	1710
Table U.36.	Locatable Minerals – Uranium Mining (Base Year – 2008)	1711
Table U.37.	Locatable Minerals – Uranium Mining (All Alternatives – 2018).....	1712

Table U.38.	Locatable Minerals – Uranium Mining (All Alternatives – 2027).....	1713
Table U.39.	Salable Minerals – Sand & Gravel (Base Year – 2008)	1714
Table U.40.	Salable Minerals – Sand & Gravel (Alternative A – 2018).....	1715
Table U.41.	Salable Minerals – Sand & Gravel (Alternative A – 2027).....	1716
Table U.42.	Salable Minerals – Sand & Gravel (Alternative B – 2018)	1717
Table U.43.	Salable Minerals – Sand & Gravel (Alternative B – 2027)	1718
Table U.44.	Salable Minerals – Sand & Gravel (Alternative C – 2018)	1719
Table U.45.	Salable Minerals – Sand & Gravel (Alternative C – 2027)	1720
Table U.46.	Salable Minerals – Sand & Gravel (Alternative D – 2018).....	1721
Table U.47.	Salable Minerals – Sand & Gravel (Alternative D – 2027).....	1722
Table U.48.	Fire Management and Ecology (Base Year – 2008).....	1723
Table U.49.	Fire Management and Ecology (Alternative A – 2018).....	1724
Table U.50.	Fire Management and Ecology (Alternative A – 2027).....	1725
Table U.51.	Fire Management and Ecology (Alternative B – 2018).....	1726
Table U.52.	Fire Management and Ecology (Alternative B – 2027).....	1727
Table U.53.	Fire Management and Ecology (Alternative C – 2018).....	1728
Table U.54.	Fire Management and Ecology (Alternative C – 2027).....	1729
Table U.55.	Fire Management and Ecology (Alternative D – 2018).....	1730
Table U.56.	Fire Management and Ecology (Alternative D – 2027).....	1731
Table U.57.	Vegetation – Forest and Woodlands (Base Year – 2008).....	1732
Table U.58.	Vegetation – Forest and Woodlands (Alternative A – 2018)	1733
Table U.59.	Vegetation – Forest and Woodlands (Alternative A – 2027)	1734
Table U.60.	Vegetation – Forest and Woodlands (Alternative B – 2018).....	1735
Table U.61.	Vegetation – Forest and Woodlands (Alternative B – 2027).....	1736
Table U.62.	Vegetation – Forest and Woodlands (Alternative C – 2018).....	1737
Table U.63.	Vegetation – Forest and Woodlands (Alternative C – 2027).....	1738
Table U.64.	Vegetation – Forest and Woodlands (Alternative D – 2018)	1739
Table U.65.	Vegetation – Forest and Woodlands (Alternative D – 2027)	1740
Table U.66.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Base Year – 2008)	1741
Table U.67.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2018) ..	1742
Table U.68.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2027) ..	1743
Table U.69.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2018) ..	1744
Table U.70.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2027) ..	1745
Table U.71.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2018) ..	1746
Table U.72.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2027) ..	1747
Table U.73.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2018) ..	1748
Table U.74.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2027) ..	1749
Table U.75.	Land Resources – Comprehensive Trails and Travel Management (Base Year – 2008)	1750
Table U.76.	Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2018)	1751
Table U.77.	Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2027)	1752
Table U.78.	Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2018)	1753
Table U.79.	Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2027)	1754
Table U.80.	Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2018)	1755
Table U.81.	Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2027)	1756
Table U.82.	Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2018)	1757

Table U.83.	Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2027)	1758
Table U.84.	Land Resources – Livestock Grazing (Base Year – 2008)	1759
Table U.85.	Land Resources – Livestock Grazing (Alternative A – 2018)	1760
Table U.86.	Land Resources – Livestock Grazing (Alternative A – 2027)	1761
Table U.87.	Land Resources – Livestock Grazing (Alternative B – 2018)	1762
Table U.88.	Land Resources – Livestock Grazing (Alternative B – 2027)	1763
Table U.89.	Land Resources – Livestock Grazing (Alternative C – 2018)	1764
Table U.90.	Land Resources – Livestock Grazing (Alternative C – 2027)	1765
Table U.91.	Land Resources – Livestock Grazing (Alternative D – 2018)	1766
Table U.92.	Land Resources – Livestock Grazing (Alternative D – 2027)	1767
Table U.93.	Leasable Minerals – Conventional Oil and Gas Development – Total (BLM and Non-BLM) Wells (Base Year – 2008)	1768
Table U.94.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2018)	1770
Table U.95.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2027)	1772
Table U.96.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2018)	1774
Table U.97.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2027)	1776
Table U.98.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2018)	1778
Table U.99.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2027)	1780
Table U.100.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2018)	1782
Table U.101.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2027)	1784
Table U.102.	Leasable Minerals – CBNG Development – Total (BLM and Non-BLM) Wells (Base Year – 2008)	1786
Table U.103.	Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2018)	1788
Table U.104.	Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2027)	1790
Table U.105.	Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2018)	1792
Table U.106.	Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2027)	1794
Table U.107.	Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2018)	1796
Table U.108.	Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2027)	1798
Table U.109.	Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2018)	1800
Table U.110.	Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2027)	1802
Table V.1.	Wild Horse Regional Meta-populations Associated with the Planning Area	1809
Table W.1.	Travel Management Plan, Priority Rank, Timeframes for Completion, and Interim and Final Travel Restrictions	1815
Table X.1.	Issue Categories	1831
Table X.2.	Number of Commenters by Geographic Location	1832
Table X.3.	Number of Comment Documents by Affiliation (excluding form letters)	1834
Table X.4.	Number of Public Comment Documents by Method of Delivery	1835

Table X.5.	Number of Comments per Issue Category	1837
Table X.6.	Comment and Response Summaries	1841

List of Maps

Map 1.	Surface Ownership in the Planning Area	1445
Map 2.	Federal Mineral Estate in the Planning Area.....	1445
Map 3.	Dubois Area and General Location Names.....	1445
Map 4.	Physical Resources - Major River Basins	1445
Map 5.	Physical Resources - Riparian Areas.....	1445
Map 6.	Physical Resources - Class I Waters.....	1445
Map 7.	Physical Resources - Wind Erosion Potential	1445
Map 8.	Physical Resources - Water Erosion Potential	1445
Map 9.	Physical Resources - Annual Precipitation.....	1445
Map 10.	Physical Resources - Surface Slope.....	1445
Map 11.	Physical Resources - Soils with Limited Reclamation Potential	1445
Map 12.	Physical Resources - Citizen Proposed Wilderness	1445
Map 13.	Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative B) ...	1445
Map 14.	Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative D) ...	1445
Map 15.	Mineral Resources - Uranium Mining Projects and Districts	1445
Map 16.	Mineral Resources - Geothermal Development Potential	1446
Map 17.	Mineral Resources - Conventional Oil and Gas Development Potential	1446
Map 18.	Mineral Resources - Salable - Mineral Materials Sand and Gravel Occurrence Potential ...	1446
Map 19.	Mineral Resources - Phosphate Leasing Potential	1446
Map 20.	Mineral Resources - Coalbed Natural Gas Development Potential.....	1446
Map 21.	Mineral Resources - Locatable Mineral Withdrawals (Alternative A)	1446
Map 22.	Mineral Resources - Locatable Mineral Withdrawals (Alternative B).....	1446
Map 23.	Mineral Resources - Locatable Mineral Withdrawals (Alternative C).....	1446
Map 24.	Mineral Resources - Locatable Mineral Withdrawals (Alternative D)	1446
Map 25.	Mineral Resources - Geothermal Energy Constraints (Alternative A).....	1446
Map 26.	Mineral Resources - Geothermal Energy Constraints (Alternative B).....	1446
Map 27.	Mineral Resources - Geothermal Energy Constraints (Alternative C).....	1446
Map 28.	Mineral Resources - Geothermal Energy Constraints (Alternative D).....	1446
Map 29.	Mineral Resources - Oil and Gas Constraints (Alternative A)	1446
Map 30.	Mineral Resources - Oil and Gas Constraints (Alternative B)	1446
Map 31.	Mineral Resources - Oil and Gas Constraints (Alternative C)	1446
Map 32.	Mineral Resources - Oil and Gas Constraints (Alternative D)	1446
Map 33.	Mineral Resources - Oil and Gas Fields and Leases.....	1446
Map 34.	Mineral Resources - Salable - Mineral Materials Disposal (Alternative A)	1446
Map 35.	Mineral Resources - Salable - Mineral Materials Disposal (Alternative B)	1446
Map 36.	Mineral Resources - Salable - Mineral Materials Disposal (Alternative C)	1447
Map 37.	Mineral Resources - Salable - Mineral Materials Disposal (Alternative D)	1447
Map 38.	Mineral Resources - Phosphate Leasing (Alternative A).....	1447
Map 39.	Mineral Resources - Phosphate Leasing (Alternative B).....	1447
Map 40.	Mineral Resources - Phosphate Leasing (Alternative C).....	1447
Map 41.	Mineral Resources - Phosphate Leasing (Alternative D).....	1447
Map 42.	Fire Management - Fire Regime Condition Classifications	1447

Map 43.	Fire Management - Fire Management Units	1447
Map 44.	Biological Resources - Precipitation Zones for U.S. Department of Agriculture Natural Resources Conservation Service Ecological Site Descriptions	1447
Map 45.	Biological Resources - Vegetation Communities and Major Land Resource Areas	1447
Map 46.	Biological Resources - Invasive Plant Species.....	1447
Map 47.	Biological Resources - Primary Forest Resource Areas	1447
Map 48.	Biological Resources - Proper Functioning Condition Streams	1447
Map 49.	Biological Resources - Fish-bearing Streams	1447
Map 50.	Biological Resources - Bighorn Sheep Crucial Winter Range and Parturition Areas	1447
Map 51.	Biological Resources - Elk Winter Ranges and Parturition Areas	1447
Map 52.	Biological Resources - Moose Crucial Winter Range	1447
Map 53.	Biological Resources - Mule Deer Crucial Winter Range.....	1447
Map 54.	Biological Resources - Pronghorn Crucial Winter Range	1447
Map 55.	Biological Resources - Wyoming Game and Fish Department Bighorn Sheep Herd Units	1447
Map 56.	Biological Resources - Wyoming Game and Fish Department Elk Herd Units	1448
Map 57.	Biological Resources - Wyoming Game and Fish Department Moose Herd Units.....	1448
Map 58.	Biological Resources - Wyoming Game and Fish Department Mule Deer Herd Units	1448
Map 59.	Biological Resources - Wyoming Game and Fish Department Pronghorn Herd Units.....	1448
Map 60.	Biological Resources - Big Game Migration Routes and Barriers.....	1448
Map 61.	Biological Resources - Wyoming Game and Fish Department White-tailed Deer Herd Units.....	1448
Map 62.	Biological Resources - Known Raptor Nests	1448
Map 63.	Biological Resources - Special Status Species Greater Sage-Grouse (Alternatives A and C)	1448
Map 64.	Biological Resources - Special Status Species Greater Sage-Grouse (Alternative B).....	1448
Map 65.	Biological Resources - Special Status Species Greater Sage-Grouse (Alternative D)	1448
Map 66.	Biological Resources - Special Status Species Lynx Analysis Units	1448
Map 67.	Biological Resources - Special Status Species Desert Yellowhead Critical Habitat	1448
Map 68.	Biological Resources - Wild Horse Herd Management Areas	1448
Map 69.	Heritage and Visual Resources - Cultural Resources	1448
Map 70.	Heritage and Visual Resources - Potential Fossil Yield Classifications	1448
Map 71.	Heritage and Visual Resources - Visual Resource Inventory Distance Mapping Zones.....	1448
Map 72.	Heritage and Visual Resources - Visual Resource Inventory Sensitivity	1448
Map 73.	Heritage and Visual Resources - Visual Resource Inventory Scenic Quality.....	1448
Map 74.	Heritage and Visual Resources - New (2009) Visual Resource Inventory Classes	1448
Map 75.	Heritage and Visual Resources - Existing (1985) Visual Resource Management Classes (Alternative A)	1449
Map 76.	Heritage and Visual Resources - Visual Resource Management Classes (Alternative B) ...	1449
Map 77.	Heritage and Visual Resources - Visual Resource Management Classes (Alternative C) ...	1449
Map 78.	Heritage and Visual Resources - Visual Resource Management Classes (Alternative D) ...	1449
Map 79.	Heritage and Visual Resources - Regional Historic Trails and Early Highway-Intact Portions (Alternatives A, C, and D).....	1449
Map 80.	Heritage and Visual Resources - Regional Historic Trails and Early Highways (Alternative B).....	1449
Map 81.	Land Resources - Transportation Features	1449

Map 82.	Land Resources - Jeffrey City Area Transportation Features.....	1449
Map 83.	Land Resources - Lander Area Transportation Features	1449
Map 84.	Land Resources - Lysite Area Transportation Features.....	1449
Map 85.	Land Resources - Dubois Area Transportation Features	1449
Map 86.	Land Resources - 1987 Recreation Opportunity Spectrum	1449
Map 87.	Land Resources - Recreation Opportunity Spectrum 2009 Physical Setting.....	1449
Map 88.	Land Resources - Recreation Opportunity Spectrum 2009 Social Setting.....	1449
Map 89.	Land Resources - Recreation Opportunity Spectrum 2009 Operational Setting	1449
Map 90.	Land Resources - Recreation Management Areas (Alternative A)	1449
Map 91.	Land Resources - Recreation Management Areas (Alternative B)	1449
Map 92.	Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative C)	1449
Map 93.	Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative D).....	1449
Map 94.	Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternatives A and D)	1450
Map 95.	Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternatives B and C).....	1450
Map 96.	Land Resources - Wind Energy Potential	1450
Map 97.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative A)	1450
Map 98.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative B).....	1450
Map 99.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative C).....	1450
Map 100.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative D)	1450
Map 101.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative A).....	1450
Map 102.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative B)	1450
Map 103.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative C)	1450
Map 104.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative D).....	1450
Map 105.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative A)	1450
Map 106.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative B).....	1450
Map 107.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative C).....	1450
Map 108.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative D)	1450
Map 109.	Land Resources - Trails and Travel Management (Alternative A)	1450
Map 110.	Land Resources - Trails and Travel Management (Alternative B).....	1450
Map 111.	Land Resources - Trails and Travel Management (Alternative C).....	1451
Map 112.	Land Resources - Trails and Travel Management (Alternative D)	1451
Map 113.	Land Resources - Trails and Travel Management Seasonal Limitation to All Travel (Alternative D)	1451

Map 114.	Land Resources - Trails and Travel Management Over-Snow Travel (Alternative A).....	1451
Map 115.	Land Resources - Trails and Travel Management Over-Snow Travel (Alternative B).....	1451
Map 116.	Land Resources - Trails and Travel Management Over-Snow Travel (Alternative D).....	1451
Map 117.	Land Resources - Livestock Grazing (Alternatives A and C)	1451
Map 118.	Land Resources - Livestock Grazing (Alternative B).....	1451
Map 119.	Land Resources - Livestock Grazing (Alternative D).....	1451
Map 120.	Land Resources - Recreation Sites	1451
Map 121.	Special Designations - Continental Divide National Scenic Trail.....	1451
Map 122.	Special Designations - National Historic Trails High Potential Segments	1451
Map 123.	Special Designations - National Historic Trails with Associated Sites.....	1451
Map 124.	Special Designations - National Historic Trails (Alternative A)	1451
Map 125.	Special Designations - National Historic Trails (Alternative B)	1451
Map 126.	Special Designations - National Historic Trails (Alternative C)	1451
Map 127.	Special Designations - National Trails Management Corridor (Alternative D).....	1451
Map 128.	Special Designations - Wilderness Study Areas	1451
Map 129.	Special Designations - Suitable Wild and Scenic River Segments (Alternatives A, B, and D)	1452
Map 130.	Special Designations - Areas of Critical Environmental Concern (Alternative A)	1452
Map 131.	Special Designations - Areas of Critical Environmental Concern (Alternative B).....	1452
Map 132.	Special Designations - Areas of Critical Environmental Concern (Alternative D)	1452
Map 133.	Socioeconomic Resources - Tribal Census Tracts in the Wind River Indian Reservation...	1452
Map 134.	Mineral Resources - Designated Development Area (Alternative D).....	1452
Map 135.	Mineral Resources - Areas with Master Leasing Plans (Alternative D)	1452
Map 136.	Cumulative Impact Analysis Area - Greater Sage-Grouse - Surface Ownership	1452
Map 137.	Cumulative Impact Analysis Area - Greater Sage-Grouse - Split Estate	1452
Map 138.	Cumulative Impact Analysis Area - Fourth Order Hydrologic Units	1452
Map 139.	Cumulative Impact Analysis Area - Wyoming Basin Ecoregion and Continental Divide National Scenic Trail.....	1452
Map 140.	Cumulative Impact Analysis Area - National Historic Trails.....	1452
Map 141.	Land Resources - Lands Proposed for Exchange by Members of the Public	1452
Map 142.	Trails and Travel Management - Travel Management Areas	1452

This page intentionally
left blank

Chapter 4. Environmental Consequences

This page intentionally
left blank

Introduction

The following analyses addresses impacts from Bureau of Land Management (BLM) management of federal surface and federal minerals. In some locations, there are private or State of Wyoming lands near or intermingled with public lands and/or federal mineral estate. The BLM land use plan only covers federal lands and mineral estate and federal actions. There depiction of geographic areas which might include lands with other ownerships does not suggest or imply that federal management applies to those properties.

General Assumptions for Analysis

The methods and assumptions listed below, and for each resource in Chapter 4, are disclosed to provide a basis for the conclusions reached in environmental assessments. Assumptions common to all alternatives and all resources are listed below, whereas assumptions unique to specific resources and resource uses are listed under *Methods and Assumptions* in the appropriate resource section.

- All alternatives are implemented in compliance with standard practices, best management practices (BMPs) (Appendix H (p. 1521)), design features, guidelines for surface-disturbing activities, and mitigation guidelines (Appendix M (p. 1595)). In other words, the practices and guidelines included in Appendix H (p. 1521) and Appendix M (p. 1595) are considered a component of each alternative. Appendix M (p. 1595) lists standard practices used in the planning area to mitigate adverse impacts caused by surface-disturbing activities.
- Comparison of impacts among resources is intended to provide an impartial assessment to inform the decision maker and the public. The impact analysis does not imply or assign a value or numerical ranking to impacts. Actions resulting in adverse impacts to one resource may impart a beneficial impact to other resources.
- In general, adverse impacts described in this chapter are considered important if they result from or relate to the key planning issues described in Chapter 1 and the context or intensity of impacts suggest potential impacts to public health and safety; a potential for violating legal standards, laws, or protective status of resources; or potential impacts to unique resources.
- The comparison of individual alternatives is qualitative, relative to Alternative A (current management), and based on professional judgment and consideration of the context and intensity of allowable uses and management actions anticipated to impact resources and resource uses.
- Analysis of environmental consequences considers the extent of projected surface disturbance and associated development resulting from BLM actions.
- The analysis of impacts reflects the anticipated impacts of alternatives on individual resources; for example, the impact of invasive nonnative plant species on wildlife is described in the *Fish and Wildlife Resources – Wildlife* section – not in the *Invasive Species and Pest Management* section.
- The analysis of impacts focuses on the anticipated future incremental and meaningful impact of management actions and allowable uses proposed for each alternative. The impact of past

and present actions is encompassed within the description of existing conditions in Chapter 3, Affected Environment.

- The definition of surface-disturbing activities used for analysis is provided in the *Glossary*. Surface disturbance typically is described in terms of the total acres of short- or long-term disturbance from BLM actions. Short-term impacts are defined as those impacts that are anticipated to begin and end within the first 5 years after the action is implemented. Long-term impacts are defined as lasting beyond 5 years to the end of or beyond the 20-year planning timeframe addressed in the Resource Management Plan (RMP). Appendix T (p. 1641) lists projected surface disturbance associated with individual reasonable foreseeable actions.
- Although not defined as a surface-disturbing activity, livestock and native ungulate grazing and off-highway vehicle (OHV) use may remove vegetation and expose the soil surface leading to increased erosion if use is unmanaged or heavy.
- The decision to designate a right-of-way (ROW) corridor for major ROWs is not, in and of itself, a surface-disturbing activity. Under all alternatives, ROWs would be co-located with existing disturbance if at all possible. However, each new disturbance in a location expands the geographic area where the adverse impacts associated with surface disturbance would occur. In the case of aboveground ROWs, minimum separation requirements can expand the impacts of additional lines to new areas that had not been impacted by the original line. While the types of adverse impacts associated with the additional lines are described in the impacted resources, those impacts would occur (and would be analyzed in detail) only if a new application were authorized.
- Surface disturbances generally increase surface runoff due to an increase in impervious surface, changes in water routing, and loss of vegetation. Surface disturbances also can decrease recharge to aquifers by increases in impervious surface due to compaction, or by transporting water away from areas which have the capability to infiltrate.
- It is assumed that the greater the amount of surface disturbance in a watershed, the greater the probability that accelerated sedimentation associated with the excess surface runoff and will result.
- The Wyoming Standards for Healthy Rangelands (Appendix J (p. 1537)) set forth standards that apply to all activities.
- Planning decisions pursuant to the RMP also apply to BLM-administered federal minerals that underlie non-federal lands (split-estate).
- There are no RMP decisions made for non-federal land surface or mineral estate, on federal lands administered by other federal agencies, or on the federal mineral estate underlying federal lands administered by other federal agencies.
- Planning and management direction focuses on the relative values of resources and not exclusively on the greatest economic return or economic output.
- Reasonably foreseeable action or activity scenarios for all land and resource uses have been developed and portrayed based on historical, existing, and projected levels for all programs. These reasonably foreseeable actions or activity scenarios are estimates for analysis; they are not considered as ceilings or limits, but for comparison of impacts. The 20-year planning

timeframe is also not a predictor of the length of time the RMP will be in effect; it could be less or more, and could be amended at any time.

- Existing endangered species recovery plans, including plans for reintroduction of endangered species and other species, have been considered. Consultation, coordination, and cooperation with the United States Fish and Wildlife Service (USFWS) has occurred in accordance with the 2000 BLM/USFWS Interagency Memorandum of Agreement regarding Section 7 Consultation (USFWS and BLM 2000). All existing biological assessments and biological opinions regarding areas within the planning area have been reviewed for applicability.
- Mitigation requirements exist that prevent or limit direct impacts associated with land use activities or that reclaim the land after the activity has been completed.
- Projections of the level of activity for land uses are based on historical trends, existing land use agreements such as leases or permits, and statements of interest in land use by individuals and industry organizations.
- Funding will be available to implement the alternatives described in Chapter 2.
- The decisions proposed in the alternatives apply to public lands only. However, cumulative impact analyses considered decisions made for resources managed by other entities or individuals.
- The alternatives will be implemented as described in Chapter 2. Each decision in the alternatives is predicated on the entire alternative being implemented. In other words, each management action was developed assuming all other management actions in the respective alternative would be implemented. Had different alternatives been analyzed, a different suite of management actions and resource protections or uses might have been appropriate.
- Appropriate maintenance will be carried out to maintain the functional capability of all developments (e.g., roads, fences, and other projects).
- Monitoring will be completed as indicated, along with any needed adjustments or revisions.
- It is commonly accepted that fire suppression costs and risk to life and property should be less when wildland fires occur where hazardous fuels have been treated, compared to areas where fuels have not been treated. For example, fires generally burn hotter and flame lengths are higher in untreated areas.

4.1. Physical Resources

4.1.1. Air Quality

Air resources in the planning area were evaluated to determine how future BLM actions could impact air quality. Actions that initiate or increase emissions of air pollutants can adversely impact air resources, including increased concentrations of air pollutants, decreased visibility, increased atmospheric deposition on soils and vegetation, and acidification of sensitive waterbodies. Actions that reduce or control emissions of air pollutants can be very effective at improving air quality and preventing air quality degradation. This section addresses the potential impacts of air pollutant emissions from specific activities authorized, allowed, or performed by the BLM in the planning area under each alternative.

4.1.1.1. Summary of Impacts

Emissions of air pollutants were estimated for several management actions and activities likely to occur under each alternative. Emissions were estimated for five criteria pollutants, volatile organic compounds (VOCs), Hazardous Air Pollutants (HAPs), and greenhouse gases (GHGs). A baseline year of 2008 was used to estimate actual emissions and two future years, a short-term year (2018) and a long-term year (2027), were used as the basis to project future emissions. Emissions of all analyzed pollutants are estimated to increase over baseline levels in the short term with a decreasing trend in emissions from the short term to the long term. Emissions increases are due in part to the projected increase in oil and gas development, mining, and other mineral development.

In general, Alternative B emissions estimates would result in the least increase in total air pollutant emissions. Lower emissions would be expected under this alternative because it is the alternative with the greatest restrictions on mineral development. Although total emissions increases are estimated to be the lowest under this alternative, carbon monoxide (CO) emissions could be highest under Alternative B and sulfur dioxide (SO₂) emissions could be the third highest under Alternative B. This is due primarily to the larger acreage of prescribed burning projected for Alternative B. However, limitations on the use of prescribed burning in Core Area would limit this increase. This alternative would likely result in the least adverse impacts to air quality. Alternative C emissions estimates would result in the greatest increase in total air pollutant emissions. Alternative C imposes the fewest restrictions on minerals development, which would result in higher emissions than the other alternatives. Alternative C would have the highest potential to result in adverse impacts to air quality. Total emissions estimated under Alternative D would result in the next-to-lowest increase in emissions over baseline. Table 4.1, “Estimated Annual Emissions Summary for BLM Activities in the Lander Planning Area” (p. 594) summarizes the estimated annual emissions under each alternative by pollutant. This same information is displayed graphically in Figure 4.1, “Estimated Annual Emissions by Alternative from BLM Activities in the Lander Planning Area, 2018” (p. 595) and Figure 4.2, “Estimated Annual Emissions by Alternative from BLM Activities in the Lander Planning Area, 2027” (p. 595).

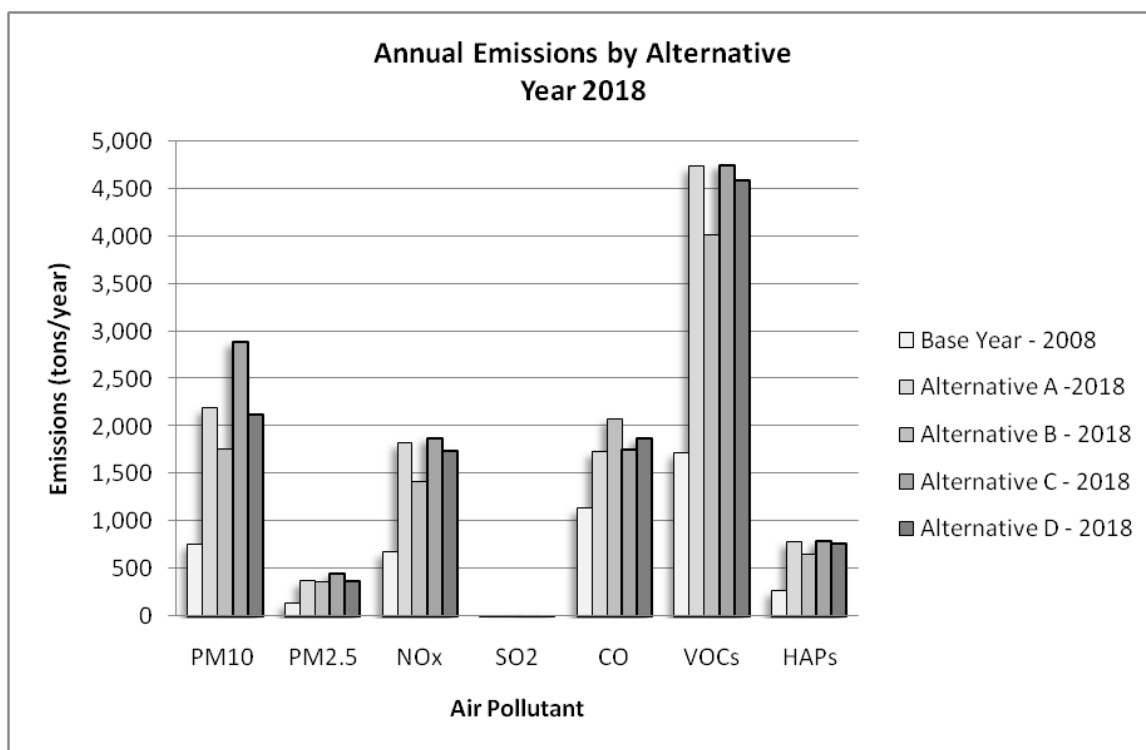
Table 4.1. Estimated Annual Emissions Summary for BLM Activities in the Lander Planning Area

Scenario	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Base Year – 2008							
Base Year	761	135	678	11	1,138	1,726	270
Forecast Year – 2018							
Alternative A	2,195	371	1,829	23	1,734	4,737	786
Alternative B	1,760	359	1,420	24	2,077	4,019	654
Alternative C	2,887	443	1,873	25	1,758	4,754	788
Alternative D	2,122	373	1,747	24	1,872	4,592	759
Forecast Year – 2027							
Alternative A	2,047	344	1,528	22	1,583	3,722	616
Alternative B	1,621	335	1,173	23	1,953	3,145	509
Alternative C	2,737	416	1,546	24	1,596	3,734	617

Scenario	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOCs	HAPs
Alternative D	1,976	347	1,458	23	1,727	3,606	594

Source: Appendix U (p. 1651)

BLM Bureau of Land Management
CO carbon monoxide
HAPs hazardous air pollutants
NO_x nitrogen oxides
PM_{2.5} particulate matter less than 2.5 microns in diameter
PM₁₀ particulate matter less than 10 microns in diameter
SO₂ sulfur dioxide
VOC volatile organic compound

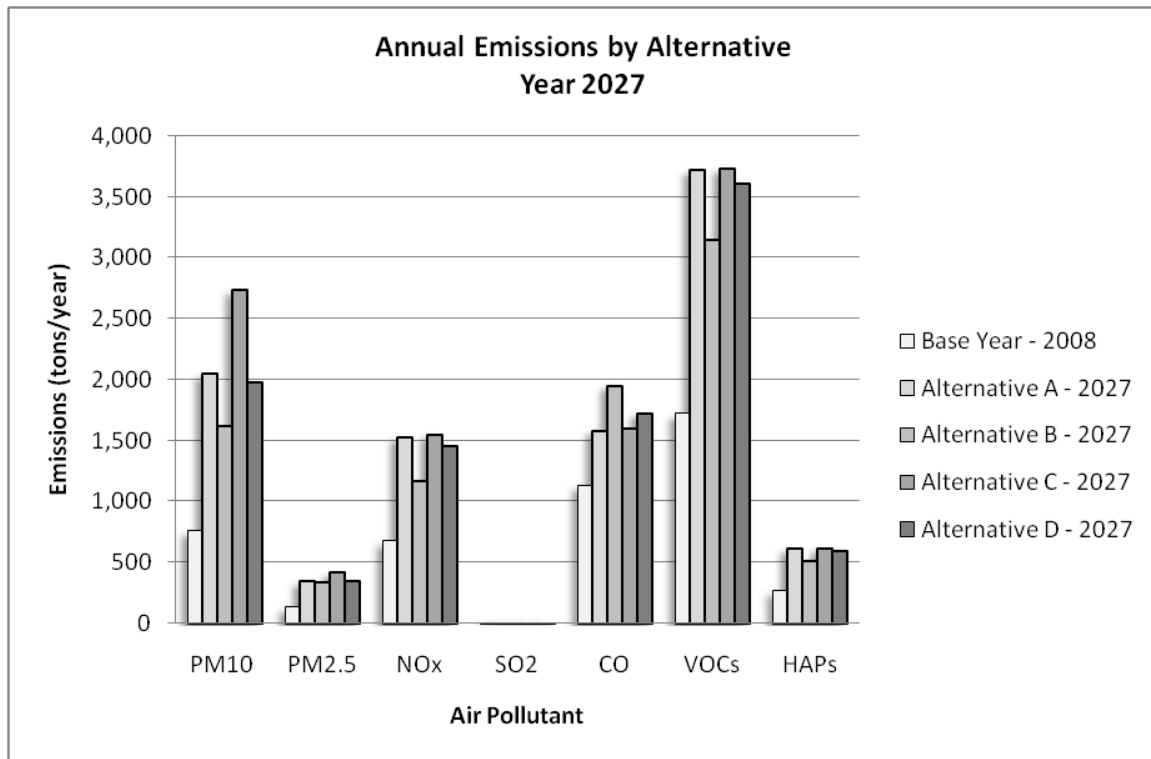


Source: Appendix U (p. 1651)

BLM Bureau of Land Management
CO carbon monoxide
HAPs hazardous air pollutants
NO_x nitrogen oxides

PM_{2.5} particulate matter less than 2.5 microns in diameter
PM₁₀ particulate matter less than 10 microns in diameter
SO₂ sulfur dioxide
VOC volatile organic compound

Figure 4.1. Estimated Annual Emissions by Alternative from BLM Activities in the Lander Planning Area, 2018



Source: Appendix U (p. 1651)

BLM Bureau of Land Management
 CO carbon monoxide
 HAPs hazardous air pollutants
 NO_x nitrogen oxides

PM_{2.5} particulate matter less than 2.5 microns in diameter
 PM₁₀ particulate matter less than 10 microns in diameter
 SO₂ sulfur dioxide
 VOC volatile organic compound

Figure 4.2. Estimated Annual Emissions by Alternative from BLM Activities in the Lander Planning Area, 2027

4.1.1.2. Methods and Assumptions

The air resources impact analysis used an emissions-comparison approach, which involved the following steps:

- Identify management actions and activities of concern in the planning area that generate air pollutant emissions.
- Compile current (2008) operational and production data for each identified emission-generating activity.
- Compile projected future operational and production data for each identified emission-generating activity for the selected future project years (2018 and 2027).
- Calculate estimated current and projected future emissions of specific air pollutants for identified management actions and activities under each alternative.
- Analyze changes in estimated emissions over the baseline year and among alternatives.

The analysis focused on emissions associated with peak year construction activities and peak year production and operations emissions approximately 10 and 20 years from the baseline year. Year 2008 was chosen as the baseline year because this is the most recent year for which reliable data are available for estimating actual emissions. Project years 2018 and 2027 were selected for

future-year scenarios because these years represent peak construction and operations years for projected oil and gas development. Management actions associated with oil and gas development represent the largest single sector of emissions for most of the air pollutants; therefore, peak development years for this sector were considered most conservative for calculating air emissions. Given uncertainties concerning the numbers, nature, and specific locations of future emissions sources and activities, the emissions-comparison approach provides an appropriate basis for determining potential impacts under each alternative. For a more detailed description of the methodologies and assumptions used in this analysis, refer to Appendix U (p. 1651).

The following air pollutants were identified as pollutants that could be emitted as a result of management actions and activities authorized, permitted, allowed, or performed under this RMP. Emissions of each of these pollutants were estimated for each identified activity and addressed for each alternative in this analysis.

- Carbon monoxide (CO)
- Nitrogen oxides (NO_x)
- Ozone (O₃)
- Particulate matter less than or equal to 10 microns in diameter (PM₁₀)
- Particulate matter less than or equal to 2.5 microns in diameter (PM_{2.5})
- Sulfur dioxide (SO₂)
- Volatile organic compounds (VOCs)
- Hazardous air pollutants (HAPs)

The following list of emissions-generating activities were identified as management actions and activities authorized, permitted, allowed, or performed under this RMP that could emit identified air pollutants and could adversely impact air quality in the planning area and Class I areas within 100 kilometers (approximately 60 miles) of the planning area. Emissions of air pollutants were estimated for the baseline year (2008) and projected for two future years (2018 and 2027) for each identified activity and addressed for each alternative in this analysis.

- Leasable Minerals – Conventional Oil and Gas Development
- Leasable Minerals – Coalbed Natural Gas (CBNG) Development
- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Gold Mining
- Locatable Minerals – Uranium Mining
- Salable Minerals – Sand, Gravel, and other Mineral Development
- Fire and Fuels Management – Planned and Prescribed Fire
- Vegetation – Forests, Woodlands, and Aspen Communities Management
- Land Resources – Renewable Energy, ROW, and Corridor Projects
- Land Resources – Comprehensive Trails and Travel Management
- Land Resources – Livestock Grazing

Operations, production, and construction activity data used to estimate emissions for proposed emission sources were obtained from Lander Field Office personnel, the Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas for the Lander Field Office, the Mineral Occurrence and Development Potential Report, and from National Environmental Policy Act (NEPA) analyses underway for BLM actions in the planning area. Emissions factors used to estimate proposed emissions were obtained primarily from (1) the U.S. Environmental Protection Agency (EPA) AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995a), (2) the EPA NONROAD2008a Emissions Model (EPA 2009c), (3) the EPA MOBILE6.2 Motor Vehicle Emission Factor Model (EPA 2006), (4) the American Petroleum Institute Compendium of

Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009), (5) the Wyoming Department of Environmental Quality (DEQ) – Air Quality Division, and (6) Western Governor’s Association – Western Regional Air Partnership.

Methods and assumptions used in this impact analysis include the following:

- Air pollutant emissions are useful for comparing the relative impacts of each alternative and might not represent actual future emissions. Emissions estimates are based on predictions of future mineral resource development scenarios rather than actual development projects. Air emissions modeling will be done as part of project-specific NEPA analyses.
- Stationary sources associated with oil and gas development will operate in accordance with the Wyoming DEQ Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2, revised March 2010.
- Emissions from the following management actions were not estimated because the potential for development was considered low: coal mining, phosphate mining, oil shale-tar sands development, geothermal development, and gemstones and other lapidary materials development.
- Emissions from the following management actions were not estimated because (1) the level of activity is not expected to change between alternatives, and (2) the magnitude of emissions from the activity is considered to be very small compared to other management activities, or (3) available operational or production data was not sufficient to quantify emissions: wildfires (unplanned), invasive species and pest management, grassland and shrubland management, wild-horse management, and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

4.1.1.3. Detailed Analysis of Alternatives

4.1.1.3.1. Impacts Common to All Alternatives for Greenhouse Gas Emissions

Concentrations of certain gases in Earth’s atmosphere have been identified as being effective at trapping heat reflected off Earth’s surface, thereby creating a “greenhouse effect.” As concentrations of these GHGs increase, Earth’s surface warms, the composition of the atmosphere changes, and global climate is affected. Concentrations of GHGs have increased dramatically in Earth’s atmosphere in the past century. These increases, particularly in carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases have been attributed to man-made sources and human activities (EPA 2010a).

The EPA has determined that six GHGs are air pollutants and subject to regulation under the Clean Air Act (CAA): CO₂, CH₄, N₂O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Of these GHGs, CO₂, CH₄, N₂O are commonly emitted by the types of activities included in this analysis, while the remaining three GHGs are emitted in extremely small quantities or are not at all. GHG emissions from management actions and activities were estimated for each alternative in this analysis for CO₂, CH₄, and N₂O. Carbon sequestration through CO₂ injection is not addressed because at the time of analysis it was considered too speculative for estimation.

As the major component of natural gas, CH₄ emissions from oil and gas exploration, production, and transportation can be considerable. Emissions of CO₂ and N₂O from fossil fuel combustion and fire can also be of concern. This analysis quantified emissions of CO₂, CH₄, and N₂O from the following management actions and activities for each alternative:

- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Gold Mining
- Locatable Minerals – Uranium Mining
- Leasable Minerals – Conventional Oil and Gas Development
- Leasable Minerals – CBNG Development
- Salable Minerals – Sand, Gravel, and other Mineral Development
- Fire and Fuels Management – Planned and Prescribed Fire
- Vegetation – Forests, Woodlands, and Aspen Communities Management
- Land Resources – Renewable Energy, ROWs, and Corridor Projects
- Land Resources – Comprehensive Trails and Travel Management
- Land Resources – Livestock Grazing

Each GHG has been given a Global Warming Potential (GWP) number that accounts for the intensity of the substance's heat-trapping effect and its longevity in the atmosphere compared to CO₂. The EPA-recommended GWPs of 21 for CH₄ and 310 for N₂O were used in this analysis. The estimated quantity emitted for each GHG was multiplied by its GWP and summed with the other GHGs to obtain total GHGs emitted in CO₂ equivalents in short tons. CO₂ equivalents were then converted to million metric tons (MMt), the typical reporting unit for GHG emissions. Table 4.2, "Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for BLM Activities in the Lander Planning Area" (p. 599) shows the estimated annual emissions of the GHGs under each alternative. Appendix U (p. 1651) includes additional details on the GHG emissions calculations. That these numbers are estimates only, utilized for comparison purposes, cannot be emphasized too strongly. Moreover, all are subject to modification based on changes in technology, market conditions, and guidance, such as the limitation on prescribed fire for greater sage-grouse protections.

Table 4.2. Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for BLM Activities in the Lander Planning Area

Scenario	CO ₂	CH ₄	N ₂ O	CO ₂ equivalents	CO ₂ equivalents (MMt)
Base Year – 2008					
Base Year	169,265	8,619	3	351,311	0.33
Forecast Year – 2018					
Alternative A	559,075	32,651	7	1,246,816	1.17
Alternative B	416,330	20,561	10	851,295	0.81
Alternative C	571,776	33,210	7	1,271,258	1.19
Alternative D	530,540	30,946	8	1,182,822	1.11
Forecast Year – 2027					
Alternative A	463,202	26,699	6	1,025,689	0.96
Alternative B	339,404	16,070	10	679,856	0.64
Alternative C	475,621	27,242	6	1,049,511	0.98
Alternative D	438,381	25,276	7	971,142	0.91
Source: Appendix U (p. 1651)					
BLM Bureau of Land Management					
CO ₂ carbon dioxide					
CH ₄ methane					
MMt Million Metric Tons					
N ₂ O nitrous oxide					

GHG emissions are estimated to increase under all alternatives over estimated baseline emissions by almost 1½ under Alternative B and more than 2 times under alternatives A, C, and D. Alternative C shows the highest increases in GHG emissions due primarily to the higher projected oil and gas production activities under that alternative. Oil and gas production is the major contributor to GHG emissions under all alternatives. The largest sources of GHG emissions in the oil and gas sector are CO₂ emissions from natural gas compressors and drill rig engines, and fugitive CH₄ emissions from wellhead equipment, pneumatic devices, and tanks. Estimated GHG emissions are based on worst-case estimates of production rates and operational characteristics, and likely result in overestimated total GHG emissions. Considerable reductions in these estimated emissions might be realized at the time of actual development through control technologies such as electric compressor engines, “green completions,” low- or no-bleed pneumatic devices, and capture and control of leaks and vents. All depend on variability in the market demand for these products.

Table 4.3, “Lander Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions” (p. 600) compares project-related GHG emissions under each alternatives to a statewide inventory of GHG emissions completed in 2007. The inventory was compiled for the Wyoming DEQ by the Center for Climate Strategies and was based on actual emissions for 2005 and projected emissions for 2010 and 2020. GHG emissions estimated for each of the alternatives comprise approximately 2 percent of statewide GHG emissions. As another means of comparison, the total estimated GHG emissions for Alternative D are approximately equivalent to the CO₂ emissions from a 100 megawatt (MW) coal-fired power plant or approximately one-fifteenth the reported CO₂ emissions from the Jim Bridger Power Plant in Sweetwater County for 2009 (EPA 2009d). The total estimated GHG emissions under Alternative D of 1.11 MMt are approximately equal to 0.01 percent of the total U.S. 2008 GHG emissions of 6,956 MMt (EPA 2010b). Assessing the impacts of GHG emissions on global climate change requires modeling on a global scale, which is beyond the scope of this analysis. Potential impacts to climate change are influenced by GHG emission sources from around the globe and it is not possible to distinguish the impacts to global climate change from GHG emissions originating from the planning area.

Table 4.3. Lander Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions

Lander Planning Area		Wyoming Statewide Inventory		Percent Contribution
Scenario	Estimated GHG Emissions (MMt CO ₂ equivalents)	Year	Estimated GHG Emissions (MMt CO ₂ equivalents)	BLM GHGs to Wyoming GHGs
Base Year - 2008	0.33	Actual Estimated 2005	55.6	0.60%
Alternative A - 2018	1.17	Projected 2020	69.4	1.69%
Alternative B - 2018	0.81	Projected 2020	69.4	1.16%
Alternative C - 2018	1.19	Projected 2020	69.4	1.72%
Alternative D - 2018	1.11	Projected 2020	69.4	1.60%
Source: Center for Climate Strategies 2007				
BLM Bureau of Land Management CO ₂ carbon dioxide GHG greenhouse gas MMt million metric tons				

4.1.1.3.2. Impacts Common to All Alternatives

Impacts to air quality include changes in air pollutant concentrations, changes in visibility, impacts to soils and vegetation from atmospheric deposition, and changes in lake chemistry. Several key factors play a role in determining the severity of these impacts, such as the magnitude and chemistry of the air emissions, meteorological conditions, and topography. Emissions were quantified for each of the alternatives as an indication of the potential magnitude of impacts to air quality under each alternative for purposes of making general comparisons and not as predictions of what will occur. All of the alternatives would result in changes to emissions of air pollutants in relation to the baseline year and would therefore result in impacts to air quality. For this analysis, the magnitude of the change in emissions was analyzed to determine if impacts to air quality have the potential to be significant (i.e., exceed the National Ambient Air Quality Standards [NAAQS] or exceed screening levels of concern for visibility and atmospheric deposition). Air dispersion modeling can be used to determine ambient concentrations of air pollutants and impacts to visibility; however, models depend on specific input data to predict impacts. These input data include actual meteorological data, actual emissions data, emissions source spatial and temporal data, and actual topographic data. At this stage of the planning process, these project-specific data are not available. Proponents of mineral development projects will be required to perform a NEPA analysis of the impacts of proposed projects to ambient air quality standards at the time projects are proposed. Such an analysis could require a dispersion modeling analysis that includes a demonstration of no adverse impacts in Class I areas.

Under all alternatives, oil and gas development is the single largest contributor to total air pollutant emissions compared to other management activities. Activities quantified in this category include well drilling and completion, road and well pad construction, flaring and venting, compressor operations, dehydrator and separator operations, tank venting and loadout, wellhead fugitives, pneumatic device operations, and vehicle traffic. The quantities of emissions estimated from these activities are based on reasonably foreseeable estimates of production rates, well counts, development rates, and existing technologies. The emissions numbers should not be considered definitive and might not reflect actual emissions at the time of development and are utilized for comparison among the alternatives. Although the quantity of emissions calculated for this category might not represent actual emissions from eventual development, the magnitude of differences in emissions estimated for this source category compared to the other source categories is considerable. Emissions of NO_x and VOCs from this category have the potential to adversely impact air quality under each alternatives. These impacts could include increased ambient concentrations of O_3 , decreases in visibility, adverse impacts to vegetation, and increased atmospheric deposition. Emissions of particulate matter from this category could increase ambient concentrations of particulate matter (fugitive dust), decrease visibility, and increase atmospheric deposition. Emissions of HAPs could result in a localized increased risk of adverse impacts to human health. The emissions estimated for CO under each alternative for this category could contribute to the formation of O_3 . Estimated SO_2 emissions for this category under each alternative are minor and, although they could contribute to adverse impacts to visibility, it is unlikely that these emissions would result in a major adverse impact to air quality by increasing ambient concentrations of SO_2 above the NAAQS. For additional information on significance thresholds, refer to Appendix U (p. 1651).

The second largest contributor to total air pollutant emissions under each alternative is the combined category of non-oil and gas mineral development. For the planning area, this is estimated to primarily include bentonite, uranium, and gold exploration and mining and sand and

gravel sales. The primary pollutant of concern from this category is PM₁₀. Particulate matter emissions (fugitive dust) are primarily caused by earth-moving activities and vehicular traffic on unpaved roads and surfaces associated with mine development and operation. Potential mining exploration and development activities result in the largest single contributor to estimated particulate matter (PM₁₀ and PM_{2.5}) emissions. Particulate matter emissions from this category under all alternatives have the potential to adversely impact air quality by increasing ambient concentrations of particulate matter and decreasing visibility. Estimated emissions of NO_x, VOCs, and CO are substantially less for this category than for oil and gas development. Emissions of these pollutants could result in minor impacts to air quality by contributing to increased ambient concentrations of O₃. Estimated emissions of SO₂ and HAPs from this source category under all alternatives are minor and it is not likely that these emissions would result in major adverse impacts to air quality.

Two other source categories have estimated emissions that could result in impacts common to all alternatives. CO emissions from fire management activities, primarily prescribed fire, have the potential to result in increased ambient concentrations of O₃. However, it is likely that the differences among the alternatives using prescribed fire in the 70 percent of the planning area that is in Core Area is likely to be minimal because of protections for greater sage-grouse. CO and VOC emissions from trails and travel management, primarily OHV use, have the potential to result in increased ambient concentrations of O₃. Estimated emissions of other pollutants from these two source categories would not be likely to result in major impacts to air quality.

There are several federally designated Class I areas within 100 kilometers (approximately 60 miles) of the planning area. Bridger Wilderness Area comprises the western border of the planning area. Fitzpatrick Wilderness Area is in the planning area on the west. Washakie Wilderness Area lies to the north and Teton Wilderness Area lie to the northwest. Although farther away than 100 kilometers, Yellowstone National Park and Grand Teton National Park are to the west and northwest of the planning area. Management actions and activities under each of the alternatives could impact Air Quality Related Values (i.e., visibility and atmospheric deposition) in these areas.

The Wyoming DEQ has the authority to implement emissions controls for sources requiring air permits under Wyoming Air Quality Standards and Regulations and to ensure that those sources do not contribute to an exceedance of an ambient air quality standard. To facilitate this process, the BLM works in cooperation with Wyoming DEQ and other federal agencies to share, review, and analyze emissions data, modeling results, and mitigation measures for development projects. This cooperation would continue under all alternatives. In addition, the BLM could require implementation of BMPs and mitigation measures within its authority to minimize adverse impacts to air quality from development projects. Determination and application of such measures would be completed during project approval, and would be subject to NEPA analysis at that time. Refer to Appendix U (p. 1651) for additional information on BMPs and mitigation measures.

Management under all alternatives must adhere to the Lander Air Resources Management Plan (Appendix F (p. 1491)), which was developed to address air quality issues identified during the analysis for this document. The plan outlines specific requirements for managing air resources and authorizing activities that have the potential to adversely impact air resources within the planning area. The plan also provides specific requirements for projects that have the potential to generate air emissions and adversely impact air resources within the planning area. In accordance with the plan, quantitative air quality modeling of industrial activities may be required in order to determine the potential impacts of proposed emission sources and subsequent potential mitigation strategies.

Table 4.4, “Estimated Annual Emissions by Activity – Base Year 2008” (p. 603) lists the estimated emissions for each pollutant from each emissions-generating activity analyzed for the base year 2008. Individual alternatives analyses compare estimated emissions to the baseline emissions.

Table 4.4. Estimated Annual Emissions by Activity – Base Year 2008

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	125	29	449	4	206	1,498	247	2,558
Leasable Minerals - Coalbed Natural Gas	4	1	4	0	2	2	0	13
Total Oil and Gas minerals	129	30	453	4	208	1,500	248	2,571
Locatable Minerals - Bentonite Mining	101	11	0	0	0	0	0	113
Locatable Minerals - Gold Mining	1	0	0	0	0	0	0	2
Locatable Minerals - Uranium Mining	37	6	30	1	13	3	0	89
Salable Minerals - Sand and Gravel	282	39	174	4	81	13	1	594
Total Non-Oil and Gas Minerals	422	56	204	5	94	15	2	797
Fire and Fuels Management	71	30	8	2	271	14	1	397
Vegetation - Forests, Woodlands, and Aspen Communities	38	4	0	0	5	1	0	48
Land Resources - Renewable Energy, ROWs and Corridors	13	1	2	0	1	0	0	18

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Land Resources - Comprehensive Trails and Travel Management	9	6	6	1	472	191	19	704
Land Resources - Livestock Grazing	80	8	5	0	86	4	0	183
TOTAL	761	135	678	11	1,138	1,726	270	4,719

Source: Appendix U (p. 1651)

CO carbon monoxide

HAPs hazardous air pollutants

NO_x nitrogen oxides

PM_{2.5} particulate matter less than 2.5 microns in diameter

PM₁₀ particulate matter less than 10 microns in diameter

ROWS rights-of-way

SO₂ sulfur dioxide

VOC volatile organic compound

4.1.1.3.3. Alternative A

Table 4.5, “Estimated Emissions by Activity (tons per year) under Alternative A, 2018” (p. 605) and Table 4.6, “Estimated Emissions by Activity (tons per year) under Alternative A, 2027” (p. 606) show the estimated emissions for each pollutant from each emission-generating activity analyzed for Alternative A in 2018 and 2027, respectively. Appendix U (p. 1651) provides the detailed emissions spreadsheets that are the basis for these tables. Non-oil and gas minerals development accounts for the greatest estimated emissions of PM₁₀ and PM_{2.5}. Oil and gas development accounts for the greatest estimated emissions for all other pollutants. It is important to note that the emissions estimates for these two categories are based on reasonably foreseeable estimates of future development and might not reflect actual emissions at the time of development.

Although estimated emissions are dominated by mineral development, the second highest source of CO and VOC emissions under this alternative is from the Comprehensive Trails and Travel Management sector. These emissions are generated primarily from OHVs (including all-terrain vehicles, over-snow vehicles, and dirt bikes) and trail and road maintenance equipment.

Alternative A emissions estimates for 2018 show an increase of emissions of all pollutants over the baseline year. The most substantial increases are projected to be for particulate matter, NO_x, VOCs, and HAPs, with percent increases all more than 170 percent. Figure 4.3, “Contribution of Each Category to Total PM₁₀ Emissions under Alternative A, 2018” (p. 607) through Figure 4.6, “Contribution of Each Category to Total HAPs Emissions under Alternative, A 2018” (p. 610) show the relative contribution of each source category to emissions of these four pollutants. Alternative A emissions estimates for 2027 show decreases in all pollutants from 2018 levels in the range of 5 to 22 percent, depending on the pollutant. This is likely due to decreases in oil and gas production and mining activities over the long term. It is likely that the increases in

estimated emissions over baseline would result in increased concentrations of ambient O₃ and NO_x, and short-term impacts to visibility. Given the current background levels of pollutants, it is not likely that emissions under Alternative A would contribute to an exceedance of a national or state ambient air quality standard.

Table 4.5. Estimated Emissions by Activity (tons per year) under Alternative A, 2018

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	371	87	1,325	11	607	4,401	725	7,528
Leasable Minerals - Coalbed Natural Gas	60	15	256	1	126	173	44	675
Total Oil and Gas minerals	431	101	1,582	12	733	4,574	769	8,203
Locatable Minerals - Bentonite Mining	542	59	10	0	12	2	0	625
Locatable Minerals - Gold Mining	314	77	8	0	5	1	0	406
Locatable Minerals - Uranium Mining	254	34	128	3	55	12	1	487
Salable Minerals - Sand and Gravel	330	41	79	4	39	9	1	504
Total Non-Oil and Gas Minerals	1,440	211	225	8	111	25	2	2,022
Fire and Fuels Management	55	27	8	2	271	14	1	378
Vegetation - Forests, Woodlands, and Aspen Communities	138	14	0	0	5	1	0	158
Land Resources - Renewable Energy, ROWs and Corridors	45	5	2	0	1	0	0	54

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Land Resources - Comprehensive Trails and Travel Management	7	4	7	1	526	119	12	676
Land Resources - Livestock Grazing	80	8	4	0	86	4	0	183
Total	2,195	371	1,829	23	1,734	4,737	786	11,674
Percent Change over Base Year	188	174	170	109	52	174	191	147
Source: Appendix U (p. 1651)								
CO carbon monoxide								
HAPs hazardous air pollutants								
NO _x nitrogen oxides								
PM _{2.5} particulate matter less than 2.5 microns in diameter								
PM ₁₀ particulate matter less than 10 microns in diameter								
ROWs rights-of-way								
SO ₂ sulfur dioxide								
VOC volatile organic compound								

Table 4.6. Estimated Emissions by Activity (tons per year) under Alternative A, 2027

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	326	76	1,115	11	501	3,435	563	6,027
Leasable Minerals - Coalbed Natural Gas	57	14	233	1	114	156	40	614
Total Oil and Gas minerals	383	89	1,348	12	615	3,592	603	6,641
Locatable Minerals - Bentonite Mining	542	59	5	0	10	1	0	617
Locatable Minerals - Gold Mining	310	76	8	0	5	1	0	401

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Locatable Minerals - Uranium Mining	177	26	120	3	52	12	1	391
Salable Minerals - Sand and Gravel	313	37	27	3	17	8	1	406
Total Non-Oil and Gas Minerals	1,341	198	160	7	84	22	2	1,815
Fire and Fuels Management	55	27	8	2	271	14	1	378
Vegetation - Forests, Woodlands, and Aspen Communities	138	14	0	0	5	1	0	158
Land Resources - Renewable Energy, ROWs and Corridors	45	5	1	0	1	0	0	52
Land Resources - Comprehensive Trails and Travel Management	6	3	8	1	522	88	9	637
Land Resources - Livestock Grazing	80	8	4	0	86	4	0	183
Total	2,047	344	1,528	22	1,583	3,722	616	9,863
Percent Change from 2018	-7	-7	-16	-5	-9	-21	-22	-16

Source: Appendix U (p. 1651)

CO carbon monoxide

HAPs hazardous air pollutants

NO_x nitrogen oxides

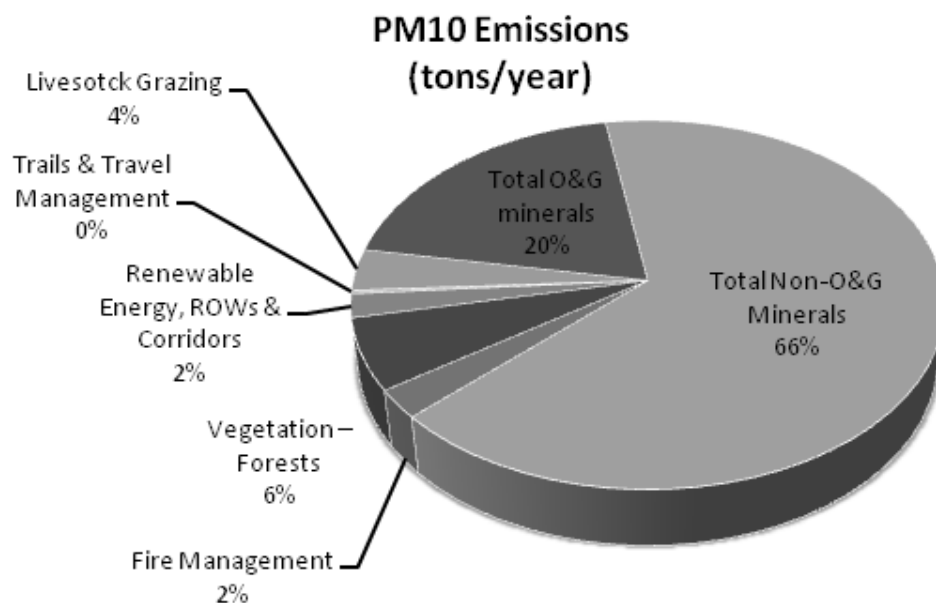
PM_{2.5} particulate matter less than 2.5 microns in diameter

PM₁₀ particulate matter less than 10 microns in diameter

ROWs rights-of-way

SO₂ sulfur dioxide

VOC volatile organic compound



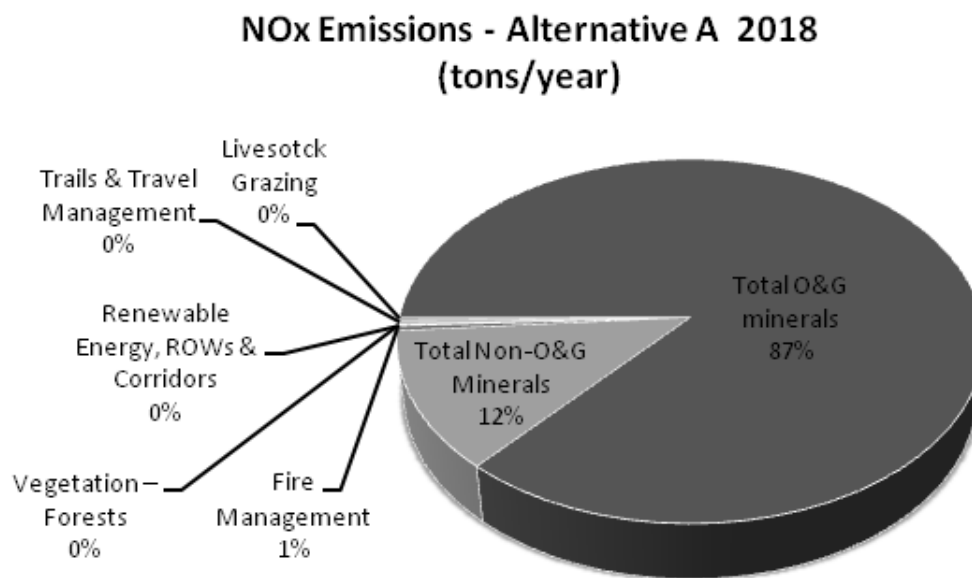
Source: Appendix U (p. 1651)

O&G oil and gas

PM₁₀ particulate matter less than 10 microns in diameter

ROWs rights-of-way

Figure 4.3. Contribution of Each Category to Total PM₁₀ Emissions under Alternative A, 2018



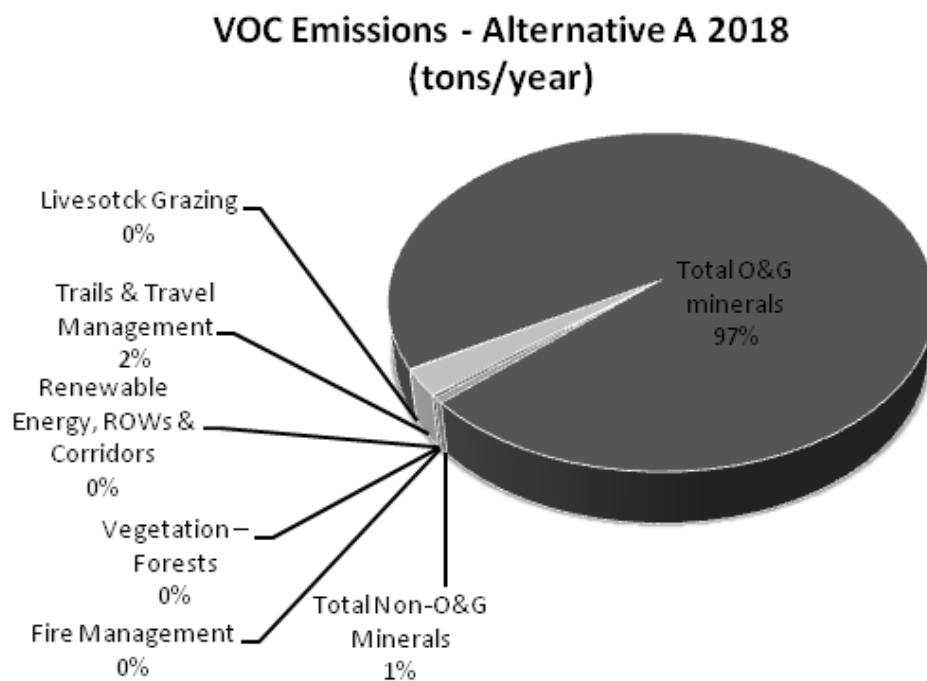
Source: Appendix U (p. 1651)

NO_x nitrogen oxides

O&G oil and gas

ROWs rights-of-way

Figure 4.4. Contribution of Each Category to Total NO_x Emissions under Alternative A, 2018



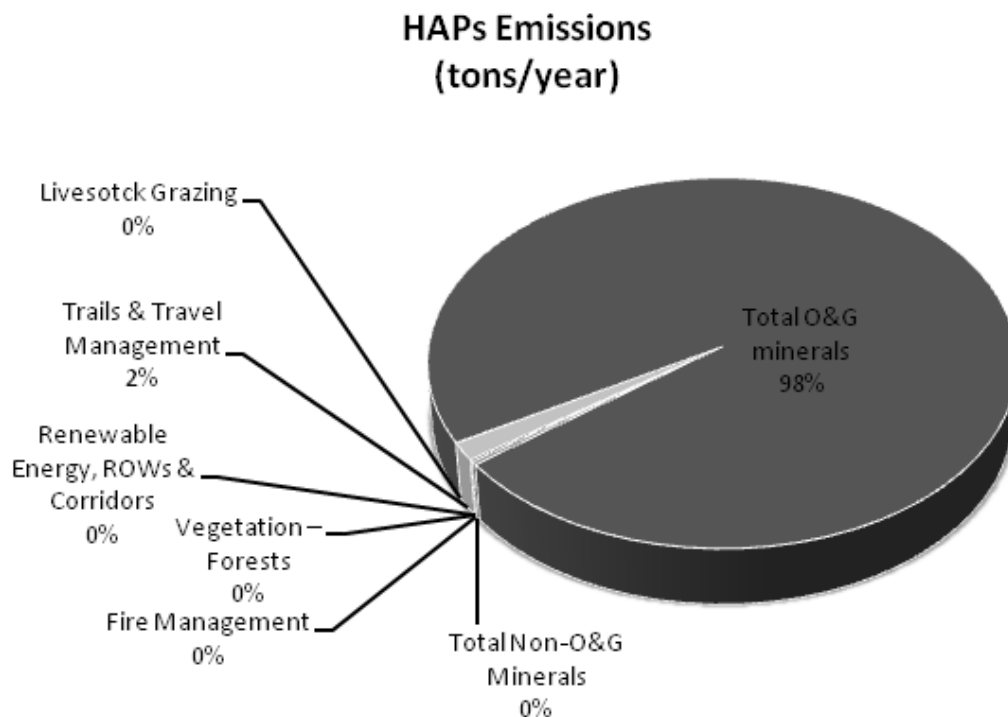
Source: Appendix U (p. 1651)

O&G oil and gas

ROWs rights-of-way

VOC volatile organic compound

Figure 4.5. Contribution of Each Category to Total VOCs Emissions under Alternative A, 2018



Source: Appendix U (p. 1651)

HAPs hazardous air pollutants
O&G oil and gas
ROWs rights-of-way

Figure 4.6. Contribution of Each Category to Total HAPs Emissions under Alternative, A 2018

4.1.1.3.4. Alternative B

Alternative B emissions estimates are the lowest of all the alternatives for total air pollutant emissions and for each analyzed pollutant except CO and SO₂. Table 4.7, “Estimated Annual Emissions by Activity (tons per year) under Alternative B, 2018” (p. 612) and Table 4.8, “Estimated Annual Emissions by Activity (tons per year) under Alternative B, 2027” (p. 614) show the estimated emissions for each pollutant from each emission-generating activity analyzed for Alternative B in 2018 and 2027, respectively. See Appendix U (p. 1651) for additional details on emissions calculations.

The overall lower estimated emissions under this alternative are due to restrictions on oil and gas development, potential restrictions on bentonite mining in designated Areas of Critical Environmental Concern (ACECs), lower projected acres of disturbance for ROWs and corridors, no new development under livestock grazing, and no new renewable-energy development. The greater emissions of CO and SO₂ estimated for this alternative are due primarily to the larger acreage of disturbance predicted for prescribed fire, although it is likely that this will not be a major increase because of limitations on the use of prescribed fire in greater sage-grouse Core Area. Figure 4.7, “Contribution of Each Category to Total CO Emissions under Alternative B,

2018” (p. 615) and Figure 4.8, “Contribution of Each Category to Total SO₂ Emissions under Alternative B, 2018” (p. 616) show the relative contribution of fire management activities to the emissions of these two pollutants. Alternative B acres of disturbance due to prescribed fire are triple the amount under alternatives A and C and double the amount under Alternative D. This would result in more smoke being generated by prescribed fire under this alternative than under other alternatives, and larger emissions of CO and SO₂ from this source category. Overall, emissions under this alternative for 2018 are estimated to increase by 83 to 142 percent over baseline emissions, depending on the pollutant.

Like Alternative A, potential oil and gas activities are the predominant source of NO_x, VOC, and HAPs emissions and potential mining activities are the predominant source of PM₁₀ and PM_{2.5} under Alternative B. The second largest source of VOC emissions is projected for the Comprehensive Trails and Travel Management sector, which includes emissions from OHVs and road and trail maintenance vehicles. Alternative B emissions estimates for 2027 show decreases in all pollutants from 2018 levels in the range of 4 to 22 percent, depending on the pollutant. This is likely due to decreases in oil and gas production and mining activities over the long term.

Impacts to O₃ ambient concentrations from emissions of NO_x, VOC, and CO under Alternative B are expected to be the least of all of the alternatives, as are impacts to particulate matter concentrations. Impacts to visibility could result from projected mineral development activities, but would be the least under Alternative B.

Table 4.7. Estimated Annual Emissions by Activity (tons per year) under Alternative B, 2018

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	312	73	1,120	9	516	3,796	627	6,453
Leasable Minerals - Coalbed Natural Gas	13	3	51	0	25	34	9	134
Total Oil and Gas minerals	325	76	1,171	9	541	3,830	635	6,587
Locatable Minerals - Bentonite Mining	147	16	3	0	4	1	0	171
Locatable Minerals - Gold Mining	314	77	8	0	5	1	0	406
Locatable Minerals - Uranium Mining	254	34	128	3	55	12	1	487

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Salable Minerals - Sand and Gravel	319	40	76	4	38	9	1	486
Total Non-Oil and Gas Minerals	1,033	167	215	7	101	23	2	1,550
Fire and Fuels Management	178	90	25	7	902	47	5	1,254
Vegetation - Forests, Woodlands, and Aspen Communities	199	20	0	0	5	1	0	225
Land Resources - Renewable Energy, ROWs and Corridors	19	2	1	0	1	0	0	23
Land Resources - Comprehensive Trails and Travel Management	6	4	7	1	526	119	12	675
Land Resources - Livestock Grazing	0	0	0	0	0	0	0	0
TOTAL	1,760	359	1,420	24	2,077	4,019	654	10,315
Percent Change over Base Year	131	165	110	121	83	133	142	119

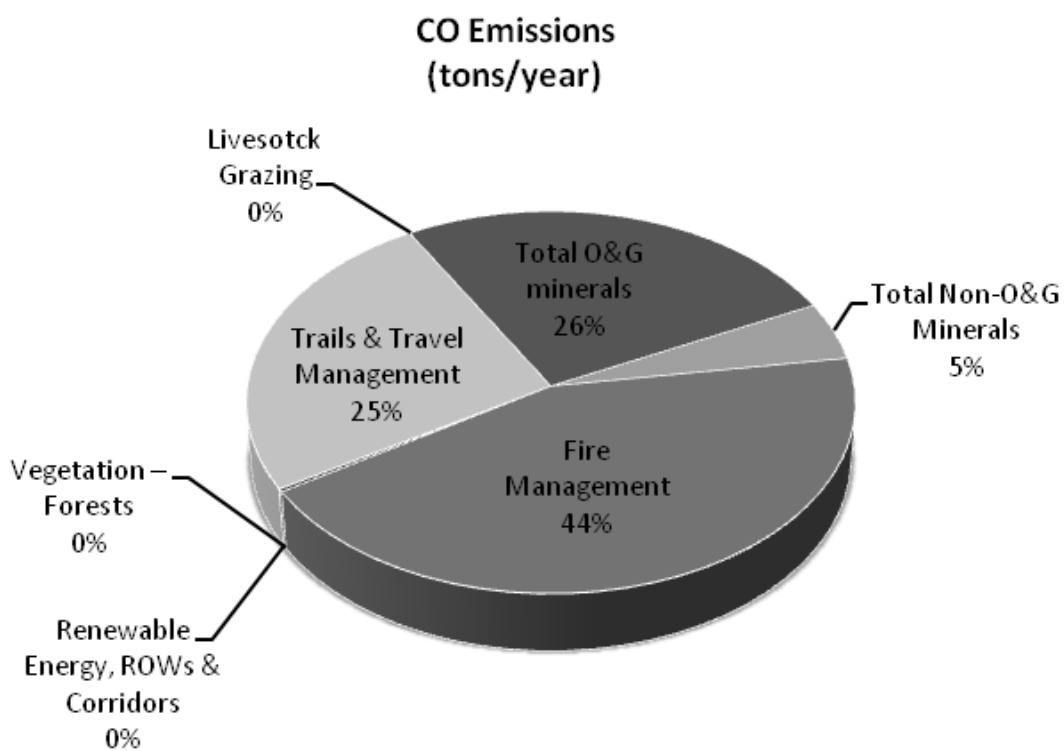
Source: Appendix U (p. 1651)

CO carbon monoxide
HAPs hazardous air pollutants
NO_x nitrogen oxides
PM_{2.5} particulate matter less than 2.5 microns in diameter
PM₁₀ particulate matter less than 10 microns in diameter
ROWs rights-of-way
SO₂ sulfur dioxide
VOC volatile organic compound

Table 4.8. Estimated Annual Emissions by Activity (tons per year) under Alternative B, 2027

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	273	63	938	9	424	2,957	485	5,149
Leasable Minerals - Coalbed Natural Gas	13	3	46	0	23	30	8	123
Total Oil and Gas minerals	285	66	984	9	447	2,988	493	5,272
Locatable Minerals - Bentonite Mining	147	16	1	0	3	0	0	168
Locatable Minerals - Gold Mining	310	76	8	0	5	1	0	401
Locatable Minerals - Uranium Mining	177	26	120	3	52	12	1	391
Salable Minerals - Sand and Gravel	301	36	26	3	16	8	1	391
Total Non-Oil and Gas Minerals	934	154	156	7	77	21	2	1,351
Fire and Fuels Management	178	90	25	7	902	47	5	1,254
Vegetation - Forests, Woodlands, and Aspen Communities	199	20	0	0	5	1	0	225
Land Resources - Renewable Energy, ROWs and Corridors	19	2	0	0	0	0	0	21

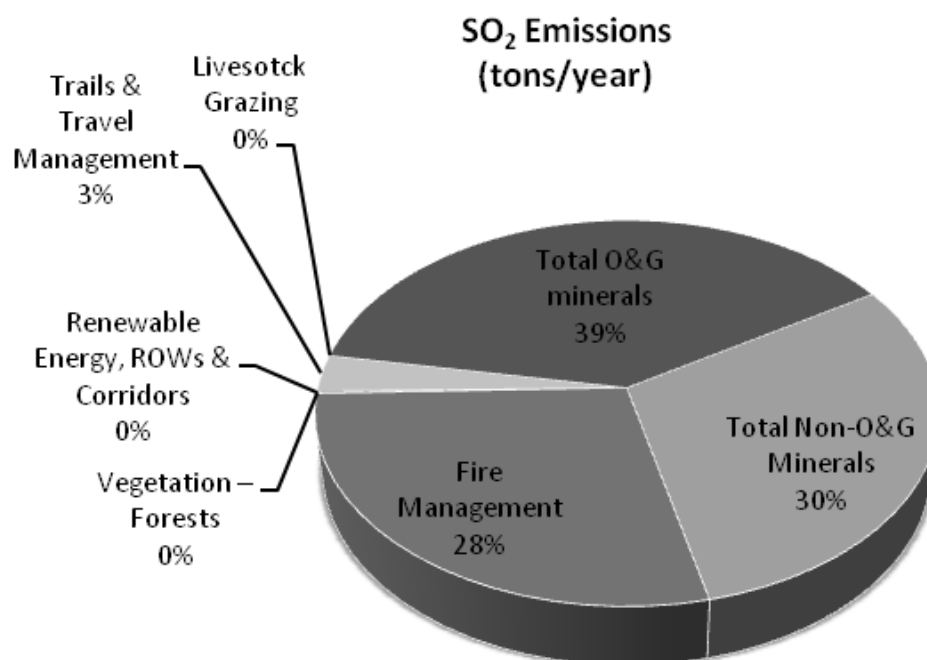
Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Land Resources - Comprehensive Trails and Travel Management	5	3	8	1	522	88	9	636
Land Resources - Livestock Grazing	0	0	0	0	0	0	0	0
TOTAL	1,621	335	1,173	23	1,953	3,145	509	8,760
Percent Change from 2018	-8	-7	-17	-4	-6	-22	-22	-15
Source: Appendix U (p. 1651) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM _{2.5} particulate matter less than 2.5 microns in diameter PM ₁₀ particulate matter less than 10 microns in diameter ROWS rights-of-way SO ₂ sulfur dioxide VOC volatile organic compound								



Source: Appendix U (p. 1651)

CO carbon monoxide
O&G oil and gas
ROWs rights-of-way

Figure 4.7. Contribution of Each Category to Total CO Emissions under Alternative B, 2018



Source: Appendix U (p. 1651)

SO₂ sulfur dioxide
O&G oil and gas
ROWs rights-of-way

Figure 4.8. Contribution of Each Category to Total SO₂ Emissions under Alternative B, 2018

4.1.1.3.5. Alternative C

Table 4.9, “Estimated Annual Emissions by Activity (tons per year) under Alternative C, 2018” (p. 618) and Table 4.10, “Estimated Annual Emissions by Activity (tons per year) under Alternative C, 2027” (p. 620) lists estimated emissions under Alternative C for 2018 and 2027, respectively. Alternative C would result in the greatest estimated emissions of all the alternatives for total air pollutant emissions and for each analyzed pollutant except CO. Alternative C allows for the most development of mineral resources and includes a large potential wind-energy project with up to 2,400 turbines. In addition, Alternative C allows for increased acres of disturbance for forestry projects and ROW projects. All of these management actions and activities account for increased levels of air pollutant emissions. The estimated acreage for prescribed fire under this alternative is approximately ½ the acreage estimated for Alternative B; this accounts for the lower estimated CO emissions under this alternative. Estimated emissions for 2018 under this alternative are projected to increase by 55 to 279 percent over baseline emissions, depending on the pollutant.

Like alternatives A and B, the primary contributors to air pollutant emissions under Alternative C are non-oil and gas minerals development and oil and gas development. However, the most noticeable difference in emissions between this alternative and alternatives A and B is the

increase in particulate matter emissions due primarily to potential projects in the renewable energy and ROW sectors. The increases in particulate matter would result from short-term construction-related activities. Any impacts that could result from these emissions would likely be short in duration. Figure 4.9, “Contribution of Each Category to Total PM₁₀ Emissions under Alternative C, 2018” (p. 621) and Figure 4.10, “Contribution of Each Category to Total PM_{2.5} Emissions under Alternative C, 2018” (p. 622) show the relative contribution of these sectors to total PM₁₀ and PM_{2.5} emissions, respectively.

Although estimated emissions are dominated by mineral and renewable energy development, the second highest source of CO and VOC emissions under this alternative is from the Comprehensive Trails and Travel Management sector. These emissions are generated primarily from OHVs (including all-terrain vehicles, over-snow vehicles, and dirt bikes) and trail and road maintenance equipment. Alternative C emissions estimates for 2027 show decreases in all pollutants from 2018 levels in the range of 5 to 22 percent, depending on the pollutant. This is likely due to decreases in oil and gas production and mining activities over the long term.

It is likely that the increases in estimated emissions over baseline would result in increased concentrations of ambient O₃, NO_x, and particulate matter, and potential impacts to visibility. Given the current background levels of pollutants, it is not likely that emissions under Alternative C would contribute to an exceedance of a national or state ambient air quality standard.

Table 4.9. Estimated Annual Emissions by Activity (tons per year) under Alternative C, 2018

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	371	87	1,328	11	608	4,410	727	7,542
Leasable Minerals - Coalbed Natural Gas	61	15	258	1	127	175	44	682
Total Oil and Gas minerals	433	102	1,586	12	736	4,585	771	8,225
Locatable Minerals - Bentonite Mining	542	59	10	0	12	2	0	625
Locatable Minerals - Gold Mining	314	77	8	0	5	1	0	406
Locatable Minerals - Uranium Mining	254	34	128	3	55	12	1	487
Salable Minerals - Sand and Gravel	387	49	95	5	47	11	1	595

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Total Non-Oil and Gas Minerals	1,497	218	241	9	119	26	3	2,113
Fire and Fuels Management	58	28	8	2	271	14	1	382
Vegetation - Forests, Woodlands, and Aspen Communities	269	27	0	0	5	1	0	302
Land Resources - Renewable Energy, ROWs and Corridors	539	56	26	1	14	4	0	641
Land Resources - Comprehensive Trails and Travel Management	7	4	7	1	526	119	12	677
Land Resources - Livestock Grazing	84	8	5	0	87	4	0	189
TOTAL	2,887	443	1,873	25	1,758	4,754	788	12,529
Percent Change over Base Year	279	228	176	125	55	175	192	166

Source: Appendix U (p. 1651)

CO carbon monoxide

HAPs hazardous air pollutants

NO_x nitrogen oxides

PM_{2.5} particulate matter less than 2.5 microns in diameter

PM₁₀ particulate matter less than 10 microns in diameter

ROWs rights-of-way

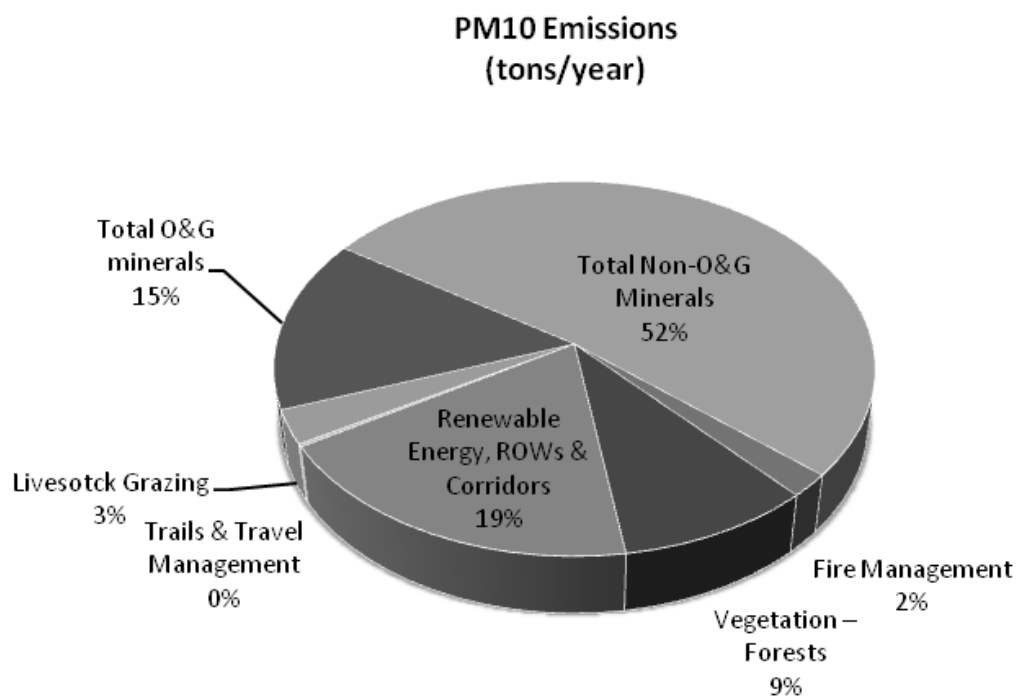
SO₂ sulfur dioxide

VOC volatile organic compound

Table 4.10. Estimated Annual Emissions by Activity (tons per year) under Alternative C, 2027

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	327	76	1,117	11	501	3,442	564	6,037
Leasable Minerals - Coalbed Natural Gas	57	14	235	1	115	158	40	619
Total Oil and Gas minerals	384	89	1,351	12	617	3,599	604	6,656
Locatable Minerals - Bentonite Mining	542	59	5	0	10	1	0	617
Locatable Minerals - Gold Mining	310	76	8	0	5	1	0	401
Locatable Minerals - Uranium Mining	177	26	120	3	52	12	1	391
Salable Minerals - Sand and Gravel	370	44	33	4	21	9	1	481
Total Non-Oil and Gas Minerals	1,398	205	165	8	88	24	2	1,890
Fire and Fuels Management	58	28	8	2	271	14	1	382
Vegetation - Forests, Woodlands, and Aspen Communities	269	27	0	0	5	1	0	302
Land Resources - Renewable Energy, ROWs and Corridors	539	55	9	1	6	3	0	614

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Land Resources - Comprehensive Trails and Travel Management	6	3	8	1	522	88	9	637
Land Resources - Livestock Grazing	84	8	5	0	87	4	0	189
TOTAL	2,737	416	1,546	24	1,596	3,734	617	10,670
Percent Change from 2018	-5	-6	-17	-5	-9	-21	-22	-15
Source: Appendix U (p. 1651) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM _{2.5} particulate matter less than 2.5 microns in diameter PM ₁₀ particulate matter less than 10 microns in diameter ROWS rights-of-way SO ₂ sulfur dioxide VOC volatile organic compound								



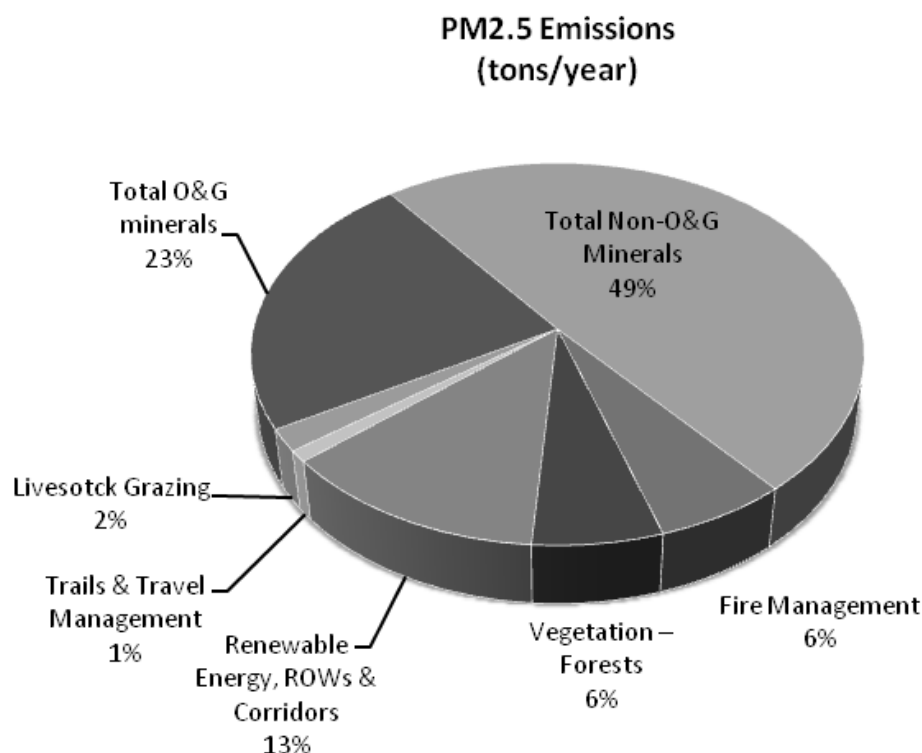
Source: Appendix U (p. 1651)

PM₁₀ particulate matter less than 10 microns in diameter

O&G oil and gas

ROWs rights-of-way

Figure 4.9. Contribution of Each Category to Total PM₁₀ Emissions under Alternative C, 2018



Source: Appendix U (p. 1651)

PM_{2.5} particulate matter less than 2.5 microns in diameter

O&G oil and gas

ROWs rights-of-way

Figure 4.10. Contribution of Each Category to Total PM_{2.5} Emissions under Alternative C, 2018

4.1.1.3.6. Alternative D

Alternative D estimated total emissions are the second lowest of the four alternatives. Estimated emissions of PM₁₀, NO_x, VOCs, and HAPs under this alternative rank next to lowest of the four alternatives. This is due to less projected oil and gas development, locatable mineral development, renewable-energy development, and fewer ROW projects under this alternative than under alternatives A and C. Estimated emissions of PM_{2.5} and SO₂ are predicted to be slightly greater under this alternative than under alternatives A and B, and estimated emissions of CO are predicted to be greater under this alternative than under alternatives A and C due primarily to the increased acreage of disturbance predicted for prescribed fire. As with Alternative B, it is not possible to determine the extent to which prescribed fire will be utilized outside of Core Area. Estimated emissions for 2018 for this alternative are projected to increase by 65 to 181 percent over baseline, depending on the pollutant. Alternative D emissions estimates for 2027 show decreases in all pollutants from 2018 levels in the range of 5 to 22 percent, depending on the pollutant. This is likely due to decreases in oil and gas production and mining activities over the long term.

Table 4.11, “Estimated Annual Emissions by Activity (tons per year) under Alternative D, 2018” (p. 624) and Table 4.12, “Estimated Annual Emissions by Activity (tons per year) under

Alternative D, 2027” (p. 626) lists estimated emissions under Alternative D for 2018 and 2027, respectively. Under this alternative, oil and gas development is the dominant category of estimated emissions of NO_x, SO₂, VOCs, and HAPs. Non-oil and gas development accounts for most of PM₁₀ and PM_{2.5} emissions. Total air pollutant emissions are dominated by these two source categories under this and the other alternatives. Figure 4.11, “Contribution of Oil and Gas Development Emissions to Total Emissions by Alternative, 2018” (p. 627) and Figure 4.12, “Contribution of Non-Oil and Gas Mineral Development Emissions to Total Emissions by Alternative, 2018” (p. 628) are provided as a tool to compare the contribution of these sectors to total emissions among alternatives. Figure 4.11, “Contribution of Oil and Gas Development Emissions to Total Emissions by Alternative, 2018” (p. 627) shows the contributions from oil and gas development under all alternatives; Figure 4.12, “Contribution of Non-Oil and Gas Mineral Development Emissions to Total Emissions by Alternative, 2018” (p. 628) shows the contributions from non-oil and gas mineral development (mining) sector.

Although estimated emissions of the air pollutants analyzed are dominated by mineral development, the second highest source of CO and VOC emissions under this alternative is from the Comprehensive Trails and Travel Management sector. These emissions are generated primarily from OHVs (including all-terrain vehicles, over-snow vehicles, and dirt bikes) and trail and road maintenance equipment.

Potential impacts to air quality under Alternative D include potential increases in ambient concentrations of O₃, NO_x, and particulate matter, and potential impacts to visibility. Given the current background levels of pollutants, it is not likely that emissions under Alternative D would contribute to an exceedance of a national or state ambient air quality standard. However, under this alternative, proponents of mineral development projects (or any project likely to impact air quality) will be required to demonstrate compliance with ambient air quality standards and other federal, state, and local air quality regulations. This demonstration could include air dispersion modeling, photochemical grid modeling, and the application of mitigation measures and control technologies prior to project authorization by the BLM.

Table 4.11. Estimated Annual Emissions by Activity (tons per year) under Alternative D, 2018

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	358	84	1,282	11	588	4,274	705	7,301
Leasable Minerals - Coalbed Natural Gas	52	12	217	1	107	147	37	572
Total Oil and Gas minerals	410	96	1,498	12	695	4,421	742	7,873
Locatable Minerals - Bentonite Mining	395	43	7	0	8	1	0	454

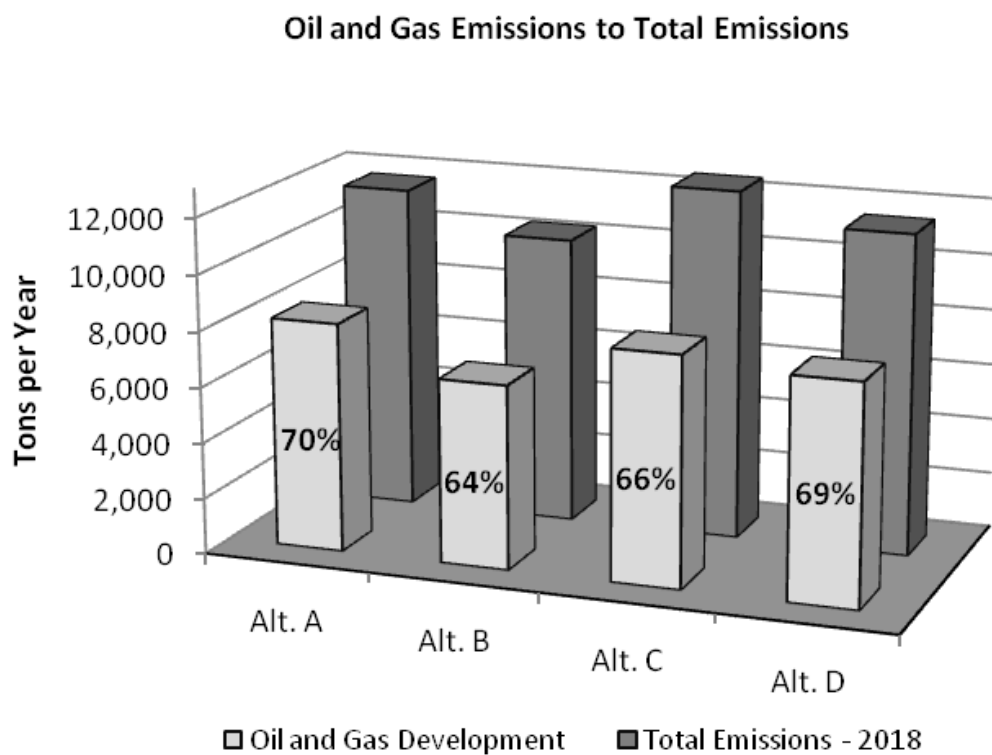
Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Locatable Minerals - Gold Mining	314	77	8	0	5	1	0	406
Locatable Minerals - Uranium Mining	254	34	128	3	55	12	1	487
Salable Minerals - Sand and Gravel	330	41	79	4	39	9	1	504
Total Non-Oil and Gas Minerals	1,293	195	222	8	107	24	2	1,852
Fire and Fuels Management	75	43	13	3	450	23	2	610
Vegetation - Forests, Woodlands, and Aspen Communities	217	22	0	0	5	1	0	245
Land Resources - Renewable Energy, ROWs and Corridors	37	4	2	0	1	0	0	44
Land Resources - Comprehensive Trails and Travel Management	7	4	7	1	526	119	12	676
Land Resources - Livestock Grazing	84	8	5	0	87	4	0	189
TOTAL	2,122	373	1,747	24	1,872	4,592	759	11,489

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Percent Change over Base Year	179	176	158	114	65	166	181	143
Source: Appendix U (p. 1651) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM _{2.5} particulate matter less than 2.5 microns in diameter PM ₁₀ particulate matter less than 10 microns in diameter ROWs rights-of-way SO ₂ sulfur dioxide VOC volatile organic compound								

Table 4.12. Estimated Annual Emissions by Activity (tons per year) under Alternative D, 2027

Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Leasable Minerals - Oil and Natural Gas	315	73	1,077	10	484	3,335	547	5,841
Leasable Minerals - Coalbed Natural Gas	49	12	196	1	96	132	33	520
Total Oil and Gas minerals	364	84	1,274	11	581	3,467	580	6,361
Locatable Minerals - Bentonite Mining	395	43	3	0	7	1	0	449
Locatable Minerals - Gold Mining	310	76	8	0	5	1	0	401
Locatable Minerals - Uranium Mining	177	26	120	3	52	12	1	391
Salable Minerals - Sand and Gravel	313	37	27	3	17	8	1	406
Total Non-Oil and Gas Minerals	1,194	182	158	7	81	22	2	1,647

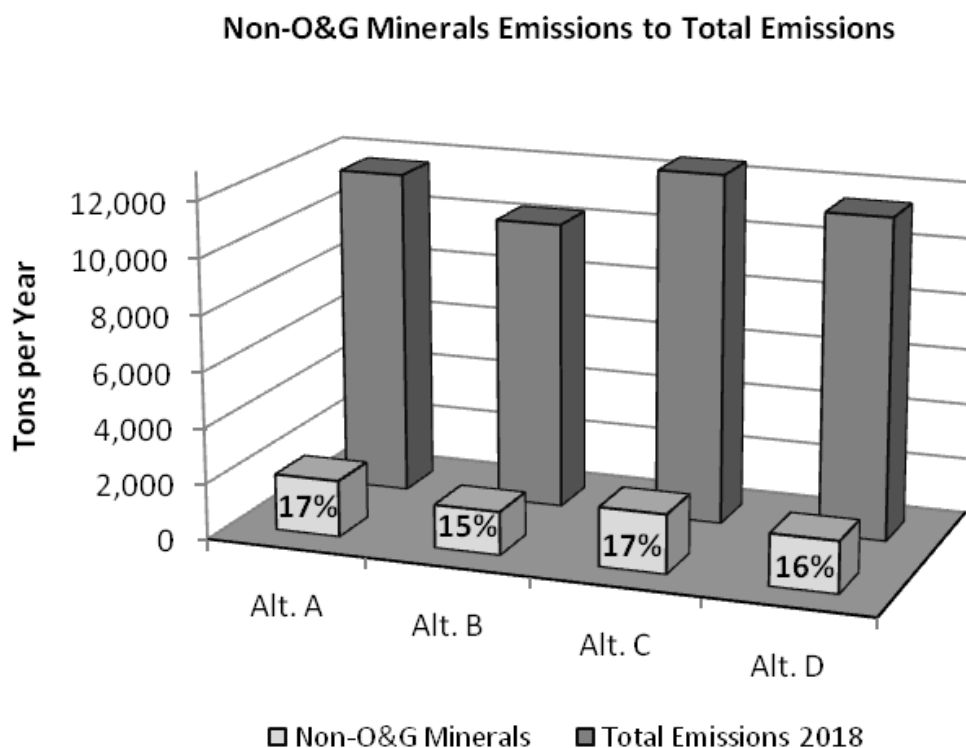
Emission Generating Activity	PM₁₀	PM_{2.5}	NO_x	SO₂	CO	VOCs	HAPs	Total Air Pollutant Emissions
Fire and Fuels Management	75	43	13	3	450	23	2	610
Vegetation - Forests, Woodlands, and Aspen Communities	217	22	0	0	5	1	0	245
Land Resources - Renewable Energy, ROWs and Corridors	37	4	1	0	0	0	0	42
Land Resources - Comprehensive Trails and Travel Management	6	3	8	1	522	88	9	637
Land Resources - Livestock Grazing	84	8	5	0	87	4	0	189
TOTAL	1,976	347	1,458	23	1,727	3,606	594	9,730
Percent Change from 2018	-7	-7	-17	-5	-8	-21	-22	-15
Source: Appendix U (p. 1651) CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM _{2.5} particulate matter less than 2.5 microns in diameter PM ₁₀ particulate matter less than 10 microns in diameter ROWs rights-of-way SO ₂ sulfur dioxide VOC volatile organic compound								



Source: Appendix U (p. 1651)

Alt. Alternative

Figure 4.11. Contribution of Oil and Gas Development Emissions to Total Emissions by Alternative, 2018



Source: Appendix U (p. 1651)

Alt. Alternative
O&G oil and gas

Figure 4.12. Contribution of Non-Oil and Gas Mineral Development Emissions to Total Emissions by Alternative, 2018

4.1.2. Geologic Resources

There are no management actions associated with geologic resources. Management associated with certain geologic features, such as Beaver Rim and Red Canyon, are addressed in the section that addresses management of the specific values associated with the feature, such as visual resources management of the geologic features of Beaver Rim.

Health and safety issues associated with geologic features, such as earthquake potential, are addressed in the *Health and Safety* section.

4.1.3. Soil

Direct adverse impacts to soil resources result from actions that remove vegetative cover, compact soil, reduce infiltration, create changes in physical and biological properties, and reduce organic matter content. These direct impacts to soils tend to result primarily from removing vegetative cover, loosening the surface soil, the formation of compacted layers, and increasing the potential for accelerated erosion by exposing soil particles to wind and water. Disrupting natural soil

horizons and removing vegetation to construct roads, well pads, and other facilities cause a loss of soil productivity.

Disrupting soil stability, increasing compaction, and reducing productivity generally result in indirect adverse impacts to other resources. For example, adverse impacts to soil can degrade water quality through sedimentation of drainages and perennial waterbodies, degrade air quality through increased airborne particulate matter, and result in the loss of vegetation from a decrease in infiltration and an increase in surface water runoff. Although such indirect impacts to other resources are the result of soil disturbance, these impacts are analyzed in sections that address those other resources.

In addition to surface disturbance, surface uses that directly disturb the surface can affect soil stability through changes in vegetative cover or soil infiltration rates. Such surface uses include livestock grazing (improper livestock grazing management could allow livestock to damage vegetative cover and compact soil), vegetative treatments, cross-country travel, and fire and fuels management. Operating motorized vehicles, especially heavy equipment, on moist soils is likely to compact the surface layer. This can decrease infiltration and aeration and could reduce soil productivity by making it more difficult for plant roots to grow and obtain soil moisture and nutrients.

Short-term impacts to soils result during initial surface disturbance before vegetation can be reestablished or before other measures are implemented to minimize erosion from wind and water. The amount of bare ground predicted under each alternative after successful reclamation of disturbed areas is an indicator of long-term adverse impacts to soils. Areas not reclaimed and left with bare soil include roads and areas around facilities that experience concentrated surface uses by equipment or animals that would preclude the reestablishment of vegetation. There would be long-term impacts from accelerated erosion in locations where bare soils are allowed to remain exposed to wind and water. Other long-term impacts to soils include the loss of fertility through removing or greatly altering the soil profile in areas where facilities and structures are built.

4.1.3.1. Summary of Impacts

Alternative B would result in the least amount of surface disturbance and would impose the most restrictions on resource uses, resulting in the fewest adverse impacts to soil resources of any alternative. Conversely, based on anticipated surface disturbance alone, Alternative C would result in the most adverse impacts to soil resources. Alternative C manages surface disturbance more like Alternative A than Alternative B, and would result in impacts similar to Alternative A. Alternative D would result in beneficial impacts to soil resources similar to Alternative B although less beneficial.

4.1.3.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Approximately 161,076 acres of federal surface in Sweetwater and Carbon counties have no detailed soils data and are excluded from this analysis. Soil erosion hazard in these areas could not be determined, although general impacts to soils in these counties would likely be the same as those in the mapped areas.
- The potential for soil erosion has not been modeled for any portion of the planning area. Such modeling could be done on a site-specific basis where more complete information regarding

proposed disturbance would be available. Soils with a severe hazard rating for erosion experience more adverse impacts from surface-disturbing activities than soils with low or moderate hazard ratings for erosion. Medium- and fine-textured soils are most prone to water erosion and soil compaction when they are wet. Course-textured soils are more prone to wind erosion. Silty-textured soils are prone to both forms of erosion.

- Surface disturbance under each alternative could modify soils by disrupting soil stability, changing vegetative cover, decreasing productivity, and increasing compaction. If these modifications occur on highly erodible soils, the potential for accelerated erosion would be approximately 40 percent greater (USFS 2004b) than predicted for less erodible soils. From a soil resources perspective, the cause of surface disturbance makes relatively little difference in the level of adverse impacts to soil. Some activities, such as wind-energy development, can result in more compaction, but this can be evaluated only on a site-specific basis. Accordingly, the acres of reasonably foreseeable long- and short-term disturbance are provided by resource use. The more disturbance, the more adverse impacts to soil resources.
- According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) National Soils Handbook (NRCS No Date), most soils on slopes greater than 15 percent experience soil erosion loss rates that are very difficult to control with standard erosion control measures, and very difficult to reclaim.
- Installing and maintaining erosion controls and implementing other impact mitigation measures, such as BMPs, results in a substantial reduction in soil erosion, ranging between 40 and 97 percent, depending on site conditions (USFS 2008). However, these measures might not reduce soil compaction and loss of productivity.
- Bare soil (without vegetation or other surface cover) with a surface layer that has been altered from its natural condition is more susceptible to accelerated erosion from wind and water than undisturbed soil.
- Soil compaction is considered a localized impact common to, for example, livestock concentration areas and cattle trails, particularly during times when soils are wet, and high-traffic areas such as roads, walking paths, hiking trails, or OHV trails.
- Short-term impacts to vegetation depend on the time it takes for a disturbed area to become revegetated, generally 1 to 5 years.
- The criteria for final stabilization requires uniform perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area, and no rills or gullies in excess of natural conditions. This assumption does not consider the adequacy of wildlife habitat or livestock grazing goals for rehabilitation, which commonly takes longer to achieve; final stabilization for soils purposes is not the same as returning soil and vegetation to predisturbance conditions. Some existing plant communities likely would not be reestablished to predisturbance structure and density for more than 20 years.
- In areas of limited reclamation potential (LRP), timeframes for successful interim and final reclamation of oil and gas well pads and flow lines and access roads are longer, and there is less probability of successful reclamation. The risk of BMP failure is greater on soils rated as moderate or severe for erosion. To be effective on these soils, more extensive reclamation and more aggressive maintenance techniques than those commonly used on soils with a slight erosion hazard are required.
- Frozen soils can be utilized for operations with appropriate care; all alternatives allow such activities.
- On lands open to minerals entry, surface management operators are governed by reclamation and performance standards focused on preventing unnecessary or undue degradation (43 Code of Federal Regulations [CFR] 3809). An operator is not governed by stipulations that might be imposed for salable or leasable minerals via land use planning decisions, but claimants

may voluntarily commit to operating practices in their notice or Plan of Operations submittals. In addition, the Authorized Officer could impose conditions when approving a Plan of Operations. A Plan of Operations is required for exploration that would disturb more than 5 acres, the removal of bulk samples of 1,000 or more tons, or for surface-disturbing activities more than casual use in special status areas such as designated ACECs and areas closed to cross-country vehicle use; see 43 CFR 3809.11. The restrictions that the BLM can apply to surface disturbance under a Plan of Operations do not preclude soil degradation that is not “undue or unnecessary.”

- The BLM Emergency Stabilization and Rehabilitation standards in the Department of the Interior (DOI) Interagency Burned Area Emergency Response Guidebook (DOI 2006b) and the BLM Burned Area Emergency Stabilization and Rehabilitation Handbook H-1742-1 (BLM 2007d) are implemented for wildland fires to protect and sustain healthy ecosystems and to protect life and property. These standards do not vary by alternative.
- It is assumed that disturbances to soils that have a severe hazard rating for erosion or LRP are distributed across the landscape in the same proportion as the distribution of these soils, unless a proposed management action specifies additional protective measures. In other words, if 5 percent of the soils in the planning area are rated as having a severe potential for erosion, it is assumed that 5 percent of the projected total disturbance would occur on such soils.
- All alternatives include timing and seasonal limitations for surface disturbance and disruption, although Alternative B includes more extensive restrictions than the other alternatives. However, these controlled surface uses (CSUs) do not protect soil over the long term; once the timing restriction has passed, habitat could be disturbed, fragmented, or made unsuitable. Accordingly, differences in timing limitations among the alternatives are not analyzed for impacts to soils.
- The BLM has a Memorandum of Understanding (MOU) with the Fremont County Weed and Pest Department to treat invasive nonnative species (INNS) on public land. This treatment is performed by pedestrians carrying the chemicals in backpacks. There is no surface disturbance associated with this treatment. The funding for this treatment does not vary by alternative and could increase or decrease with BLM budget priorities. In addition, if a particular management action under one of the alternatives, such as protections for groundwater, prohibits implementation of the pesticide program, it is assumed that the treatment would be applied to another location. Treatment funds are the limiting factor, not locations to treat. Therefore, INNS treated acres do not vary by alternative and are not further addressed in this section.
- The use of non-carbon fueled electrical generation has beneficial impacts through the avoidance of GHG production. However, calculation of such benefits is beyond the nature and purpose of this document. Projects such as industrial wind-energy generation or the mining of uranium result in local surface disturbance that adversely impacts soil, vegetation, water, and other resources and uses. This document analyzes these disturbances, but not the downstream use of the fuels produced from BLM-authorized activities in the planning area.
- Implementing and achieving Wyoming Standards for Healthy Rangelands (Appendix J (p. 1537)) improves vegetation health, vigor, cover, and litter, and minimizes erosion in most areas, with correspondingly beneficial impacts to soil resources.
- Fire suppression and rehabilitation activities also can adversely impact soil resources over the short and long terms. Activities such as firebreak construction, clearing vegetation, and use of heavy equipment would disturb the soil surface and increase erosion over the short term. For example, fire lines constructed during suppression efforts can channelize surface runoff, which can result in gully erosion. Over the long term, however, successful stabilization efforts can increase vegetative cover, and subsequently reduce the natural rate of erosion. Fire suppression and rehabilitation activities do not vary by alternative, and impacts to soil

resources would be the same under all alternatives. Prescribed fire varies moderately by alternative, but all alternatives would limit the use of prescribed fire in Core Area.

- Each of the alternatives varies in the acres open to mineral materials disposals. However, the BLM assumes that the historic demand of 183 acres of disturbance each year would not vary by alternative. Sand and gravel is readily available throughout the planning area, and other sources (whether on private or other public lands) will be available to meet demand. Therefore, impacts to soil resources from mineral materials disposals are not further addressed in this section. Although mineral materials disposals would adversely impact soils, those impacts would not vary by alternative.
- Under all alternatives, 69,276 acres are unavailable for livestock grazing because those acres are unsuitable for that purpose (such as the Sweetwater Rocks, which have no forage), safety reasons such as along highway shoulders, or for other reasons. The number of acres not available for grazing because of reasons recognized earlier than 1987 and which constitute less than 3 percent of the planning area do not vary by alternative and are not further addressed in this section.
- Under all alternatives, soil resources are managed on a case-by-case basis and in accordance with BLM state policies and the Wyoming Stormwater Discharge program requirements for BLM-authorized surface-disturbing activities that fall under this program – currently, surface disturbances of 1 or more acre.
- Surface-disturbing activities associated with minerals and realty development expose soils to increased erosion over the short and long terms. Increases in surface disturbance related to lands and realty actions and minerals development can be expected to result in a proportionate increase in adverse impacts to soils.
- Surface disturbance from locatable minerals entry, mineral materials disposals, and solid minerals leasing is not expected to vary by alternative. Therefore, impacts from these activities are not expected to vary, and these programs are not further addressed in this section.
- Concentrated herbivory that can result from range improvement projects can adversely impact soils when the removal of herbaceous vegetation is excessive and adequate vegetation does not remain to protect the soil resource. This can be a source of soil compaction that reduces infiltration, increases runoff, and hampers reclamation. The alternatives vary in their approaches to range improvement projects.
- All alternatives require management to protect soil resources. This includes analyzing all surface-disturbing activities for suitability of use and impacts; requiring a detailed project-specific reclamation plan; requiring that all suitable topsoil material be salvaged; minimizing project footprints; requiring reclamation plans that identify the plant community for each phase of reclamation for long-term disturbances; and requiring monitoring by the operator to determine reclamation success. These types of BMPs would result in the same beneficial impacts to soil resources under all alternatives, and are not further addressed in this section.
- All alternatives manage Wilderness Study Areas (WSAs) in accordance with the Interim Guidance. This management would beneficially impact soils because most surface-disturbing activities would be prohibited in WSAs. However, adverse impacts to soils could result if there is a wildfire in a WSA, because fire suppression would not be allowed. Because WSA management is the same under all alternatives (except for minor differences in travel management), impacts to soils would not vary by alternative. Accordingly, WSAs are not be further addressed in this section.

4.1.3.3. Detailed Analysis of Alternatives

4.1.3.3.1. Impacts Common to All Alternatives

Soils on BLM-administered surface lands and federal mineral estate could be disturbed under each alternative by activities proposed across a variety of resource programs. Adverse impacts to soils associated with these disturbances are predicted under each alternative, although the intensity of the impacts would vary across alternatives. Appendix T (p. 1641) lists projected surface disturbance by alternative during the planning period. These are estimates that are utilized to compare impacts across resources; these are not predictions of future events, which are most usually controlled by factors such as market conditions beyond the BLM's authority.

INNS that form monoculture stands, such as leafy spurge and Russian knapweed, can exacerbate erosion through reduced vegetative cover. The same is true of infestations of annual weeds like cheatgrass and halogeton. The presence of INNS can alter natural fire regimes to the point that increased fire frequency leads to accelerated soil erosion. Some annual weeds can have a short-term beneficial impact because they can serve as a nurse crop, although a poor one, to give a limited degree of erosion protection while species planted for reclamation establish. INNS treatment does not vary by alternative.

Various methods would be utilized to minimize impacts to soil resources under all alternatives. BMPs, watershed enhancement projects, conservation practices, Storm Water Discharge Plans, Weed Management Area Plans, project-specific soil investigations, and reclamation plans are designed to reduce impacts to soil. While these practices and actions would not result in an actual beneficial impact to soils, they can result in more successful reclamation, reduce impacts during the time the soil is bare, and reduced runoff, soil erosion, and sediment yield. Limiting motorized vehicle use off of existing roads and trails would prevent route proliferation and vegetation removal that could increase erosion. In addition, management actions that restore plant communities, particularly to the extent historic disturbance is reclaimed, enhance soil resources by restoring infiltration, organic matter content, and productivity, and reducing erosion. Impacts from surface-disturbing and disruptive activities are mitigated through the application of the Wyoming BLM Standard Mitigation Guidelines for Surface-Disturbing and Disruptive Activities (Appendix M (p. 1595)).

The standard statewide stipulation that prohibits surface-disturbing activities during periods when watershed damage is likely to occur is applied under all alternatives. This prohibition would protect soil resources and would not vary by alternative. All alternatives have removed the prohibition of use of frozen soils as not providing resource benefits.

Fuels management is generally the same under all alternatives, although the acres of treatment would vary by alternative. Acres treated depend on available funds to pay for treatment, which varies depending on the amount of funds used on range improvements. No long-term surface disturbance or associated erosion is anticipated from prescribed fire, or chemical or mechanical fuels treatments following reclamation. Fuels management could have an adverse short-term impact and a beneficial long-term impact on soil resources. Soil-disturbing vegetative treatment projects under all alternatives would result in short-term increases in erosion, but these should be ameliorated over the short to long terms as treated sites reestablish vegetation, and would have a long-term beneficial impact to soils.

Forest product sales are expected to be uniform across the alternatives. Although Alternative A manages forest product sales with board-feet restrictions in certain areas, demand for forest products is anticipated to be so low that board-feet forest restrictions would not be likely to result in different impacts by alternative. Similarly, although Alternative C has the fewest restrictions on forest management, including the use of silviculture techniques such as clear-cuts, this management would depend on market demand for timber products. With all alternatives assuming a flat demand regardless of management prescriptions, there would be no differences in impacts to soil resources from forest products management among the alternatives. BMPs for silviculture techniques to reduce adverse impacts to soils and other resources are provided.

Fire in the planning area can impact soils over the short term by removing vegetation and exposing soils to water and wind erosion. Impacts to rangeland and forest soils from fire are highly dependent on burn severity, which is a function of the peak temperatures and duration of the fire. Under certain conditions, hot fires can create hydrophobic soil conditions (i.e., resistance to water infiltration), whereby runoff and erosion are increased. On steep-sloped sites, the impacts from fire on soil resources can be major, with research showing that a 3-year cumulative water flow on severely burned sites was nearly 20 times that of similar unburned sites. On some sites, research indicates that more than three years could be required to return to background levels of soil loss and overland water flow (Pierson et al. 2008, Certini 2005). Over the long term, however, provided that vegetative recovery is successful, fire can have a beneficial impact on soil resources by improving land health and reducing erosion and the risk of landscape-level fire. In general, fire management does not vary by alternative, particularly in light of evidence that full suppression of wildland fire and avoiding planned fire in greater sage-grouse habitat might be appropriate. On a site-specific basis, impacts from fire management could vary by alternative, but on a planning area basis, differences are too speculative to be further analyzed. All alternatives apply full suppression to wildland fire in Core Area.

All alternatives manage soils and grassland and shrubland communities to meet Wyoming Standards for Healthy Rangelands. The standards are utilized to protect and improve rangeland health and are generally effective in managing impacts to soils from livestock grazing. The differences between favoring production more oriented toward wildlife than livestock would not lead to different impacts to soils as a result of management emphasis unless the management action prevents achieving Wyoming Standards for Healthy Rangelands.

Riparian-wetland areas are to be managed to meet or exceed proper functioning condition (PFC) and Wyoming Standards for Healthy Rangelands. This can involve rest or deferment from grazing pressure, fencing projects, structural in-stream projects, or any combination thereof. Fencing and in-stream structural placement will necessarily disturb soil over the short term, and an increase in erosion over natural levels; however, over the long term, erosion rates should return to natural levels. In addition, when riparian-wetland areas do not meet Wyoming Standards for Healthy Rangelands, it is usually because a degraded condition is accelerating erosion.

Impacts to soil resources from wild horses are similar to impacts from livestock, because wild horses prefer to eat grasses and visit water projects and riparian-wetland zones for water. Horses can compact soils, cave stream banks, and denude areas near water or salt licks or trails, and can spread INNS that can adversely impact soils if they become established. However, wild horses travel more widely than livestock in the course of a day and do not generally loiter in riparian-wetland areas. This tends to spread their impacts over a larger area and dilute the overall effect, although they can cause localized adverse impacts to soils.

Management of wild horses necessarily involves periodic roundups using light-duty trucks, trailers, heavy duty-trucks, aircraft, and entrapment locations. Some of these activities create short-term surface disturbance, usually less than 1 acre of total disturbance. However, horse roundups are infrequent, although increasing, and do not occur at the same location for several years and at some locations only once. These gather locations are upland sites that are expected to recover well over the short to long term.

The acreage of WSAs (55,338 acres) is the same under all alternatives, and all alternatives prohibit surface-disturbing activities in those areas.

All alternatives include actions that restrict surface disturbance in the planning area, and those restrictions generally would have a beneficial impact on soil resources. For example, withdrawals that close areas to surface-disturbing activities, or requirements for construction, operation, monitoring, and rehabilitation planning before surface-disturbing activities are initiated would, at a minimum, reduce the potential for adverse impacts to soils from surface-disturbing activities.

Under all alternatives, INNS are managed on a case-by-case basis. Vegetative treatments, including INNS control, would reduce adverse impacts to soil from INNS spread. The amount of vegetative treatment, including INNS control, vary by alternative. INNS infestations can lead to accelerated erosion and loss of soil fertility.

The Westwide Corridor in the northeast section of the planning area was established as part of a Programmatic Environmental Impact Statement (PEIS) and is common to all alternatives. Impacts to soils from the Westwide Corridor would not vary by alternative, and this designated corridor is not further addressed in this section. Other designated ROW corridors are discussed below.

4.1.3.3.2. Alternative A

4.1.3.3.2.1. Program Management

Alternative A allows surface-disturbing activities in LRP areas with mitigation on a project-by-project basis using a detailed site analysis and reclamation objectives. Alternative A manages mineral and realty actions in these areas with CSU restrictions. In addition, Alternative A avoids surface disturbance on LRP soils whenever possible. See Map 11 for identified LRP soils.

Alternative A applies the standard statewide stipulations (see Appendix M (p. 1595)) that prohibit surface-disturbing activities during periods when soil is frozen or saturated, or when watershed damage would be likely, and restricts surface occupancy on slopes equal to or greater than 25 percent. See Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45) for the number of acres associated with these restrictions that benefit soils. Under Alternative A, as opportunities arise, areas of past soil disturbance that have not been successfully reclaimed would be identified and project-specific reclamation plans developed; this would beneficially impact soil resources.

4.1.3.3.2.2. Resources

Alternative A air quality management would result in slightly adverse impacts to soil resources because degradation of existing air quality would be allowed to continue as long as federal air quality standards (adopted by the State of Wyoming) were not exceeded. Restrictive air quality management would impose PM₁₀ limits that could be achieved, in part, by limiting surface

disturbance. Alternative A water resource management would neither benefit nor adversely impact soil resources. Unlike Alternative B, which manages the Little Red Creek Complex near Whiskey Mountain as non-WSA land with wilderness characteristics, Alternative A does not specifically manage these lands for wilderness characteristics. However, the portion of the Little Red Creek Complex in the Whiskey Mountain ACEC is managed in accordance with ACEC-specific management which provides additional resource protections. For the non-ACEC portion of the WSA, travel management is limited to existing roads and trails, with no beneficial impact to soil resources.

Alternative A limits surface disturbance within 500 feet of surface water and riparian-wetland areas, which would beneficially impact soil resources in those areas. Alternative A INNS management does not require livestock flushing to prevent the spread of INNS; this would adversely impact soil resources.

Management actions under Alternative A designed to protect wildlife and special status species habitat from the adverse impacts of surface-disturbing and disruptive activities also would protect soil resources from these adverse impacts. While timing limitations would not beneficially impact soils, some wildlife protections (e.g., closing the area within ¼ mile of greater sage-grouse leks) would beneficially impact soil resources in those areas. On a case-by-case basis, Alternative A closes and reclaims unnecessary roads and old minerals exploration trails, which would beneficially impact soil resources.

The limited management prescriptions under Alternative A designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect soil resources from these activities (see sections specific to those resources).

4.1.3.3.2.3. Resource Uses

Alternative A authorizes surface-disturbing activities under the minerals and ROW programs. Appendix T (p. 1641) lists the projected acreage of surface disturbance by activity. Alternative A would result in 52,591 acres of short-term and 12,439 acres of long-term surface disturbance. Long-term disturbance would not necessarily adversely impact other resources such as water or air. Soil permanently disturbed because it supports a wind turbine, for example, would not support vegetation, but also would not contribute to sedimentation of waterways.

Alternative A does not designate any ROW corridors (other than the Westwide Corridor common to all alternatives). Alternative A co-locates future ROWs in existing ROWs where possible. Alternative A identifies a limited amount of public surface as ROW avoidance areas and ROW exclusion areas. The data in Appendix T (p. 1641) for ROW disturbance are based on historic trends, which are expected to continue into the future.

Alternative A opens most of the planning area to livestock grazing and allows range improvement projects. Appendix T (p. 1641) lists the projected long-term surface disturbance associated with range improvement projects during the planning period. Concentrated herbivory can result in adverse impacts when the removal of herbaceous vegetation is excessive and adequate vegetation does not remain to protect soil resources. Concentrated herbivory can compact soil and reduce infiltration, increase runoff, and hamper reclamation. Livestock grazing management under Alternative A provides for the protection or enhancement of resource values, which would beneficially impact soils. Alternative A prohibits the placement of salt or mineral supplements

within ¼ mile of water, riparian-wetland areas, and reclaimed or reforested areas, which would reduce vegetation removal and soil compaction from concentrated livestock grazing and traffic.

Alternative A addresses problems with rangeland health through a variety of livestock grazing management approaches, including fenced riparian-wetland exclosures and pastures, short-term rest, and grazing strategies that favor riparian-wetland enhancement. This alternative allows rangeland improvement projects, including spring development, pipeline development, reservoir/pit development, fence development, well development, and reservoir maintenance, on a case-by-case basis. Such projects are predicted to result in surface disturbance of 860 acres during the planning period, or approximately 43 acres per year. Rangeland improvement projects can result in short-term accelerated erosion from fence installation or livestock walking on the surface, but these adverse impacts would be offset by improvements to soil resources.

Under Alternative A, revegetation is expected to occur within several growing seasons. Long-term erosion rates should return to normal as upland sites farther from water are reclaimed to an appropriate percentage of ground cover that would be expected for the historic plant community for a given site. However, unprotected water developments subject to improper livestock grazing management would typically become denuded of vegetation and subject to accelerated erosion. Soil compaction, reduced infiltration, increased surface water runoff, and trail formation can occur in these upland to wet lowland (or water development) transition zones. This can compound the localized soil degradation usually found near uncontrolled water sources by channeling upland runoff in the transition zones down to the lowlands.

Recreation-related adverse impacts to soil resources, such as soil compaction, soil particle detachment, dust evolution, and increased vulnerability to water and wind erosion, can occur from authorized large-group activities, the repeated use of undeveloped campsites, and cross-country mechanized (bicycle) travel. See Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45) for the number of acres closed to motorized travel and over-snow vehicles under Alternative A. Seasonal closures would protect soil resources during times when adverse impacts could occur.

4.1.3.3.2.4. Special Designations

Alternative A manages nine waterbodies (9,919 acres) identified as eligible for inclusion in the National Wild and Scenic River System (NWSRS) for their outstanding remarkable values (ORVs) by limiting surface-disturbing activities within ¼ mile of these waterbodies; this would beneficially impact soils in that buffer.

Alternative A places moderate to major constraints on surface-disturbing and disruptive activities in certain special designation areas where surface disturbance is minimized. Alternative A designates 119,622 acres as ACECs; this would trigger the requirement for Plans of Operation for surface-disturbing activities greater than casual use. This provides the BLM with a tool to help avoid adverse impacts to soil resources, particularly during exploration. Alternative A avoids seven of the nine ACECs for ROWs. ROW avoidance protects soil resources and prevents the adverse impacts associated with ROW surface disturbances. Alternative A ROW management in those seven ACECs recognizes that soils and vegetation are part of the values supporting ACEC designation, whether because the soils themselves are sensitive (Dubois Badlands), because they contribute to a viewshed (Red Canyon), or because the soils support vegetation critical to protected wildlife (Whiskey Mountain). Alternative A manages surface disturbance in the two

ACECs not avoided for ROWs (Green Mountain and Beaver Rim) to protect identified values of concern, which would beneficially impact soil resources in those areas.

4.1.3.3.3. Alternative B

4.1.3.3.3.1. Program Management

Management actions under Alternative B prohibits surface-disturbing and disruptive activities in LRP areas, which would be more protective of soil resources than Alternative A. The risk of rehabilitation failure, and often soil strength issues, for roads and work locations in sandy soils is greatest in LRP soils. Standard operating procedures and BMPs typically do not work well, and additional measures must be employed to limit soil erosion and comply with Clean Water Act (CWA) Stormwater Discharge program requirements. The risk of BMP failure is greater in LRP areas. Impacts to soil resources under Alternative B would be more beneficial than impacts under Alternative A because Alternative B limits surface disturbances to soils that have the best potential for rehabilitation after disturbance.

Alternative B prohibits surface-disturbing activities on slopes in excess of 15 percent, where the potential for erosion is greater than on slopes less steep. Alternative B would beneficially impact soil resources because it limits surface disturbance to slopes less prone to experience high erosion rates and losses of soil fertility, and more easily stabilized and rehabilitated after disturbance. Alternative B protects far more acres from surface disturbance than Alternative A.

In addition, Alternative B requires a thorough inventory of areas with disturbed soils that have not been successfully reclaimed, and requires those areas be prioritized for reclamation. Compared to Alternative A, this would beneficially impact soil resources because soil erosion and fertility losses would eventually cease in these disturbed areas and productivity would be restored to the historic plant community for each site. Alternative A takes a less comprehensive, indirect approach to identifying unsuccessful reclamation and would not protect these areas from the adverse impacts of accelerated erosion as well as Alternative B.

4.1.3.3.3.2. Resources

Alternative B management prohibits motorized and mechanized travel in lands with wilderness characteristics managed as non-WSA lands with wilderness characteristics which would protect soil resources in these areas. Alternative A does not specially manage these lands; therefore, Alternative B would result in more beneficial impacts to soil resources in these areas. In addition, Alternative B management of the Little Red Creek Complex could reduce the demand for its use for motorized access to other lands, which would beneficially impact soil resources in that area. Alternative B management of forest products is more restrictive than Alternative A; however, this management would not be likely to result in a substantial beneficial impact to soil resources because commercial demand for forest products is expected to be depressed during the planning period.

Alternative B INNS management is more aggressive than Alternative A, and includes livestock flushing when appropriate; this would beneficially impact soils more than Alternative A.

Alternative B riparian-wetland resources management prohibits surface-disturbing activities within 1,320 feet of surface water, riparian-wetland areas, playas, and 100-year floodplains, where mapped. This wide buffer, coupled with the slope restrictions on surface use, would

protect soil resources from surface disturbance and resulting erosion, and result in more beneficial impacts to soil resources than Alternative A. Alternative B protects more than double the acres in riparian-wetland areas and transition zones than Alternative A.

Under Alternative B, the BLM would construct and upgrade a wild-horse viewing loop road, which would beneficially impact soils in that area. This road would be built to BLM Manual 9113, Roads (BLM 1985), design specifications and likely be surfaced with crushed rock or asphalt. The road would likely be from 10 to 20 miles long to accommodate sightseeing tourists and weekend traffic. Short-term adverse impacts would include increased erosion in the area of construction, but as cut-and-fill slopes were rehabilitated, long-term impacts from erosion should be negligible. While Alternative B would increase visitation for wild-horse viewing, which would increase the potential for INNS introduction, improving the existing road would beneficially impact soil resources compared to the use of unimproved roads under Alternative A.

Management actions under Alternative B designed to protect wildlife and special status species habitat from the adverse impacts of surface-disturbing and disruptive activities also would protect soil resources from these activities. Alternative B increases the areas closed to surface-disturbing activities for the protection of wildlife. While this management action would not affect areas already leased, if the leases expire, the area would not be re-leased. Closing greater sage-grouse Core Area to leasing would avoid surface disturbances associated with oil and gas development, which would result in a substantial beneficial impact to soil resources compared to Alternative A.

Alternative B also would beneficially impact soil resources by systematically inventorying and closing unnecessary roads and trails and prescribing rehabilitation for them. This would result in a greater beneficial impact to soil resources than Alternative A, which applies this management action on a case-by-case basis.

Management prescriptions under Alternative B designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect soil resources from these activities and from the undesirable impacts associated with accelerated erosion. Generally, Alternative B would provide the greatest secondary protections to soil resources by taking a more proactive approach to resource protection.

4.1.3.3.3. Resource Uses

Appendix T (p. 1641) identifies the projected surface disturbance from oil and gas development. Surface disturbance from oil and gas operations under Alternative B would be moderately less than under Alternative A. This would beneficially impact soils.

Alternative B makes far fewer acres available for wind-energy development than Alternative A; see Appendix T (p. 1641). This management would reduce surface disturbance and adverse impacts to soil. In addition to the actual footprints of the wind-energy structures and related facilities, there would be increased soil disturbance from additional roads and transmission lines associated with such development. Alternative B will protect more land from surface disturbances that would provide opportunities for the introduction of INNS than Alternative A.

Alternative B confines future major ROWs to designated corridors, currently 15,364 acres. This is a very small area designated for future major ROWs. Alternative B also places very high restrictions on ROWs outside of corridors (exclusion and avoidance areas). Alternative B also includes 315,219 acres of ROW avoidance areas and 1,919,029 acres of exclusions areas. Less disturbance related to ROW development would result in fewer adverse impacts to soil resources.

Alternative B authorizes livestock grazing on 2,312,095 acres, 12,839 fewer acres than Alternative A. A more important difference in impacts to soil resources from livestock grazing between alternatives A and B arises from the limitation on construction of new rangeland developments. Alternative B limits new developments to areas where there are no conflicts with other resources, which is much more restrictive than Alternative A and avoids the surface disturbance associated with rangeland improvements and related livestock concentration. While fencing can protect riparian-wetland resources, which also would benefit soil resources, fences and other developments could result in adverse impacts from livestock concentration.

Under Alternative B, the BLM takes a passive-management oriented, non-project development approach to correcting identified PFC and Wyoming Standards for Healthy Rangelands deficiencies, rather than authorizing range improvement projects to improve conditions. This approach could benefit soil resources on low slopes without compacted soils in moist locations. These would recover over the short to long terms. However, this might not benefit soil resources as quickly as management under Alternative A, which authorizes the use of range improvement projects to rehabilitate or enhance riparian-wetland areas, which could yield desirable results sooner, depending on degradation at a specific site. However, there are tradeoffs in using range improvement projects; fencing could protect riparian-wetland resources, but fences could adversely impact soils in other areas. See the discussion under Alternative A.

In addition, Alternative B prohibits the placement of salt or mineral supplements on many more acres than Alternative A, which would result in more beneficial impacts to soil resources. These limitations would reduce vegetation removal, soil compaction, runoff, and the risk of accelerated erosion from concentrated livestock grazing and traffic. Alternative B also provides for the establishment of forage reserves as opportunities arise. This approach would result in the fewest adverse impacts to soil resources from range improvement projects over the short and long terms.

Alternative B would result in more beneficial impacts to soil resources than Alternative A because Alternative B livestock grazing management allows only light utilization. Alternative A establishes forage utilization levels for livestock grazing on a case-by-case basis, which would result in adverse impacts to soil through compaction, loss of vegetation (which would result in higher erosion and less infiltration), and loss of vegetative diversity.

Alternative B closes 71,761 acres to motorized travel, 12.1 times more acres than Alternative A. Alternative B seasonally closes slightly more acres to motorized travel than Alternative A, and limits motorized travel to designated roads and trails on slightly more acres than Alternative A. Far more acres (181,173) are closed to over-snow vehicle use and over-snow travel is limited to conditions with at least 12 inches of snow. Otherwise, over-snow vehicle use would be considered the same as any other kind of motorized travel, which would be limited to existing (or designated, where appropriate) roads. In this regard, Alternative B would result in more substantial beneficial impacts to soil resources because cross-country travel by over-snow vehicles can damage vegetation and soil resources if the ground is not protected by a depth of snow. More restrictive travel, in general, under Alternative B would result in fewer adverse impacts from accelerated erosion than under Alternative A.

4.1.3.3.4. Special Designations

Alternative B closes all WSAs to motorized and mechanized travel. This management would beneficially impact soil resources by minimizing soil erosion in these areas. Alternative A does not close most WSAs to motorized travel.

Wild and Scenic River (WSR) management under Alternative B would result in impacts the same as Alternative A. From a practical standpoint, WSR classification would not provide additional beneficial impacts to soil resources because the Sweetwater Canyon WSR is within the WSA, where surface disturbance is limited and soil resources are protected.

Alternative B designates a total of 1,492,990 acres of ACECs, and applies moderate to severe constraints on surface-disturbing activities in ACECs and requires Plans of Operation. These protections are extended to approximately 12.5 times more acreage than Alternative A, and therefore result in substantially more beneficial impacts to soil resources than Alternative A.

4.1.3.3.4. Alternative C

4.1.3.3.4.1. Program Management

Soils program management under Alternative C is similar to management under Alternative A. There would be more adverse impacts to soil resources under Alternative C than under Alternative A, and substantially more than under Alternative B. While Alternative A includes more CSU limitations than Alternative C, which applies only standard stipulations, in most cases these additional restrictions would result in very few beneficial impacts to soil resources except in special designations areas. Like Alternative A, Alternative C avoids surface disturbance on slopes equal to or greater than 25 percent, which is much less restrictive than Alternative B.

4.1.3.3.4.2. Resources

Management actions for air and water resources under Alternative C are similar to those under Alternative A and less restrictive than under Alternative B; see Alternative B for the comparison of impacts to soil resources between alternatives A and B. The Alternative B limitation on surface disturbance in water recharge areas or sole-source aquifers would be more protective of soil resources than Alternative C, which, like Alternative A, does not include similar protections.

Alternative C does not specially manage lands with wilderness characteristics, including lands in the Little Red Creek Complex near Dubois. Therefore, Alternative C would result in more adverse impacts to those lands and their soil resources than Alternative A or B.

Alternative C emphasizes the use of structural projects to make progress toward PFC and Wyoming Standards for Healthy Rangelands, whereas Alternative B relies on passive solutions and Alternative A uses a mix of approaches. This is further discussed under livestock grazing.

INNS management prescriptions under Alternative C are the same as those under Alternative A, which is less proactive than Alternative B and therefore less effective at controlling erosion related to INNS infestations. Alternative C includes substantially more surface disturbance associated with oil and gas production than Alternative B, and somewhat more than Alternative A, with associated adverse impacts to soil resources.

Alternative C riparian-wetland management actions are very similar to those under Alternative A, except in cases where it can be shown that equivalent riparian-wetland protections could be achieved using a shorter buffer distance (within the 500-foot buffer). This buffer would afford some protection for native plant communities from potential soil compaction and accelerated erosion over the short and long terms, but would not protect native plant communities as well as Alternative A or B, although the difference between alternatives A and C would be minor.

Alternative C wildlife management is generally the same as management under Alternative A regarding wildlife protections, including protections for greater sage-grouse leks. Alternative C does not close and reclaim unnecessary roads and old mineral exploration trails, unlike Alternative A, which does so on a case-by-case basis, and Alternative B, which more actively identifies and rehabilitates redundant and hazardous roads. The difference in adverse impacts to soils between alternatives A and C would be minor.

Management prescriptions under Alternative C designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect soil resources from the impacts of these activities.

4.1.3.3.4.3. Resource Uses

Surface-disturbing activities associated with mineral development expose soils to increased erosion potential over the short and long terms (for projected acres of disturbance under Alternative C, see Appendix T (p. 1641)). Alternative C increases the amount and severity of surface disturbances related to minerals development (leasable and locatable minerals, mineral materials disposals, and geothermal leasing) substantially compared to alternatives A and B, which would be expected to result in a proportionate increase in adverse impacts to soil from compaction and accelerated erosion. This would be particularly true for soil resources in greater sage-grouse Core Area, which Alternative B closes to oil and gas leasing.

See Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45) for acres open, avoided, or excluded for industrial wind-energy development under Alternative C. Alternative C opens many more acreage to wind-energy development than Alternative B, and slightly more than Alternative A. In addition to the actual footprints of wind-energy structures and related facilities, there would be more surface disturbance and risk of accelerated erosion from additional roads and power transmission corridors associated with such development. The differences among the alternatives are less substantial when the analysis is limited to areas that have commercial wind-energy potential. Alternative C protects less land from surface disturbances than Alternative A, and much less land than Alternative B.

Alternative C ROW management would result in substantially more adverse impacts to soil resources because the alternative opens much more area to surface disturbance than Alternative A or B. Alternative C makes the most land available for ROWs and includes the fewest acres of ROW exclusion and avoidance areas compared to alternatives A and B. Because it allows the most surface disturbance, Alternative C would result in greatest impacts to soil resources from soil compaction and accelerated erosion. Under Alternative C, designation of ROW corridors would help to limit disturbance from new ROWs to areas near existing disturbance which would reduce the adverse impacts to soil resources.

Alternative C opens the same amount of the planning area to livestock grazing as Alternative A. Alternative C allows moderate grazing (41 to 60 percent) rather than setting utilization levels on a case-by-case basis, as does Alternative A, or by prescribing light (20 to 40 percent) utilization levels, as does Alternative B. This higher (moderate) utilization would necessitate more monitoring and leave less room for error than light utilization, risk greater adverse impacts to the plant community because it would increase soil compaction in livestock concentration areas, and accelerate erosion from the removal of vegetation below the threshold at which a particular site would experience adverse impacts. New range improvement projects under Alternative C would disturb the most areas of any alternative.

Alternative C emphasizes the use of structural projects and comprehensive grazing strategies to make progress toward PFC and Wyoming Standards for Healthy Rangelands that would, if properly applied, yield the fastest results in riparian-wetlands improvement, and therefore beneficially impact soils. However, project work is expensive, planning typically requires more than 2 years, monitoring and repair of structures are more intensive than passive management, and funds for such improvements are not always available. Moreover, while improved riparian-wetland health can benefit soil resources, livestock concentration areas associated with range developments would adversely impact soil. These impacts could exceed the beneficial impacts to soils from riparian-wetland improvement.

Alternative C includes the same management for the placement of salt or mineral supplements as Alternative A, thus protecting the same areas from adverse impacts to soil resources, but fewer areas than Alternative B.

Roads and trails are prime locales for soil compaction and accelerated erosion and the fewer acres open to traffic, the fewer chances for damage to soil resources. Alternative C closes far fewer (5,472) acres to motorized travel than under Alternative B and slightly less than the acres closed under Alternative A. Alternative C limits motorized travel to designated roads and trails on only about a quarter of the roads of either Alternative A or B. While Alternative C travel management is less protective of soil resources than Alternative A or B, Alternative C, like all alternatives, does prohibit cross-country vehicular traffic, which would protect large areas without roads from the adverse impacts of cross-country travel.

There would be no acres seasonally closed to motorized travel under Alternative C or other limits on over-snow travel, which would adversely impact soils by allowing travel at times when soils are wet and most susceptible to damage. This would be more adverse to soil resources than either Alternative A or B. Alternative C is the least restrictive for motorized travel in the planning area, and would allow the most opportunities for adverse impacts from soil compaction and accelerated erosion.

4.1.3.3.4.4. Special Designations

Alternative C manages Congressionally Designated Trails the same as Alternative A, with the same limited protection of soils in a ¼-mile buffer along the Congressionally Designated Historic Trails and no protections for the Continental Divide National Scenic Trail (CDNST).

WSA management under Alternative C is the same as Alternative A, which does not close most WSAs to motorized travel. The impacts to soil resources under Alternative C would be similar to impacts under Alternative A, and more adverse than under Alternative B, which closes all WSAs to motorized travel.

Alternative C does not manage any waterways to maintain their suitability for inclusion in the NWSRS; so therefore, there are no protections for the soils in the ¼-mile buffer applied to designated sections. This would have a minor adverse impact to soils compared to alternatives A and B.

Alternative C does not designate ACECs; therefore, it limits surface management to standard statewide stipulations. This would result in more adverse impacts to soil resources than Alternative A or B, and compared to Alternative B, much greater adverse impacts. The ACEC designations under alternatives A and B require submittal of Plans of Operation for surface-disturbing activities greater than casual use, and some ACEC designations limit surface occupancy and surface

disturbance. These measures would decrease the likelihood of adverse impacts to soil resources from surface-disturbing activities and INNS over the short and long terms best under Alternative B, and less under Alternative A. Alternative C does not provide similar protections.

4.1.3.3.5. Alternative D

4.1.3.3.5.1. Program Management

Soils program management under Alternative D is generally similar to management under Alternative B, but would result in more adverse impacts to soil resources than Alternative B. Alternative D would result in substantially fewer adverse impacts to soil resources than alternatives A and C, particularly in those areas where surface disturbance is limited or prohibited for the protection of wildlife, viewsheds, cultural, or other resource values. The Required Design Features mandated under Alternative D make it more similar to the reduced adverse impacts to soils resources associated with Alternative B, but far less adverse because of the very limited development that would occur in Core Area under Alternative B.

4.1.3.3.5.2. Resources

Management actions for air and water resources under Alternative D are similar to those under Alternative A and less restrictive than those under Alternative B, and would result in the same minor adverse impacts to soil resources. Alternative D management of surface disturbance in water recharge areas or sole-source aquifers is the same as Alternative B and more protective of soil resources than alternatives A and C.

Alternative D manages slightly fewer acres of the Little Red Creek Complex as non-WSA lands with wilderness characteristics than Alternative B. This management would result in essentially the same beneficial impacts to soils as Alternative B, considerably more than Alternative C, and slightly more than Alternative A.

Management of forest product sales and forests and woodlands under Alternative D only limits silviculture techniques as needed to protect resources. This would likely result in more beneficial impacts to water than alternatives A and C, which include artificial slope and riparian-wetland limitations, regardless of impacts. While the more restrictive management under Alternative B would result in more short-term beneficial impacts, over the long term, the limits on silviculture techniques under Alternative B would be likely to result in more adverse impacts because no commercial thinning or fuels reductions would be likely. However, as previously stated, the actual impacts to soil resources would not vary substantially by alternative because of depressed demand for forest products.

INNS management prescriptions under Alternative D are the same as under Alternative B. Alternative D has Required Design Features to protect wildlife habitat, particularly sagebrush obligates, and health and human safety from mosquitoes, a vector of West Nile virus (WNV). These Required Design Features would secondarily help to reduce adverse impacts to water quality from surface disposal of produced water or “blow out” reservoirs. The degree of benefit depends on the extent of produced water from mining activities and the number and kind of livestock reservoirs created. Compared to alternatives A and C, Alternative D takes a more proactive approach to INNS management, such as flushing livestock and adjusting terms and conditions of authorized activities to help control INNS. This management would benefit soils

because it would help prevent erosion related to INNS infestations. Moreover, Alternative D involves the second lowest amount of surface disturbance and second greatest management focus on reducing duplicative roads after Alternative B. The best indicator of INNS infestation potential is the amount of surface disturbance and roads.

Riparian-wetlands management under Alternative D applies the same riparian-wetlands buffer as Alternative A and would result in similar beneficial impacts to soil resources. This buffer will afford some protection to native plant communities from potential soil compaction and accelerated erosion over the short and long terms, but not as much protection as Alternative B. The Alternative D management approach for riparian-wetlands relates to livestock grazing management; impacts to soil resources are addressed in the discussion below under *Resource Uses* for grazing management.

Alternative D is similar to Alternative B in its wildlife protections, including greater sage-grouse lek protections, except that Alternative D is less protective, particularly outside Core Area and regarding solid minerals leasing. Alternative D wildlife management is more protective of soil resources than Alternative A, and considerably more protective than Alternative C, because Alternative D closes much more area to surface disturbance.

Management prescriptions under Alternative D designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect soil resources from these activities. See resource-specific sections for the prescriptions. Generally, Alternative D provides the second most secondary protections against INNS invasion and erosion, preceded by Alternative B and followed by Alternative A and then Alternative C.

4.1.3.3.5.3. Resource Uses

Surface-disturbing activities associated with minerals development expose soils to increased erosion potential and INNS invasion over the short and long terms (for projected acres of disturbance under Alternative D, see Appendix T (p. 1641)). Alternative D decreases the amount and severity of surface disturbance related to minerals development (leasable minerals, locatable minerals, mineral materials disposals, and geothermal leasing) substantially compared to alternatives A and C, but much less than Alternative B, particularly in Core Area. In addition, the Required Design Features mandated under Alternative D would further reduce adverse impacts to soil by limiting disturbance size and location. This would be expected to result in a proportionate decrease in risk of adverse impacts to soil (e.g., compaction and accelerated erosion). Alternative D would result in fewer beneficial impacts than Alternative B because Alternative D applies fewer major constraints to oil and gas leasing and opens Core Area to oil and gas leasing. This would be particularly true for soil resources outside greater sage-grouse Core Area, except for areas protected with No Surface Occupancy (NSO) stipulations for the benefit of other wildlife and resources. As indicated above, Required Design Features under Alternative D would reduce the adverse impacts associated with development, but would still allow some adverse impacts to occur, unlike Alternative B, under which leasing and locatable mineral activity is strictly limited so that soil disturbances would not occur.

See Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45) for acres open, avoided, or excluded from industrial wind-energy development under Alternative D. Wind-energy development adversely impacts soil and water resources on the actual footprint of the wind-energy structures and related facilities, and through increased surface disturbance and risk of accelerated erosion from additional roads and power transmission

corridors associated with such development. The difference in impacts among the alternatives is less substantial when the analysis is limited to areas with potential for commercial wind-energy development. All permitted activities in excess of 1 acre are required to comply with the Wyoming storm water management program, which would help limit adverse impacts to soil resources from surface disturbance.

Alternative D ROW management is similar to Alternative C, although Alternative D designates fewer corridors, has narrower corridor widths, and limits the number of aboveground corridors. Designating corridors would beneficially impact soils, and therefore water resources, because designation would increase the likelihood that ROWs would be co-located. Like Alternative B, Alternative D limits ROWs outside of corridors, but not as extensively as Alternative B. Alternative B would result in more beneficial impacts than any of the other alternatives because it closes areas not designated as corridors to major ROWs; all other alternatives consider authorizing ROWs outside designated corridors, although Alternative D avoids more areas for ROWs than either Alternative A or C and applies avoidance criteria. Alternative D results in beneficial impacts to soil resources (and therefore water quality) similar to Alternative B, but less beneficial. For those major ROWs considered outside of the designated ROW corridors, Alternative D puts the burden of justifying new locations on the ROW proponent; this could limit new surface disturbance. The Required Design Features could further limit adverse impacts to soils and water quality, but less than closing those areas.

Alternative D is similar to the other alternatives in authorizing livestock grazing in approximately 97 percent of the planning area. Alternative D does not identify set utilization levels, but would make that determination on a site-specific basis during permit renewals. Higher utilization can lead to greater adverse impacts to the plant community because it would increase soil compaction in livestock concentration areas, and accelerate erosion from the removal of vegetation below the threshold at which a particular ecological site would experience adverse impacts. Required Design Features could reduce the adverse impacts to soil from range infrastructure, but less than under Alternative B. However, short-term benefits to riparian-wetland resources, and therefore soil and water, resulting from exclosure fences will be more beneficial if those fences do not increase livestock trailing and resulting loss of vegetation, or increase use of uplands that are generally less used than riparian-wetland vegetation.

Alternative D uses salt and mineral supplements for livestock similar to Alternative B, and would result in fewer adverse impacts to soil resources than alternatives A and C. Alternative D allows the use of structural projects to make progress toward PFC and Wyoming Standards for Healthy Rangelands only pursuant to a Comprehensive Grazing Strategy. This would result in beneficial impacts to soil resources by avoiding surface disturbance associated with range improvement projects and limiting livestock concentration areas. Alternative D riparian-wetlands management provides for more flexibility than Alternative C; if properly applied, this would yield the most expedient results in riparian-wetlands improvement. However, project work is expensive, planning typically requires more than 2 years, monitoring and repair of structures are more intensive than passive management, and funds for such improvements are not always available, especially because current BLM budget projections call for decreasing budgets for the next several years. While improved riparian-wetland health can benefit soil resources, livestock concentration areas associated with range developments would adversely impact soil and therefore water quality. These impacts could exceed the beneficial impacts to soils from riparian-wetland improvement. If livestock grazing is reduced over time based on monitoring and health assessments, the reductions would decrease nonpoint source pollution.

Roads and trails are prime locations for soil compaction and accelerated erosion, and the fewer acres open to traffic, the less chance for damage to soil resources. Alternative D closes the second most acres to motorized travel so is the second most beneficial to soil resources. Alternatives B and D both treat over-snow vehicle use in areas with less than 12 inches of snow coverage the same as any other motorized vehicle use, and limit travel to existing or designated roads. This management would protect vegetation and soil resources, and would result in substantial beneficial impacts in compared to alternatives A and C. The Required Design Features for roads are likely to reduce the number of roads over time and therefore reduce the adverse impacts to water quality associated with road development and use. The Required Design Features for reclaiming decommissioned roads would beneficially impact water quality by increasing infiltration, reducing erosion along roads, reducing pollution associated with motorized use, and increasing vegetation which, in turn, would beneficially impact soils. As travel management planning is implemented, the number of roads with related adverse impacts to soils is likely to decrease, but only slowly. Improvements made by the Required Design Features reclamation practices will slowly impact soil resources in a beneficial way.

4.1.3.3.5.4. Special Designations

Alternative D management of Congressionally Designated Trails in the National Trails Management Corridor (NTMC) would result in more beneficial impacts to soil resources than Alternative A, substantially more than Alternative C, but substantially less than Alternative B, because Alternative B has fewer limits on surface disturbance. However, the actual number of acres protected from surface disturbance under any alternative is difficult to calculate because closure depends on visual resource management (VRM) considerations such as distance from the trails and topography.

Alternative D WSR management would be moderately less beneficial to soils than management under Alternative A by limiting surface disturbance in much less area. However, some of the protected waterways under alternatives A and B are in ACECs, such as the Lander Slope, or a WSA under Alternative D, so adverse impacts to soils, even in the areas around unprotected waterways are likely to be minimal.

Alternative D designates fewer acres of ACECs than Alternative B, with surface disturbance limitations (including a Plan of Operations) as part of the protection of ACEC values. However, the extent to which lands are withdrawn from locatable mineral entry to protect other values (including the ruts and swales of the National Historic Trails [NHTs]), reduces the differences from Alternative B. These measures under Alternative D would decrease the likelihood of adverse impacts to soil resources due to surface-disturbing activities and INNS over the short and long terms, followed by Alternative A; Alternative C affords no similar protections.

4.1.4. Water

This section analyzes impacts to surface water and groundwater quality and quantity from management actions under the alternatives. There is considerable overlap between surface water and groundwater, and adverse impacts to one would likely have a similar impact on the other, although to a different degree. In addition, there is a relationship between soil and vegetation resources and water quality, because removing vegetation or otherwise disturbing soil increases the likelihood of adverse impacts to water resources.

Surface Water Quality

Adverse impacts to water quality are those that would result in a violation of water quality standard (e.g., not meeting drinking water standards), or degrade a designated beneficial use (e.g., suitability for game fish). Management that allows surface-disturbing activities that contribute to erosion, and therefore sediment delivery to water, would result in adverse impacts. Beneficial impacts to surface water quality result from management actions that directly improve water quality or that minimize, reduce, or prevent sediment flow into water. Other beneficial impacts to water quality result from management that limits the discharge of lower-quality water (e.g., water produced during minerals activities that has higher solids or salts) than the receiving water, or the discharge of water that degrades riparian-wetland and recharge areas. For example, management actions that stabilize watersheds or improve degraded portions of watersheds beneficially impact surface water quality. Therefore, the more an alternative limits surface disturbance that would result in adverse sedimentation or limits the release of lower quality water, the more beneficial the impacts to water quality.

Direct adverse impacts to surface water quality result from actions that degrade the quality of surface waters. For example, management actions that modify drainages, such as altering the number of linear water crossings or the distribution and condition of riparian-wetland areas, result in direct adverse impacts to surface water quality.

Indirect impacts result from actions that disturb soil and vegetation in a watershed, especially highly erodible soil, because this leads to increased sedimentation of the water.

Long-term impacts to surface water quality are those that result from bare soil that continues to erode because it is not revegetated within 5 years or because established point discharges (such as the surface release of produced water) are not expected to stop in 5 years. Short-term impacts include exceedance of state water quality standards that are mitigated or stopped within required timeframes, or surface disturbances that temporarily affect water quality and are reclaimed immediately after a temporary use.

Fire suppression and rehabilitation activities can impact water resources over the short and long terms. Activities such as firebreak construction, clearing vegetation, and the use of heavy equipment would disturb the soil surface and increase erosion and sediment production over the short term. For example, fire lines constructed during suppression efforts can channelize surface runoff, which can result in gully erosion. Over the long term, however, successful stabilization efforts can increase cover and result in a subsequent reduction in erosion and sediment production to natural rates.

Surface Water Quantity

Impacts to surface water quantity result from management actions that reduce or supplement streamflows, and can be either beneficial or adverse, depending on the quantity and the location of the withdrawal(s) and discharge(s).

Direct impacts to surface water quantity result from management actions (e.g., vegetative and physical treatments, impoundments, and retention and detention structures) that increase or decrease runoff, and from changes in the quantity of water discharged into the system.

Indirect impacts to surface water quantity result from management that modifies the capacity of stream channels or changes the amount of water reaching the stream system. For example, changes in the locations of roads that direct surface water runoff into drainages can increase or decrease the timing and amount of surface water flowing in the stream system. The distribution

and condition of riparian-wetland areas would indirectly result in changes to surface water quantity because they increase infiltration and delay peak flows. Where surface water and groundwater are interconnected, short-term direct impacts can occur where localized withdrawals cause a lowering of the water table. The intensity of impact would be a direct result of the intensity of withdrawal. Compounding drought conditions could further the extent of the impact with resultant decreases in baseflow volumes.

Long-term impacts to surface water quantity are those that result from actions that alter the amount of impervious surface in a drainage or change established discharges that alter supplemental streamflows (more than 5 years) through either extensive groundwater withdrawals or sustained drought conditions. Short-term impacts result from uses that temporarily affect water quantity, such as temporary impoundments or detention structures.

Although there are small differences among the alternatives regarding acres available for land tenure adjustments, direct impacts to surface water quality under any alternative would be negligible, and are not further addressed in this section. See the *Soil* section for potential impacts to soil resources, and therefore water quality.

Groundwater Quality and Quantity

Direct impacts to groundwater quality and quantity result from changes in the number of wells drilled in a given area, including domestic or municipal water supply wells, oil and gas wells, and water disposal or injection wells. These direct impacts can occur either through consumptive uses that exceed water supply, localized lowering of the water table, and/or through direct contamination by materials used to drill and or complete said wells. Contaminates can be introduced through improper well construction and/or lack of maintenance. Additionally, where proposed drilling zones intersect zones being used as a water source, additional precautions should be taken including but not limited to the use of non-toxic drilling and/or stimulation fluids. Other factors to consider include the numbers and locations of springs developed, whether there are water conservation efforts in an area, and the amount of water infiltration and recharge.

Indirect impacts to groundwater quality and quantity result from activities that modify recharge areas related to a groundwater system(s). For example, activities that decrease vegetative cover or increase runoff can reduce infiltration of precipitation, thereby reducing recharge to groundwater aquifers.

Short-term impacts to groundwater can result from any temporary or short-term use of groundwater (e.g., temporary use of a well to supply water for drilling an exploratory gas well allotment). Long-term impacts to groundwater quality and quantity can result from permanent oil and gas fields and production facilities being constructed in recharge areas, or from landscape alterations that modify the areal extent of groundwater recharge zones. Such impacts can include wells that deplete an aquifer through extraction of water, paved surfaces and compacted soils that decrease water infiltration, or wells used to inject water of similar quality (disposal wells) into the aquifer. Actions that increase permeability, such as reclaiming disturbed areas and removing redundant roads, result in long-term beneficial impacts to groundwater quantity and, possibly, quality.

The primary BLM management action that impacts water quantity is minerals development. Oil and gas development and locatable minerals activity use large volumes of water and produce groundwater as an ancillary by-product of mineral activities. The amounts, locations, and quality of water produced varies from site to site, and often is known only after activities

begin. Most produced water is generally not of a quality that it can be reused for consumption without treatment. As such, most produced water is considered “consumed” and not available for beneficial use; however, recycling of produced water for additional drilling related uses is encouraged.

For example, in situ leach recovery of uranium intentionally uses a “bleed off” of a percentage of groundwater to maintain the pressure necessary to recover the uranium. The impacts of these management actions cannot be identified on a planning area-wide basis and need to be analyzed in a site-specific NEPA document. Impacts to groundwater quantity from minerals activities under the alternatives are not further analyzed other than to state that as minerals development increases in intensity and extent, the potential for adverse impacts to groundwater quantity and quality, including potentially connected impacts to surface water quality and quantity increase. The BLM does not anticipate that there would be any impacts associated with water consumption and/or produced water except on a site-specific basis.

4.1.4.1. Summary of Impacts

Impacts to surface water and groundwater quality would directly relate to the amount of surface disturbance allowed under an alternative if it is assumed that each discrete action creates its own surface disturbance (i.e., actions would not be co-located as in the case of multi-well pad drilling). Using the amount of surface disturbance as the metric, Alternative B would result in the fewest adverse impacts to and greatest protections for water resources. Management actions under this alternative would result in the least amount of projected surface disturbance and most restrictions on resource uses, and therefore the least amount of potential impact to surface water and groundwater quality and quantity. Conversely, based on anticipated surface disturbance alone, Alternative C would result in the greatest adverse impacts to water resources. Alternative C manages surface disturbance more like Alternative A than like Alternative B. Alternative D would result in beneficial impacts much more like Alternative B than like Alternative A.

All alternatives would result in the same level of water consumption impacts as they relate to mineral related activities, although impacts would be localized and addressed at the project or site-specific stage.

4.1.4.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Actions that disturb soils, particularly soils most susceptible to erosion, are the most likely to create dust or deliver sediment to waterbodies and adversely impact surface water. Erosion contributes to sedimentation if the sediment is delivered to the surface water drainage system either as fugitive dust or carried by surface water. The amount carried by surface water is limited by the effectiveness of storm water discharge practices and the buffering capacity of the land over which the water flows before reaching drainage.
- The extent of unsurfaced roads (i.e., those without gravel or any other added surface material) and the degree of usage is an indicator of the quantity of sediment delivery that could impact surface water quality within each watershed (Furniss et al. 2000). The alternatives vary substantially in the number and types of ROWs likely to be authorized and the amount of traffic likely to be generated by authorized activities. Therefore, to the extent that an alternative limits resource uses, such as closing an area to oil and gas development or reducing areas open to motorized travel, it would involve fewer unsurfaced roads and avoid traffic from

oil and gas operations over unsurfaced roads. Therefore, reduced resource use is an indicator of beneficial impacts to water quality.

- All alternatives employ various methods to minimize adverse impacts to water quality. BMPs, watershed enhancement projects, conservation practices, Storm Water Discharge Plans, Weed Management Area Plans, project-specific soil investigations, and reclamation plans are designed to reduce impacts to soil and vegetation, which in turn protects water resources by reducing runoff and sediment yield. Limiting motorized vehicle use to existing roads and trails would prevent route proliferation and vegetation removal, which could decrease erosion. In addition, management actions that restore plant communities would enhance water resources by restoring infiltration, organic matter content, and productivity, and by reducing erosion and the generation of sediment. Impacts from surface-disturbing and disruptive activities are mitigated through the application of the Wyoming BLM Standard Mitigation Guidelines for Surface-Disturbing and Disruptive Activities (Appendix M (p. 1595)).
- Substantial disturbance to soil, including compaction or changes in vegetative cover, increases water runoff and downstream sediment loads and lowers soil productivity, thereby degrading water quality, channel structure, and overall watershed health. The degree of impact attributed to any one disturbance or series of disturbances is influenced by several factors, including location within the watershed, time and degree of disturbance, existing vegetation, and precipitation. Only a site-specific analysis can address these potential impacts to water.
- Changes in channel geometry due to surface-disturbing activities would be likely to adversely impact water quality. Sediment in channels is necessary for maintaining channel geomorphology and building riparian-wetland systems. Most channel systems achieve a channel form in equilibrium to the water and sediment being naturally supplied to it, and generally respond to changes in sediment loads or streamflows by changing the channel form.
- Actions that protect soil and vegetation resources will generally mitigate or prevent adverse impacts to water resources as well.
- As the local population expands in the planning area, new disturbances related to OHV use will likely continue, with adverse impacts to soil and vegetation resources and water quality.
- Surface-disturbing and other activities are most likely to adversely impact the parts of the planning area where depths to groundwater are less than 100 feet or where the proposed action would occur within an aquifer containing potable water zones. In general, the shallower the water, the more sensitive an aquifer is to contamination (Wyoming Geographic Information Science Center 2003).
- Changes in surface water quality, such as increases in pollutants or physical parameters (e.g., temperature), can degrade habitat used by aquatic life and can affect other designated uses (e.g., livestock watering, irrigation, and drinking water supplies).
- Changes in surface water quantity, such as a lowering of the water table and resultant baseflows, can degrade habitat used by aquatic life and can affect other designated uses (e.g., livestock watering, irrigation, and drinking water supplies).
- BLM Wyoming state office policy requires the BLM to ensure that surface-disturbing activities comply with the CWA National Pollutant Discharge Elimination System Storm Water Discharge provisions as administered by the Wyoming DEQ. This program is designed to hold soil on construction and industrial sites and keep it from running offsite as sediment and causing adverse impacts to water quality. This CWA program will be complied with for all Wyoming DEQ-regulated surface disturbances; at present, this applies to all surface disturbances of 1 or more acre.
- Potential surface water and groundwater quality impairments are identified through inventories and routine monitoring activities and reported to the Wyoming DEQ, the regulatory agency that enforces the CWA and state water quality statutes. Monitoring is required by the BLM

and conducted by the permit holder. The U.S. Army Corps of Engineers regulates CWA section 404 provisions regarding riparian-wetland disturbance and channel modifications to waters of the United States. The EPA regulates drinking water quality in the state.

- All alternatives require inventory and condition assessment of reservoirs on BLM-administered lands in the planning area. Functionally compromised reservoirs will be repaired or reclaimed.
- The Lander Field Office will develop and implement watershed management plans as necessary and cooperate with ongoing watershed management initiatives of other stakeholders.
- The BLM manages water quality to meet Wyoming Standards for Healthy Rangelands, which protect and improve rangeland health, including water resources. Wyoming Standards for Healthy Rangelands are applied to all activities, not just livestock grazing.
- The acreage in the planning area managed as WSAs (55,338 acres) is the same under all alternatives, and all alternatives prohibit surface-disturbing activities in WSAs; this prevents adverse impacts to water resources in WSAs.
- Management actions that protect or enhance water resources, regardless of alternative, include but are not limited to, implementing BMPs for erosion and sediment control; employing watershed improvement and conservation practices; timely restoration of healthy plant communities and vegetative cover after surface disturbance; managing water resources to meet Wyoming Standards for Healthy Rangelands; achieving PFC and meeting state water quality standards; and participating with the Wyoming DEQ in the development and implementation of watershed management plans or total maximum daily load (TMDL) allocation plans.

4.1.4.3. Detailed Analysis of Alternatives

4.1.4.3.1. Impacts Common to All Alternatives

Impacts to Surface Water Quality

Surface water quality on BLM-administered surface lands and federal mineral estate could degrade under each alternative from activities proposed across a variety of resource programs. Impacts to water quality associated with these disturbances are projected to occur under each alternative, although the intensity of the impacts would vary across alternatives. Appendix T (p. 1641) lists projected surface disturbance by alternative during the planning period.

No long-term surface disturbance or associated erosion is anticipated from prescribed fire, chemical treatments, or mechanical fuels treatments following reclamation. Fuels management could result in short-term adverse impacts and long-term beneficial impacts to water quality.

Wildland fire in the planning area can impact water quality over the short term by removing vegetation and exposing soils to water and wind erosion, thereby generating sediment. Under certain conditions, hot fires can create hydrophobic soil conditions (i.e., resistance to water infiltration), whereby runoff and erosion increase; see the *Soil* section. Over the long term, if provided vegetative recovery is successful, fire can beneficially impact water quality by improving land health, reducing erosion and sediment contribution, and lowering the risk of landscape-level fire. The impacts of fighting wildland fires and the use of wildland fire to restore fire-adapted ecosystems or reduce hazardous fuels varies by alternative. On a planning-level scale, it is not possible to analyze impacts to water resources under individual alternatives because of the unpredictable nature of wildland fire and the contributions of weather, disease, and climate change.

Under all alternatives, surface-disturbing vegetative treatment projects to achieve management goals would result in short-term increases in erosion and potential sediment generation; however,

these adverse impacts would be ameliorated over the long term as vegetation reestablishes on treated sites.

All alternatives manage riparian-wetland areas to meet or exceed PFC and Wyoming Standards for Healthy Rangelands. This could involve rest or deferment from grazing pressure, fencing projects, structural in-stream projects, or any combination of thereof. Fencing and in-stream structural placement would necessarily involve short-term water quality degradation, but over the long term, water quality would return to meet or exceed that required to meet the designated beneficial uses.

INNS that form monoculture stands, such as leafy spurge and Russian knapweed, can exacerbate erosion by reducing vegetative cover, with resulting adverse impacts to water resources. The same is true of infestations of annual INNS species like cheatgrass and halogeton. The presence of INNS can alter natural fire regimes and increase fire frequency, which would lead to accelerated soil erosion and result in sediment deposition to waterbodies. Some annual INNS can result in a short-term beneficial impact because they can serve as a nurse crop to give a limited degree of erosion protection and sediment control while species planted for reclamation establish.

When watersheds lack vegetation, surface infiltration into the soil decreases, causing more runoff to reach stream systems. As surface disturbance increases, so does the amount of bare soil, compacted soils, and possibly less-pervious areas in a watershed. Therefore, more surface water runoff reaches streams in a shorter period, which increases the potential for sedimentation and the frequency of flooding or erosive velocities from high flows in channels. Conversely, activities such as reclamation would improve vegetative cover and would beneficially impact water resources. Healthy vegetative cover increases infiltration of surface water flows, filters out sediment before it reaches drainages, reduces runoff, and lowers peak flows in the surface water system. Prescribed fire reduces vegetative cover and increases sedimentation over the short term, but restoring fire-adapted ecosystems increases vegetative cover and decreases the potential for large landscape-level fires over the long term. Concentrated grazing by livestock, wild horses, and wildlife can contribute to soil compaction and damage the vegetative cover and soil crust, therefore increasing surface water runoff, erosion, and sedimentation. Produced water from oil and gas wells is sometimes discharged to surface waters, thereby contributing to surface water flows. Beneficial impacts from produced water discharges include increased availability of surface water; however, there can be adverse impacts from altering natural flow regimes, such as increased channel erosion, which would offset beneficial impacts.

Impacts to water resources from wild horses would be similar to those described in the *Soil* section.

Under all alternatives, approximately 97 percent of the planning area is open to livestock grazing. Properly managed livestock grazing at appropriate stocking levels can have a neutral to beneficial impact on vegetation and soil resources, and therefore water resources. These impacts are measurable only on a site-specific basis. The alternatives vary in how rangeland health standards and PFC will be achieved through managing livestock grazing. These differences are analyzed below by alternative.

The acreage of WSAs (55,338 acres) is the same under all alternatives, and all alternatives prohibit surface-disturbing activities in those areas. While travel management in WSAs varies by alternative, the differences in impacts to water resources is too small to analyze.

All alternatives include actions that restrict surface disturbance, which is generally considered to beneficially impact water resources. For example, withdrawals that close areas to surface-disturbing activities or requirements for construction, operation, monitoring, and

rehabilitation planning before surface-disturbing activities are initiated would, at a minimum, reduce the potential for adverse impacts to water resources from surface-disturbing activities.

Surface-disturbing activities associated with realty and minerals development expose soils to increased erosion and increased rates and volumes of runoff over the short and long terms. For the projected acres of disturbance under Alternative A, see Appendix T (p. 1641). Increases in surface disturbance related to lands actions and minerals development can be expected to result in a proportionate increase in adverse impacts to water resources. See the *Soil* section for acres of surface disturbance from mineral and realty actions under Alternative A.

Although the sale of forest products is considered unlikely, BMPs to reduce adverse impacts to all resources, but particularly surface water, would be evaluated and appropriate provisions would be applied as Conditions of Approval (COA) on the sale authorization under all alternatives. See Appendix H (p. 1521).

Impacts to Surface Water Quantity

Management of forest product sales primarily results in impacts to soil resources, and secondarily to water resources. As discussed in the *Soil* section, while each alternative includes different management actions for forest product sales (also see Chapter 2), impacts are not expected to vary by alternative because of the depressed demand for forest products in the planning area. Cutting of forest products can result in short-term and potentially long-term adverse impacts to water resources by removing vegetation and increasing erosion and surface disturbance. However, the BLM has not identified any reasonably foreseeable demand for substantial quantities of forest products, so impacts to water resources from management of forest product sales are not analyzed.

Impacts to Groundwater Quality and Quantity

Groundwater contamination can come from point sources, such as chemical spills, chemical storage tanks (aboveground and underground), industrial sites, landfills, household septic tanks, oil and gas well sites, oil and gas detention and retention ponds, and mining activities. Of solid minerals mining activities potentially impacting groundwater in the planning area, the legacy of past uranium mining and the potential of future in situ recovery (ISR) operations have the greatest potential to impact groundwater quality (e.g., produced-water bleed, leakage past approved areas, acid pit lakes, and contaminated plumes from tailings ponds). Other possible sources of groundwater contamination are nonpoint sources such as roadways and agricultural activities. Groundwater quality is most susceptible to pollution where the aquifer is shallow (within 100 feet of the surface), very permeable, or connected directly to a surface water system, such as river gravels. Potential impacts on groundwater resources from fluid mineral extraction activities could include the five following scenarios:

- Contamination of aquifers during drilling through the introduction of drilling fluids.
- Extended fracture growth allowing fracking fluid migration into source water zones or drinking water supplies.
- Cross-contamination of aquifers from the introduction of drilling fluids into one aquifer that travels upward into shallower units due to improperly sealed well casings.
- Localized depletion of unconfined groundwater availability.
- Progressive contamination of deep confined, shallow confined, and unconfined aquifers if the deep confined aquifers are not completely cased off from deeper units.

The application of BMPs as Required Design Features and compliance with federal rules and regulations are adequate to minimize adverse impacts from these activities.

The production of water from oil and gas wells would have the greatest potential to impact groundwater quality and quantity where the wells are producing from zones containing aquifers which are used as a source of freshwater (e.g., Wind River Formation).

4.1.4.3.2. Alternative A

4.1.4.3.2.1. Program Management

Alternative A prohibits or avoids surface-disturbing activities in groundwater recharge areas to prevent contamination on a case-by-case basis. Alternative A manages minerals and realty actions in these areas with standard stipulations. Pesticide use in aquifer recharge areas under Alternative A is the same as that specified on the legal pesticide label use restrictions.

Alternative A manages permanent facilities in floodplains and riparian-wetlands with moderate restrictions, except to benefit watershed health or vegetation, and considers linear water crossings on a case-by-case basis. This management would result in beneficial impacts to water resources.

4.1.4.3.2.2. Resources

Alternative A air quality and soils management would result in moderate beneficial impacts to water quality because it applies only statewide standard restrictions to surface-disturbing activities. Alternative A authorizes surface-disturbing activities in LRP areas with mitigation on a project-by-project basis using a detailed site analysis and reclamation objectives. This would benefit water quality and quantity. Alternative A also avoids surface disturbance of LRP soils whenever possible. To the extent that LRP soils are avoided, adverse impacts to water quality would be avoided. Similarly, the provisions of the Wyoming Stormwater Discharge program will help avoid adverse impacts to water resources from accelerated erosion and sediment loading. All of these management measures designed to forestall accelerated erosion and soil compaction would beneficially impact water resources by keeping sediment levels and runoff to natural levels.

There are no special management prescriptions for lands with wilderness characteristics under Alternative A.

Alternative A uses full suppression of fire and allows soil disturbance associated with suppression activities on a case-by-case basis. See above under *Impacts Common to All Alternatives* for impacts to water quality and quantity based on some fire suppression.

Alternative A manages activities likely to spread INNS on a case-by-case basis. Impacts to resources attributed to INNS are addressed above under *Impacts Common to All Alternatives*.

Alternative A prohibits surface-disturbing activities within 500 feet of surface water and riparian-wetlands unless the activities are necessary and their impacts can be mitigated. This buffer would protect water resources from both short- and long-term adverse impacts.

Alternative A management actions designed to protect wildlife and special status species habitat from the impacts of surface-disturbing and disruptive activities also would protect water resources from the adverse impacts associated with these activities. See Appendix T (p. 1641) for acres of projected surface disturbance. Management prescriptions under Alternative A designed to

protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect water resources.

4.1.4.3.2.3. Resource Uses

Under Alternative A, projected acres of disturbance from locatable minerals, leasable minerals, and mineral materials disposal management are listed in Appendix T (p. 1641). There would be a commensurate potential to adversely impact water quality and possibly water quantity to the extent that produced water is depleted. Impacts to water quality from ROWs, including industrial wind-energy development, would be secondary to impacts to vegetation and soils. See the *Soil* section. Alternative A considers oil and gas leasing in the area along the east side of Boysen Reservoir on a case-by-case basis, which could adversely impact water quality.

Livestock grazing management under Alternative A provides for protection or enhancement of other resource values, which would beneficially impact water resources. Alternative A prohibits the placement of salt or mineral supplements within ¼ mile of water, riparian-wetland areas, and reclaimed or reforested areas, which would reduce vegetation removal, soil compaction, and sediment production from concentrated livestock grazing and traffic. Alternative A allows rangeland improvement projects on a case-by-case basis; see analysis in the *Soil* section. Revegetation would usually occur within several growing seasons, and long-term erosion rates and sediment production should return to normal as upland sites farther from water are reclaimed to an appropriate percent of ground cover that would be expected for the historic plant community for a given site. However, unprotected water source developments subjected to improper livestock grazing management would typically become livestock concentration areas denuded of vegetation and subject to accelerated erosion rates and generation of sediment. Soil compaction, reduced infiltration, increased surface runoff, trail formation, and sediment generation can occur in these upland to wet lowland (or water development) transition zones. In addition, livestock concentration can compound the localized degradation of water resources usually found near uncontrolled water sources by channeling upland runoff in the transition zones down to the lowlands.

On a case-by-case basis, Alternative A uses the Wyoming Standards for Healthy Rangelands systematic assessment approach and PFC data to identify riparian-wetland areas that need improvement. Alternative A employs a variety of measures and passive and active (constructed projects) management to stop accelerated erosion and sediment production and restore long-term health and productivity to surface waters. These measures include fenced riparian-wetland exclosures and pastures, short-term rest from grazing, and grazing strategies favorable to riparian-wetland enhancement. Adverse impacts from range development projects can involve short-term accelerated erosion and sediment contribution from fence installation or livestock hoof action, but these impacts are expected to disappear over the long term and lead to improved conditions in riparian-wetlands. There could be long-term adverse impacts to water quality from areas denuded of vegetation and the resulting accelerated erosion.

Alternative A travel management would beneficially impact soils and vegetation, and therefore water resources by limiting travel to existing or designated roads and trails and prohibiting cross-country travel. In addition, Alternative A closes 5,923 acres to motorized travel; seasonally closes 111,002 acres to motorized travel; limits motorized travel to designated roads and trails on 163,075 acres, and closes over-snow vehicle use on 14,729 acres. As discussed under *Impacts Common to All Alternatives*, limiting travel management either seasonally or entirely beneficially impacts water resources by beneficially impacting soil and vegetation resources. Alternative A

does not require a minimum snow cover for cross-country travel, which could result in adverse impacts to soil and vegetation, and therefore water resources from over-snow vehicle use if there is not sufficient snow cover.

Recreation-related adverse impacts to water resources can take the form of soil compaction, soil particle detachment, dust evolution, and increased vulnerability to water and wind erosion from authorized large-group activities, the repeated use of undeveloped campsites, and cross-country mechanized travel.

4.1.4.3.2.4. Special Designations

Congressionally Designated Trails management under Alternative A protects ¼ mile on each side of the NHTs from surface disturbance, and in some cases, a slightly greater distance. To the extent there are water resources in or near this buffer, the buffer would benefit the water resources by limiting erosion and sedimentation.

Alternative A limits motorized travel in all eight WSAs to designated roads and trails, except in the Dubois Badlands WSA, which the alternative closes to motorized travel. This management would have a minor beneficial impact to water quality in those areas.

Alternative A also manages nine waterways as eligible for inclusion in the NWSRS for their ORVs by restricting surface disturbance within ¼ mile of the waters. This would benefit water resources by limiting erosion and sedimentation in those areas.

Alternative A places moderate constraints on surface-disturbing and disruptive activities on 119,622 acres in ACECs where surface disturbance is minimized and where Plans of Operation are required for minerals development. The existing ACECs designated under Alternative A moderately restrict surface-disturbing activities, except in ACECs avoided for major ROWs, which would beneficially impact water resources.

4.1.4.3.3. Alternative B

4.1.4.3.3.1. Program Management

Alternative B limits more surface disturbance than Alternative A, and avoids surface-disturbing and disruptive activities in sole-source aquifers and groundwater recharge areas. Mineral and realty actions in areas underlain by an identified sole-source aquifer are managed with moderate restrictions. Alternative B also prohibits pesticide use in identified aquifer recharge areas and any areas underlain by a sole-source aquifer or wellhead protection area. Alternative B would better protect groundwater recharge areas against accidental contamination. Alternative B implements management actions on a watershed basis to prevent degradation of surface water and groundwater and to improve water quality, using existing watershed plans where possible. In general, Alternative B water management is more protective of water quality and quantity than Alternative A.

4.1.4.3.3.2. Resources

Management actions under Alternative B designed to prohibit, avoid, or mitigate soil erosion also would beneficially impact water resources by eliminating sediment production and delivery that would result from authorized surface-disturbing activities capable of causing accelerated soil

erosion. See the analysis in the *Soil* section. Alternative B would result in more beneficial impacts to water resources than Alternative A, particularly related to disturbance in LRP soils and limiting disturbance on slopes less than 15 percent.

Alternative B manages 5,490 acres in the Little Red Creek Complex near Dubois as non-WSA lands with wilderness characteristics and closes these areas to motorized and mechanized travel. This would beneficially impact water resources by protecting them from erosion and runoff due to surface-disturbing activities. Alternative A does not include special management for these lands.

Alternative B proactively manages INNS and would likely be more successful in controlling the spread of INNS; see the *Soil* section. Impacts to water resources attributed to INNS are described above under *Impacts Common to All Alternatives* and in the *Invasive Species and Pest Management* section of this chapter. Alternative B will better limit the introduction and spread of INNS and therefore be more likely to prevent the spread and adverse impacts associated with INNS (e.g., accelerated erosion and increased runoff and sediment generation). However, limitations on pesticide use under Alternative B might be less effective in controlling INNS near water recharge areas and sole-source aquifers than Alternative A, which does not include that restriction.

Alternative B prohibits permanent facilities in floodplains and riparian-wetlands, which would result in more beneficial impacts to water resources than Alternative A, which only avoids those areas. This wide buffer and moderate restrictions on surface use would protect water resources from surface disturbance and the resulting sediment generation. As previously stated, alternatives involving the least amount of surface disturbance would be expected to indirectly benefit the control of accelerated erosion; Alternative B includes many more acres of protection for riparian-wetlands and transition zones than Alternative A.

Management actions under Alternative B designed to protect wildlife and special status species habitat from the impacts of surface-disturbing and disruptive activities also would protect water resources from impacts associated with these activities. Alternative B limits substantially more surface disturbance than Alternative A, including closing greater sage-grouse Core Area to oil and gas leasing, limiting surface disturbance within 0.6 mile of leks, and applying timing restrictions that would have the effect of protecting soil and therefore water during vulnerable times; see the *Soil* section. Less surface disturbance means fewer adverse impacts to soil, vegetation, and water resources. Alternative B management would systematically inventory and close unnecessary roads and trails and prescribe rehabilitation for them, which would help control runoff and sediment. Comparatively, Alternative A, on a case-by-case basis, closes and reclaims unnecessary roads and old mineral exploration trails, which would result in fewer beneficial impacts to water resources. The difference in beneficial impacts would depend on reclaiming roads that contribute to erosion and sedimentation of waters.

Alternative B includes the construction and upgrade of a wild-horse viewing loop road. Short-term adverse impacts to vegetation, soil, and water resources would include increased erosion in the area of construction, but as cut-and-fill slopes are rehabilitated, long-term impacts from erosion and sediment should be negligible. Alternative A does not include wild-horse viewing road designation or construction, but would result in the use of unimproved roads for horse viewing, which also would adversely impact soil and water resources.

Management prescriptions under Alternative B designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would

protect water resources. Generally, this alternative would provide more secondary protections to water resources than Alternative A.

4.1.4.3.3. Resource Uses

Surface-disturbing activities associated with minerals development expose soils to increased erosion and sediment generation over the short and long terms. For projected acres of disturbance under Alternative B, see Appendix T (p. 1641). Alternative B decreases the amount and severity of surface disturbance related to mineral development (leasable minerals, locatable minerals, mineral materials disposals, and geothermal leasing) substantially compared to Alternative A. Therefore, Alternative B would be expected to result in a proportionate decrease in risk of adverse impacts to water quality.

Alternative B management limits acres open to oil and gas and locatable mineral entry, which would reduce the potential for adverse impacts to water quantity compared to Alternative A, particularly in the area on the west side of Boysen Reservoir.

Industrial wind-energy development and ROWs result in surface disturbance, with the potential for adverse impacts to water quality. Alternative B opens substantially less acreage for industrial wind-energy development and ROWs than Alternative A, and manages more area as ROW avoidance and exclusion areas. Alternative B limits new ROWs to designated corridors and co-locates them with existing disturbance. The reduction in surface disturbance under Alternative B would likely result in fewer adverse impacts to water resources than Alternative A; see the *Soil* section for additional analysis.

Alternative B livestock grazing management provides for more protection or enhancement of other resource values than Alternative A; this would beneficially impact water resources. Alternative B prohibits the placement of salt or mineral supplements over a larger area than Alternative A; these provisions would reduce vegetation removal, soil compaction, runoff, and the risk of accelerated erosion from concentrated livestock grazing and traffic and the resulting adverse impacts to water resources.

This alternative emphasizes the use of non-structural grazing management to achieve or maintain Wyoming Standards for Healthy Rangelands. Alternative B does not allow new range improvements if they would result in adverse impacts to other resources. The establishment of forage reserves, as opportunities arise, is also provided for under this alternative. This approach should result in the fewest adverse impacts to water resources from range improvement project construction over the short and long terms. Alternative B low to moderate forage utilization would be more beneficial to water resources than management under Alternative A, which establishes forage utilization levels for livestock grazing on a case-by-case basis. However, improvements in riparian-wetland areas could be slower under Alternative B, and therefore take longer to beneficially impact water quality because riparian-wetland exclosure fences would not be used. Because range improvement projects would not be used for infrastructure, projects that would directly benefit water resources, such as improvements to riparian-wetland areas or vegetative treatments to eliminate heavy water users such as Russian olive, would be implemented.

With more restrictive travel, there would be less surface disturbance and fewer adverse impacts from accelerated erosion and runoff under Alternative B than under Alternative A.

4.1.4.3.3.4. Special Designations

Alternative B limits surface disturbance in a much larger buffer around Congressionally Designated Trails than Alternative A and, to the extent that water resources are in or near this buffer or would be receiving waters for erosion associated with surface disturbance, this larger buffer would beneficially impact water quality.

Unlike Alternative A, Alternative B closes all WSAs to motorized and mechanized travel. This would minimize soil erosion and runoff in these areas and beneficially impact water resources. Alternative B manages all NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS. This management would result in similar beneficial impacts to water quality as Alternative A, because of similar limitations on surface disturbance.

Alternative B designates 1,492,990 acres as ACECs (approximately 12.4 times the acres under Alternative A) and places very restrictive constraints on surface-disturbing activities in the ACECs. This would result in more beneficial impacts to water resources than the more moderate restraints under Alternative A. All of the ACECs under Alternative B are excluded to ROWs, which would better limit adverse impacts to water resources.

4.1.4.3.4. Alternative C

4.1.4.3.4.1. Program Management

Most program management actions under Alternative C are the same as under Alternative A, with the following exceptions:

Alternative C allows new permanent facilities in floodplains and riparian-wetland areas provided there are no practicable alternative locations and there is mitigation sufficient to ensure the action would meet the requirements of Executive Orders 11988 and 11990, CWA wetland protections, and federal and state water quality requirements. This management would have impacts very similar to Alternative C.

Like Alternative A, Alternative C does not include protective management for groundwater recharge areas to control potential chemical contamination, runoff, and sediment. Alternative C allows more surface disturbance in comparison to alternatives A and B, with the potential for adverse impacts to water quality and quantity. Impacts to water resources under Alternative C would be very similar to impacts under Alternative A, although possibly somewhat more adverse.

4.1.4.3.4.2. Resources

Air quality, soils, lands with wilderness characteristics, and INNS program management under Alternative C are similar to Alternative A, and would result in the same limited beneficial impacts to water quality and quantity as described above under *Alternative B, Resources*.

Alternative C has the same 500-foot buffer around riparian-wetlands as Alternative A, except when it can be shown that equivalent protection for riparian-wetland areas can be achieved using a smaller buffer distance. Alternatives A and C would be similar in their beneficial impacts to water quality, and would result in somewhat fewer beneficial impacts than Alternative B. Additional analysis of riparian-wetland management under Alternative C is provided in the discussion of livestock grazing.

Alternative C wildlife and special status species program management is very similar to Alternative A, and would result in the same beneficial impacts. Alternative C wildlife resources management does not close and reclaim unnecessary roads and old mineral exploration trails, and would not have the beneficial impacts to water quality that might be achieved under Alternative A or B. Alternative C provides the fewest protections for special status species, and would have more potential for adverse impacts to water resources.

Management prescriptions under Alternative C designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect water resources. See the resource-specific sections in this chapter for those management prescriptions. Generally, Alternative C would provide the fewest protections for water resources compared to the other alternatives.

4.1.4.3.4.3. Resource Uses

Surface-disturbing activities associated with minerals development expose soils to increased erosion over the short and long terms (see Appendix T (p. 1641) for projected acres of disturbance under Alternative C). Alternative C increases the amount and severity of surface disturbance related to minerals development (leasable minerals, locatable minerals, mineral materials disposals, and geothermal leasing) substantially compared to alternatives A and B, which would be expected to result in a proportionate increase in risk of adverse impacts to water resources as runoff and sediment increase above natural levels. Like Alternative A, Alternative C considers oil and gas leasing in the area along the east side of Boysen Reservoir on a case-by-case basis, which could adversely impact water quality.

Alternative C manages the least amount of area that is excluded from wind-energy and ROW development compared to the other alternatives. Because so much more area is available for disturbance, impacts to water quality would likely be proportionately greater. To the extent that new ROWs occur in the corridors designated under this alternative, the adverse impacts associated with ROW disturbances would be somewhat more reduced than if there were no co-location requirements.

Alternative C authorizes livestock grazing with moderate livestock utilization (41 to 60 percent) rather than setting utilization levels on a case-by-case basis as does Alternative A, or by prescribing light (20 to 40 percent) utilization levels as does Alternative B. This higher utilization would necessitate more monitoring and leave less room for error than light utilization, risk greater adverse impacts to the plant community because it would increase soil compaction in livestock concentration areas, and have the potential to accelerate erosion through the removal of vegetation below the threshold at which a particular site would experience adverse impacts.

Efforts to meet the Wyoming Standards for Healthy Rangelands for water quality and riparian-wetland management under Alternative C rely on a variety of measures and passive and active (constructed projects) management to correct water resource problems from accelerated erosion and restore long-term health and productivity to these areas. These measures include fencing riparian-wetland exclosures and pastures, short-term rest, and grazing strategies favorable to riparian-wetlands enhancement. Project impacts associated with riparian-wetland areas can involve short-term accelerated erosion from fence installation or livestock walking on the surface, but impacts of range improvement projects would be expected to disappear over the long term and lead to improved conditions.

Alternative C livestock grazing management would, if properly applied, yield the most expedient results and protect water resources best (without consideration of adverse impacts to other resources). Alternative C could lead to quicker riparian-wetlands improvement, and greater resistance to soil erosion and less sediment generation than Alternative B. However, the risk of adverse impacts associated with infrastructure projects also would be greater. In addition, Alternative C would utilize infrastructure range projects with correspondingly less emphasis on non-infrastructure range improvement projects such as vegetative treatments or aspen or willow treatments, which would beneficially impact water resources.

Alternative C prescriptions for buffers for salt or mineral supplements are very similar to those under Alternative A, with similar beneficial impacts to water quality. Alternative B would result in the most beneficial impacts to water resources by reducing soil compaction and accelerated erosion compared to Alternative A, which would result in minor additional beneficial impacts compared to Alternative C.

Alternative C closes the fewest acres to motorized travel and closes no acres seasonally to motorized travel. There are no acres closed to over-snow vehicle use, so there are no protections for soil and vegetation even if snow covering is light. This would have the potential to increase erosion and therefore adversely impact water resources. Compared to alternatives A and B, Alternative C is the least restrictive for motorized travel in the planning area and would allow the most opportunities for adverse impacts to water resources from soil compaction and accelerated erosion. However, like all alternatives, Alternative C would beneficially impact soil resources by prohibiting cross-country motorized vehicle use (except regarding over-snow vehicle use).

4.1.4.3.4.4. Special Designations

Congressionally Designated Trails receive minimal protections under Alternative C, which is slightly less protective of water resources than Alternative A. To the extent that water is available in the protective buffer under Alternative B or would receive erosion from surface disturbances, adverse impacts to water quality from surface disturbance would be much greater under Alternative B than under Alternative C.

WSA management under Alternative C is the same as Alternative A, which does not close most WSAs to motorized travel. Alternative B closes all WSAs to motorized travel and would provide more protections for water resources from the adverse impacts of vehicular traffic.

Alternative C does not manage any NWSRS-eligible waterway segments to maintain their suitability for inclusion in the NWSRS, so it would not preclude surface disturbance in a ¼-mile buffer, with resulting adverse impacts to adjoining water quality. In this regard, Alternative C would result in the fewest beneficial impacts to water resources.

Alternative C designates no ACECs; therefore, it limits surface management to standard statewide stipulations. This would result in greater adverse impacts to water resources than Alternative A or B, and compared to Alternative B, the difference would be major. Absent ACEC designation, there would be no Plans of Operation for locatable minerals exploration up to 5 acres in size, and there would be more potential for adverse impacts to water quality. Under Alternative C, much more surface disturbance in general through minerals activities and ROWs would be likely in areas that other alternatives designate as ACECs (Appendix T (p. 1641)). ACEC prescriptions under other alternatives would decrease the likelihood of adverse impacts to water resources from

surface-disturbing activities and INNS over the short and long terms best under Alternative B and less well under Alternative A. Alternative C does not provide similar protections.

4.1.4.3.5. Alternative D

4.1.4.3.5.1. Program Management

Alternative D water resources program management is similar to Alternative B, but has somewhat fewer restrictions on surface disturbance. Sole-source aquifers and groundwater recharge areas are avoided and pesticide use is allowed in recharge areas if no other type of treatment would be successful. Alternative D would result in substantially fewer adverse impacts to water resources than alternatives A and C, both of which authorize more surface disturbance and more mineral entry. The Required Design Features discussed in the *Soil* section for this alternative, would reduce the adverse impacts to water quality, but less so than the more restrictive management under Alternative B.

4.1.4.3.5.2. Resources

Management actions for air quality and soil resources under Alternative D are very similar to those under Alternative A, and would result in the same impacts to water quality and quantity.

Alternative D manages the Little Red Creek Complex as non-WSA lands with wilderness characteristics. Although it manages slightly fewer acres for wilderness characteristics than Alternative B, Alternative D management would result in essentially the same beneficial impacts to water as Alternative B, considerably more beneficial impacts than Alternative C, and slightly more beneficial impacts than Alternative A; Alternative A likely will limit surface disturbance in the Little Red Creek Complex because of nearby wilderness (Shoshone National Forest) and the Whiskey Mountain ACEC. See the discussion for Special Designations below. Under Alternative D, CSU for slopes in excess of 15 percent limits more disturbance in areas vulnerable to soil erosion, so it provides more benefit to water resources than either Alternative A or C.

Management of forest product sales and forests and woodlands under Alternative D limits silviculture techniques to only as needed to protect resources; this would likely result in more beneficial impacts to water resources than alternatives A and C, which include artificial slope and riparian-wetland limitations, regardless of impacts. While the more restrictive management under Alternative B would result in more short-term beneficial impacts, over the long term, the limits on silviculture techniques under Alternative B would likely result in more adverse impacts because commercial thinning or fuel reductions would not likely occur. However, as previously stated, the actual impacts to water resources would not vary substantially by alternative because of depressed demand for forest products.

INNS management prescriptions under Alternative D are the same as under Alternative B. Compared to alternatives A and C, Alternative D takes a more proactive approach to INNS management which would better control the impacts of erosion related to INNS infestations. Moreover, Alternative D involves the second lowest amount of surface disturbance and second most management focus on reducing duplicative roads next to Alternative B. The best indicator of INNS infestation potential is the amount of surface disturbance and roads. While INNS impact water quality only secondarily, the adverse impacts of INNS to soil and vegetation would lead to adverse impacts to water resources over time. However, Alternative D would have the same

effect on groundwater quality in areas of inferred aquifer recharge or Sole Source Aquifers or Wellhead Protection Areas as Alternative B as the management is the same. This would be more beneficial than either alternative A or C. As described in the *Soil* section, Required Design Features under Alternative D regarding impound pond design would reduce the adverse impacts of INNS, including WNV-bearing mosquitoes, but less than under Alternative B.

Riparian-wetland management under Alternative D applies the same riparian-wetlands buffer as Alternative A, and therefore would result in similar beneficial impacts to water resources. This buffer will afford some protection to native plant communities from potential soil compaction and accelerated erosion over the short and long terms, but not as much protection as Alternative B, which applies a buffer 2 and a half times wider (1,320 feet) and would afford greater protection from surface disturbances than Alternative A, C, or D. The Alternative D management approach for riparian-wetlands relates to livestock grazing management; impacts to soil resources are addressed in the discussion below for grazing.

Alternative D is similar to Alternative B in its wildlife protections, including greater sage-grouse lek protections, except that Alternative D is less protective, particularly in non-Core Area and regarding solid mineral leasing. Alternative D wildlife management is more protective of water resources than Alternative A, and considerably more protective than Alternative C, because Alternative D closes more area to surface disturbance (Appendix T (p. 1641)). Withdrawals associated with wildlife and other resources makes Alternative D more like Alternative B. Alternative D increases mineral prescriptions for the benefit of wildlife and are analyzed below under *Resource Uses*.

Management prescriptions under Alternative D designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and disruptive activities also would protect soil resources from these activities. See resource-specific sections for the prescriptions.

4.1.4.3.5.3. Resource Uses

Surface-disturbing activities associated with mineral development expose soils to increased erosion potential and INNS invasion over the short and long terms (for projected acres of disturbance under Alternative D, see Appendix T (p. 1641)). Alternative D decreases the amount and severity of surface disturbance related to minerals development (leasable minerals, locatable minerals, mineral materials disposal, and geothermal leasing) substantially compared to alternatives A and C; this would be expected to result in a proportionate decrease in risk of adverse impacts to water resources from compaction and accelerated erosion that is described in the section on impacts to soil resources. Alternative D would result in fewer beneficial impacts than Alternative B, because Alternative D closes or applies major constraints on oil and gas leasing on less of the planning area and does not close Core Area to leasing. The Alternative D requirement for evaluating impacts of the oil and gas program on groundwater, including potentially monitoring groundwater quality, would reduce the potential adverse impacts associated with oil and gas operations. Monitoring would allow management to respond rapidly to water quality degradation. This would be particularly true for water resources outside greater sage-grouse Core Area. However, Alternative D, like Alternative B, closes the area to the east of Boysen Reservoir to oil and gas leasing, so Alternative D would have the same beneficial impacts to water quality. Alternative D is more similar to Alternative B in withdrawing large areas of land from locatable mineral entry and limiting more surface occupancy for oil and gas development than either Alternative A or C, so the beneficial impacts to water quality would also be greater.

Implementation of Required Design Features to limit the size and extent of development would reduce the adverse impacts to water quality associated with those developments, although less than prohibiting the development, as would occur under Alternative B, especially in Core Area. However, the requirement under all alternatives for a water protection plan to be in place for all surface disturbance makes the differences in impacts to water quality relatively small across the alternatives.

Refer to Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45), for acres open, avoided, or excluded for industrial wind-energy development under Alternative D, which is less beneficial to water resources than Alternative B. However, only a relatively small number of these acres are in areas with high wind-energy potential, so the difference in impacts between the two alternatives is less than the acres alone would suggest; see the *Soil* section for a discussion of impacts to soil and vegetation, which would result in long-term adverse impacts to water quality. Alternative D ROW management is similar to Alternative C, although Alternative D designates fewer corridors and the corridors are narrower than those designated under Alternative B. See the *Soil* section for an analysis of impacts on soil and vegetation from ROWs both inside and outside of designated corridors, which lead to long-term adverse impacts to water quality.

Livestock grazing management under Alternative D would result in more beneficial impacts to water resources than Alternative A as a result of substantially more restrictions on the placement of salt or mineral supplements, and reducing the likelihood of range infrastructure and related loss of vegetation, which can lead to erosion degrading water quality. The reduced amounts of livestock grazing that are anticipated to occur over time as monitoring and rangeland health assessments identify those areas not meeting the Wyoming Standards for Healthy Rangelands due to livestock grazing, would result in beneficial impacts to water by reducing nonpoint source contamination. In addition, Alternative D would result in more beneficial impacts to water resources than alternatives A and C, but less than Alternative B, by reducing soil compaction and accelerated erosion.

Alternative D authorizes the use of structural projects only pursuant to a Comprehensive Grazing Strategy to make progress toward PFC and Wyoming Standards for Healthy Rangelands, whereas Alternative B relies on passive solutions. If properly applied, Alternative D management, like Alternative C, would yield the fastest results in riparian-wetlands improvement; however the potential for adverse impacts to soil and vegetation, and therefore water resources, would also be greater because more intensive grazing would be possible, although less so under Alternative D than under Alternative C. The Required Design Features would result in further reduction of adverse impacts associated with range infrastructure.

Although Alternative D would disturb fewer acres from range improvement projects than alternatives A and C, the beneficial impacts of improved riparian-wetland health could be offset by adverse impacts to soil from creating livestock concentration zones associated with range developments and increasing use of available natural water sources. These impacts could exceed the beneficial impacts from riparian-wetland improvement. Loss of vegetation in uplands areas could contribute to degradation of water resources, which would have more adverse impacts to water resources than the beneficial impacts from improved riparian-wetland condition. In addition, range improvements would still emphasize infrastructure projects, so there would be fewer acres of vegetative treatments and fewer projects, such as aspen and willow regeneration, that would beneficially impact water resources.

Roads and trails are prime locations for soil compaction and accelerated erosion, and the fewer acres open to traffic, the less chance for damage to soil resources. Comprehensive trails and travel management under Alternative D is similar to, but less protective than, Alternative B. The Required Design Features would assist in reducing adverse impacts to water quality from road-related erosion and pollution from motorized vehicles. The Required Design Features for reclamation of decommissioned roads described in the *Soil* section would benefit water quality. Alternatives B and D close areas to over-snow vehicle use on snow less than 12 inches deep and would result in the same beneficial impacts to soil resources, and long-term beneficial impacts to water resources. Neither Alternative A nor C has a minimum snow-depth requirement, and would result in more long-term adverse impacts to water resources, although all alternatives limit OHV utilization.

4.1.4.3.5.4. Special Designations

Alternative D management of Congressionally Designated Trails in the NTMC would result in more beneficial impacts to water resources than Alternative A, substantially more than Alternative C, and substantially less than Alternative B, again because of limits on surface disturbance in connection with lands in the NTMC. On a site-specific basis, the actual number of acres on which soil disturbance would be limited would depend on factors such as visual resources and impacts to the settings of the trails. However, ACEC management of the Congressionally Designated Trails has not been identified as more than a minor impact to water quality, so the beneficial impact might not be great. Limits on surface disturbance, however, as discussed in the *Soil* section, are likely to beneficially impact water quality through limiting erosion.

Management of NWSRS-eligible waterway segments would be slightly less beneficial to water resources under Alternative D than under alternatives A and B. However, most of the eligible waterways not managed as suitable under Alternative D have other protective management, such as ACEC designation or WSA protections, that would limit surface disturbance that could adversely impact water resources.

Alternative D designates fewer acres of ACECs than Alternative B, and therefore avoids fewer adverse impacts to water quality from disturbance, such as identified in the *Soil* section. Other management in support of ACEC protection, such as VRM and travel management, would also lessen potential adverse impacts to water quality associated with development. This management would avoid more adverse impacts to water resources, but less so than Alternative B. Alternative C affords no similar protections.

4.1.5. Cave and Karst Resources

No significant caves have been identified in the planning area. However, there has been no survey of cave and karst resources. Therefore, potential impacts to cave and karst resources under the alternatives can be described only in theoretical terms.

Adverse impacts to cave and karst systems result from management actions that alter, degrade, or destroy cave or karst systems and their features. Conversely, actions that result in data collection and preservation or establishment of cave and karst resources and their associated geological, biological, cultural, paleontological, hydrological, and/or educational values are considered beneficial impacts. Special designations such as the Lander Slope ACEC would protect cave and karst resources in that area.

Direct impacts to cave and karst resources result from management actions that physically alter, damage, or destroy cave and karst systems, including their associated geologic features (speleothems) and biologic communities. In general, recreational uses of caves have the greatest potential to result in direct adverse impacts to cave and karst resources.

Indirect impacts to cave and karst systems can result from actions that increase the accessibility of cave and karst areas, and therefore the probability of adverse impacts due to incompatible or excessive recreational use. Indirect impacts can also result from activities that alter water quality (e.g., agriculture, pesticide application, and pollution) when degraded water infiltrates into groundwater, thereby possibly altering the chemical and biological environment of cave and karst systems.

Under all alternatives, if cave and karst resources protected by federal legislation were discovered, the BLM would specially manage those areas under a protocol developed to meet preservation needs.

4.1.6. Lands with Wilderness Characteristics

4.1.6.1. Summary of Impacts

Consistent with the Federal Land Policy and Management Act (FLPMA), the BLM evaluates lands in the planning area to determine if they contain wilderness characteristics that should be managed to maintain and protect those characteristics. As Table 4.13, “Acres of the Planning Area Managed to Protect Wilderness Characteristics” (p. 668) demonstrates, Alternative B would benefit lands with wilderness characteristics the most out of the four alternatives, as it allocates the highest amount of acres to be managed as non-WSA lands with wilderness character to protect these wilderness values. Alternatives A and C do not specially manage lands with wilderness characteristics to protect wilderness values and could result in degradation of these areas. Alternative D allocates 536 fewer acres as non-WSA lands with wilderness character than Alternative B.

Table 4.13. Acres of the Planning Area Managed to Protect Wilderness Characteristics

Area	Alternative A	Alternative B	Alternative C	Alternative D
Little Red Creek Complex	0	5,490 acres ¹	0	4,954 acres ¹
Source: BLM 2012a				
¹ Alternatives B and D manage lands with wilderness characteristics as non-WSA land with wilderness characteristics to protect the areas’ wilderness values.				

4.1.6.2. Methods and Assumptions

This section focuses on analyzing potential impacts to the 5,490 acres in the Little Red Creek Complex found to have wilderness characteristics, as discussed in Chapter 2. The *Recreation* and *Visual Resources* sections address impacts throughout the planning area to naturalness, solitude, and primitive/unconfined recreation. The following indicators and definitions are used in this analysis of lands with wilderness characteristics:

Naturalness: The degree to which an area generally appears to have been affected primarily by the forces of nature with the imprint of people's work substantially unnoticeable. It is not synonymous with natural integrity.

Solitude: The state of being alone or remote from others; isolation. A lonely or secluded place.

Primitive and Unconfined Recreation: Nonmotorized, nonmechanized (except as provided by law), and undeveloped types of recreational activities.

Assumptions used in this impact analysis include the following:

- Closing areas to motorized vehicles will increase the protection of solitude and primitive/unconfined recreation. Limiting motorized vehicles to designated roads and trails, and seasonal closures will increase the protection of solitude and primitive/unconfined recreation at a lower level than a year-round closure. Limiting vehicles to existing roads and trails will not protect solitude and primitive/unconfined recreation.
- Managing areas as VRM Class II visual resources will increase the protection of naturalness and primitive/unconfined recreation. Managing areas at a lower VRM Class will result in impacts to naturalness and primitive/unconfined recreation.
- Designating an area as non-WSA land with wilderness characteristics will benefit naturalness and primitive/unconfined recreation.
- ACEC management will benefit lands with wilderness characteristics because often, management prescriptions for ACECs associated with relevant and important values (e.g., scenic, wildlife, and geologic) benefit naturalness and solitude and primitive/unconfined recreation.
- This analysis only considers present conditions when considering lands with wilderness characteristics and not the potential for other areas to become lands with wilderness characteristics through restoration or other changes in current condition.
- In this document, the BLM refers to lands with wilderness characteristics managed to protect wilderness values as "non-WSA lands" to distinguish management of these lands from management of WSAs. Lands with wilderness characteristics not managed as non-WSA lands does not mean the lands do not contain wilderness characteristics, rather it means the BLM would not specially manage these lands to protect wilderness values.

4.1.6.3. Detailed Analysis of Alternatives

4.1.6.3.1. Impacts Common to All Alternatives

Consistent with FLPMA, the BLM evaluates lands in the planning area to determine if they contain wilderness characteristics that should be managed to support and/or enhance those characteristics. The inventory conducted by the BLM as part of the RMP process to evaluate lands with wilderness characteristics is identified in Chapter 3. Only lands in Dubois, known as the Little Red Creek Complex, contained lands with wilderness characteristics. Consistent with the FLPMA and the BLM Land Use Planning Handbook, analysis of the impacts of the alternatives addresses management of the Little Red Creek Complex and does not revisit the decisions with regard to other areas found not to contain wilderness characteristics.

A small portion of the Little Red Creek Complex is open to livestock grazing in all alternatives, but grazing use is not expected to adversely impact wilderness characteristics.

Alternative C does not designate any area as an ACEC, including the Whiskey Mountain ACEC that was designated in the 1987 RMP. However, for clarity, this geographic area is referred to as the Whiskey Mountain ACEC in all alternatives, even Alternative C.

4.1.6.3.2. Alternative A

4.1.6.3.2.1. Program Management

Alternative A does not manage the Little Red Creek Complex as non-WSA land with wilderness characteristics. The alternative does not prescribe management actions to enhance or maintain the wilderness characteristics of the area. This management would result in impacts to wilderness characteristics from other programs because mitigation actions and proactive management will focus on enhancing the area for other resources (primarily wildlife). These impacts will be somewhat offset by the fact that benefits to wildlife often benefit wilderness characteristics.

4.1.6.3.2.2. Resources

This alternative manages the Little Red Creek Complex as VRM Classes II, III, and IV. This would allow for modifications to the visual environment that would increase visual intrusions and the evidence of human presence in VRM Class III and IV areas.

4.1.6.3.2.3. Resource Uses

Alternative A limits resource uses in the Little Red Creek Complex to support Whiskey Mountain ACEC management for the benefit of bighorn sheep (see below under *Special Designations*). This management will enhance and support wilderness characteristics of the area by limiting surface disturbance and the intrusion of human presence. However, outside of the ACEC, there are no limits on mineral extraction or realty actions. Resource uses can result in increased road densities, visual intrusions, unnatural sounds, evidence of humans, and social crowding. Except for ACEC management, this alternative does not limit resource use with the potential for adverse impacts to wilderness values. Although the mineral potential is low, the demand for ROWs to access the Shoshone National Forest may lead to adverse impacts to the area's wilderness values.

This alternative will continue to allow motorized vehicles in the area. Travel management decisions for the ACEC will beneficially impact wilderness values (see below). Because the travel management focus will not be on enhancing wilderness characteristics, it is assumed that this decision would moderately benefit naturalness, but would not benefit solitude and primitive/unconfined recreation.

Alternative A does not include specific recreation management for the Little Red Creek Complex. Therefore impacts from social trails, crowding, and other recreation-related activities would continue in the area. These impacts would reduce all wilderness characteristics during the planning period.

4.1.6.3.2.4. Special Designations

Managing the majority of the area as an ACEC would beneficially impact naturalness and would result in limited beneficial impacts to solitude and opportunities for primitive/unconfined recreation. ACEC management prescribes limits on resource uses, directly limiting the amount

of change that can occur to the landscape. The ACEC designation and supporting management would primarily limit energy development in the Little Red Creek Complex, which would reduce the potential for visual intrusions, unnatural sounds, evidence of humans, and social crowding. Travel management limits motorized travel to designated roads and provides seasonal closures for the benefit of bighorn sheep, which would beneficially impact the wilderness characteristics of the area.

4.1.6.3.3. Alternative B

4.1.6.3.3.1. Program Management

Alternative B would enhance wilderness characteristics on 5,490 acres of the Little Red Creek Complex. By managing the area as non-WSA land with wilderness characteristics, management actions will sustain and enhance the wilderness characteristics of the area. Program management under this alternative closes the area to motorized vehicles and manages the area as VRM Class II. In addition, the alternative explicitly manages recreation to sustain and enhance wilderness characteristics. Alternative B program management will close all roads in the area; provide management that precludes visual intrusions and unnatural sounds; reduce the evidence of human presence; and apply a management framework to reduce social crowding. These program decisions would complement ACEC management in the area. The synergy of the ACEC designation and management of the area as non-WSA land with wilderness characteristics would result in an area with a high degree of naturalness, solitude, and opportunities for primitive/unconfined recreation.

4.1.6.3.3.2. Resources

Alternative B air, soil, water, and wildlife management beneficially impacts the Little Red Creek Complex by limiting surface disturbance and intrusion of human presence. Compared to Alternative A, this management would reduce the probability of visual intrusions and evidence of human presence in the area, and would enhance wilderness characteristics over a larger area.

4.1.6.3.3.3. Resource Uses

Alternative B mineral and realty management beneficially impacts the Little Red Creek Complex by limiting surface disturbance and visual/human intrusions. Although mineral potential is low, the area and other lands nearby have high potential for wind-energy development. Alternative B restrictions on ROWs will preclude development of access to the Shoshone National Forest which would adversely impact the wilderness characteristics. VRM is more beneficial than under Alternative A since the area around the Little Red Creek Complex is managed as VRM Class II, which further limits disturbance and human presence.

Resource uses can result in increased road densities, visual intrusions, unnatural sounds, evidence of human presence, and social crowding. This alternative specifically closes the area to motorized vehicle use, which would enhance wilderness characteristics.

Alternative B manages recreation use in lands with wilderness characteristics to maintain naturalness, solitude, and primitive/unconfined recreation. This management would ensure future recreation management actions support wilderness characteristics by not allowing motorized or mechanized travel in the Little Red Creek Complex. In addition, this alternative pursues foot and

horseback access to this area to support primitive and unconfined recreation. These actions would enhance wilderness characteristics throughout the planning period, and would beneficially impact wilderness characteristics more than Alternative A.

4.1.6.3.3.4. Special Designations

Managing the majority of the Little Red Creek Complex as an ACEC would result in beneficial impacts similar to Alternative A. The synergistic effect of ACEC and wilderness characteristics management would result in an area with a high degree of naturalness, solitude, and opportunities for primitive/unconfined recreation.

4.1.6.3.4. Alternative C

4.1.6.3.4.1. Program Management

Alternative C does not manage any area as non-WSA land with wilderness characteristics or provide other specific management for lands with wilderness characteristics. The impacts from program management of the Little Red Creek Complex under Alternative C is similar to that under Alternative A.

4.1.6.3.4.2. Resources

Alternative C air, soil, water, and wildlife management is less protective than Alternative A and thus has fewer beneficial impacts to wilderness characteristics. These resources are managed with standard stipulations which would allow more surface disturbance which would reduce the wilderness characteristics of the area.

Alternative C manages the Little Red Creek Complex (including the Whiskey Mountain ACEC) as VRM Classes III and IV. This management would allow for modifications to the visual environment that would increase visual intrusions and evidence of human presence in the area. Because this alternative does not include VRM Class II management for the complex, adverse impacts from modifications to the visual environment would be higher under Alternative C than under Alternative A.

4.1.6.3.4.3. Resource Uses

This alternative does not limit resource uses such as mineral development or realty actions in the Little Red Creek Complex, including the Whiskey Mountain ACEC. Therefore, activities in support of resource uses would increase in the area compared to Alternative A, including: road densities, visual intrusions, unnatural sounds, evidence of human presence, and social crowding. Mineral and realty actions in the area would be authorized with adverse impacts to the solitude and undisturbed character of the area. Although there is limited potential for minerals in the area, demand for ROWs to access the Shoshone National Forest could lead to disturbances which would adversely impact wilderness characteristics.

Alternative C places fewer restrictions on motorized vehicles in the area than Alternative A. Travel management decisions for the area would limit motorized travel to existing roads and trails. Because the travel management focus is not on enhancing wilderness characteristics or ACEC

values, compared to Alternative A, Alternative C management would decrease naturalness, solitude, and primitive/unconfined recreation in the area.

This alternative does not include specific recreation management for the area; therefore, impacts from social trails, crowding, and other recreation-related activities would continue in the area. These impacts would reduce all wilderness characteristics during the planning period. Because Alternative A includes the area as part of an ACEC, impacts from recreation would be limited under Alternative A to protect relevant and important values of the ACEC. Alternative C does not include this area in an ACEC; therefore, Alternative C would result in more impacts from recreation than Alternative A. This would decrease wilderness characteristics, resulting in adverse impacts.

4.1.6.3.4.4. Special Designations

Alternative C does not designate the Whiskey Mountain ACEC and manages the area with standard stipulations which allow mineral and realty actions and includes less restrictive travel management decisions for the area, both of which would result in increased road densities, visual intrusions, unnatural sounds, evidence of human presence, and social crowding compared to Alternative A. These increases would result in an overall loss of wilderness characteristics in this area.

4.1.6.3.5. Alternative D

4.1.6.3.5.1. Program Management

Management under Alternative D is similar to Alternative B, with slightly less acreage (4,954 acres) managed as non-WSA land with wilderness characteristics. The boundary in this alternative is more contiguous with the Fitzpatrick Wilderness Area boundary which was accomplished by adjusting the portion of the Little Red Creek Complex managed as non-WSA land with wilderness characteristics to follow a primitive road that is also used as the boundary of the Fitzpatrick Wilderness Area.

4.1.6.3.5.2. Resources

Alternative D impacts to lands with wilderness characteristics from resources management would be the same as Alternative B. Air, water, soil, and riparian-wetland management limits surface disturbance which beneficially impacts wilderness. Wildlife management protects habitat from surface disturbance, disruptive activities, and closes the entire Dubois area to oil and gas leasing because of wildlife resources, particularly threatened and endangered species. These protections for other resources would beneficially impact the wilderness characteristics of the Little Red Creek Complex.

4.1.6.3.5.3. Resource Uses

Alternative D impacts to lands with wilderness characteristics from resource uses would be the same as Alternative B since realty and mineral actions are sharply curtailed or prohibited in the general Dubois area and the area around the Little Red Creek Complex. Both alternatives B and D would beneficially impact wilderness characteristics and limit or prohibit human intrusions.

4.1.6.3.5.4. Special Designations

Alternative D impacts to lands with wilderness characteristics from special designations would be the same as Alternative B, which is far more beneficial to wilderness characteristics than Alternative C and moderately more than Alternative A.

4.2. Mineral Resources

4.2.1. Locatable Minerals

Locatable minerals are minerals obtained on public lands by way of “locating” a mining claim. In many cases, such minerals are metallic in nature and because of the geologic environments in which they are generally found, locatable minerals are also referred to as “hard rock” minerals. Some metallic locatable minerals occur in placer deposits, like in sand and gravels near streams and rivers. Some nonmetallic minerals are locatable too, including bentonite and gypsum (BLM 2009b). Mill sites and tunnel sites can also be located on lands open to mineral entry (see 43 CFR Part 3832 Subparts C and D). The authority for exploiting locatable minerals is in the General Mining Law of 1872 (as amended), which allows for the location of lode and placer mining claims and includes a prescription for patents (see 43 CFR Part 3860; mill sites may also qualify for patent; no funds have been appropriated for the processing of patent applications since October 1, 1994). Whether a claim to a locatable mineral is entitled to a patent depends on such factors as quality, quantity, mineability, demand, and marketability. The law encourages claimants to initiate exploration and development, stating that “...all valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase...”

4.2.1.1. Summary of Impacts

Because of the legal prescriptions in the General Mining Law, the federal government has limited ability to manage where locatable minerals are obtained unless the BLM withdraws those lands from mineral development. Segregation from the mining law or a mineral withdrawal (both subject to valid existing rights; see more about valid existing rights in *Methods and Assumptions*) removes certain public lands from location and entry under the General Mining Law. Mineral withdrawals and issues related to protected resources would result in long-term adverse impacts to locatable mineral resources.

Over time, the method by which lands are made unavailable to locatable mineral activities has changed. Before the enactment of the FLPMA in 1976, a number of different processes were followed that resulted in the closure of lands to locatable mineral activities. There are existing pre-FLPMA withdrawals (technically identified as segregations) that do not expire. They were designated by Congress or other entities and are not within BLM authority to modify. Some are for cultural, historical, or recreation purposes and others are to meet the requirements of other entities such as the U.S. Department of Energy. These properties are unavailable for locatable mineral actions under all alternatives since they do not result from RMP decisions. The acreage associated with these pre-FLPMA withdrawals are not included in the analysis of areas that are open or closed to locatable mineral activities. Also common to all alternatives is the withdrawal for the protection of desert yellowhead (Yermo) habitat which is a threatened and endangered

species found only in the planning area. The pre-FLPMA and desert yellowhead withdrawals include 8,634 acres.

Under regulations in effect in 2010, RMPs identify lands for segregation. This is a different use of the word “segregation” that was in effect before passage of the FLPMA. Lands are segregated, or not available, for mineral entry for a period not to exceed two years while the BLM pursues the withdrawal action. The process following the RMP segregation involves additional public notice and opportunities for commenting and extensive additional Washington level review. A segregation of more than 5,000 acres requires Secretarial approval. Once in place, a withdrawal is effective for no more than 20 years and does not affect existing claims. Claims that expire during the 2-year segregation period or the 20-year withdrawal period become subject to the terms of the withdrawal and are no longer available for claims.

For clarity, the lands that are identified for mineral withdrawal pursual are described in this document as “withdrawn”. This nomenclature does not imply that the lands will be withdrawn on signing of the RMP Record of Decision (ROD). The actual withdrawal process is lengthy and the BLM may not be successful in having the lands withdrawn. However, in order to make it possible to compare the alternatives, the following analysis assumes that withdrawal will be achieved for the acres identified as “withdrawn”. To the extent that withdrawal is not achieved, then the impacts to resources described in Alternative C would occur.

Management actions related to wildlife protection that could adversely impact locatable minerals are actions that affect timing or result in delays to operators; these would be short-term impacts. For this planning effort, impacts would primarily be economic because, for example, there might be certain times of the year when surface-disturbing activities would not be allowed, or there might be times when exploration activity would not be allowed within a certain distance from a specific wildlife habitat. The BLM does not manage to avoid adverse economic impacts to project proponents, but manages on behalf of those resources under its mandate. While the BLM does not consider cost irrelevant in this or any other program, the BLM is not obligated to select the alternative that is most profitable to the applicant. FLPMA requires analysis of socioeconomic impacts to the local economy.

Finally, there are special status areas that impact locatable minerals which include the designation of ACECs, NWSRS-eligible waterway segments managed as suitable WSRs, areas designated as “closed” to cross-country travel (as defined in 43 CFR 8340.0-5), any lands or waters known to contain federally proposed or listed threatened or endangered species or their proposed or designated habitat (unless BLM allows for other action under a formal land use plan or threatened and endangered species recovery plan), and National Monument and National Conservation Areas administered by the BLM (43 CFR 3809.11). In these areas, disturbances associated with locatable mineral exploration or mining are allowed, but must be performed under a Plan of Operations, as defined under the 43 CFR Subpart 3809 Surface Management Regulations, without regard to the size of the disturbance. Because preparing a Plan of Operations expends time and money and potential mitigative prescriptions could make operations more expensive or time consuming, the impacts would be primarily short-term. Requiring a Plan of Operations is not considered to be an adverse environmental impact.

Table 4.14, “Acres of Subsurface Mineral Estate Closed to Locatable Minerals (Segregation and Withdrawals)” (p. 676) provides the acres of mineral estate currently withdrawn and proposed for withdrawal from locatable mineral entry. Through a variety of mechanisms that have changed over time, federal minerals can be unavailable to operation under different mining laws (BLM

2009b). Sometimes the mechanism is closure, sometimes segregation, and under current law, segregation while withdrawal is pursued. These mechanisms vary by type of mineral and mining law. For convenience, the phrase “closed to locatable minerals” is used to encompass the various mechanisms that are utilized to make the minerals unavailable. All alternatives have timing restrictions, including wildlife and travel management limits. The BLM generally applies these only to exploratory activities because once mining development begins, it is generally not feasible to seasonally limit a mining operation without interfering with a claimant's statutory right to mine. For ISR extraction of uranium, for example, stopping operations seasonally would likely cause complications to the mining process that could prevent full recovery of the uranium. In addition to lands formally withdrawn from mineral entry, when lands are sold or exchanged under the Small Tracts Act, Recreation and Public Purposes (R&PP) Act, 43 United States Code (U.S.C.) 1713 and 1716, the minerals reserved to the U.S. continue to be removed from operations of the mining laws unless a subsequent land use planning decision expressly restores the land to mineral entry (43 CFR 3809.2[a]).

The BLM expects that the historic (1989 through 2009) average within the planning area of 13.5 acres of short-term surface disturbance per year and 95 acres of long-term disturbance as a result of locatable mineral exploration and mining to continue under all alternatives. Although the acres of land closed to pursue locatable mineral entry withdrawal varies by alternative, that management action would not impact valid existing claims. Therefore, the BLM expects these claims will be developed in accordance with historic patterns. Although the historic pattern does not include the years of high levels of uranium development, it does include substantial amounts of uranium exploration. Actual mining could result, depending on unknown commodity pricing. At present, the Lander Field Office is evaluating one mine.

Table 4.14. Acres of Subsurface Mineral Estate Closed to Locatable Minerals (Segregation and Withdrawals)

Alternative A	Alternative B	Alternative C	Alternative D
23,114	1,632,605	0	449,068

Source: BLM 2012a

Alternatives A, B, and D would retain existing withdrawals including seeking renewal as the withdrawal period expires. Alternative C would allow existing renewals except for desert yellowhead to expire. Alternative B identifies the greatest amount of acres for new locatable mineral withdrawals (in accordance with the requirements necessary following RMP implementation), followed by Alternative D, then A and then C. Similarly, Alternative B also has the greatest amount of acres that have a requirement for a Plan of Operations (ACECs, WSRs, areas closed to motorized vehicle travel, proposed or designated threatened and endangered species habitat, and National Monuments and Conservation areas) followed by alternatives D, A, and C (Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45) and Table 2.5, “Comparative Summary of Areas of Critical Environmental Concern by Alternative” (p. 50)). Alternative C does not designate any ACECs or manage NWSRS-eligible waterway segments to maintain their suitability and 5,472 acres are closed to motorized vehicle travel (451 acres less than Alternative A). Over time, as the existing mineral withdrawals expire, even more lands will be available for locatable mineral development.

Note: the presence of mining claims is an indicator of interest in the locatable mineral estate. A claim that pre-dates a withdrawal or segregation may continue to be maintained. However, if the claimant files a 3809 notice or Plan of Operations after the date of withdrawal the BLM is obligated to prepare a mineral examination report in accordance with 43 CFR 3809.100(a); the

BLM may prepare such a report if the land has been segregated as per advice rendered in BLM Washington Office Instruction Memorandum (IM) 2010-088.

4.2.1.2. Methods and Assumptions

The region of analysis is the entire mineral estate under the jurisdiction of the Lander Field Office, including split-estate where the surface may be fee but federal minerals are reserved in the subsurface estate. The analysis conducted with respect to locatable minerals is primarily qualitative because of a lack of details and because of certain provisions of the mining law. First, a mining claimant has a statutory right to obtain locatable minerals. Second, other than proving certain activities conducted by a claimant meet the threshold of “unnecessary or undue degradation,” there are very few management actions that can be taken that materially affect when and where casual use, notice and Plan of Operations level operations pursuant to the 43 CFR Subpart 3809 regulations may take place on lands open to mineral entry.

Methods and assumptions used in this impact analysis include the following:

- Because of the statutory right to locate mining claims and explore for and develop locatable mineral resources, direct closures to locatable mineral activity can only occur through a mineral withdrawal or segregation (subject to valid existing rights).
- The use/occupancy regulations at 43 CFR 3715 and the surface management regulations at 43 CFR 3809 (outside WSAs) and 43 CFR 3802 (within WSAs), apply to all surface-disturbing activities for locatable minerals.
- Lands not formally withdrawn or segregated from mineral entry will be available for the location of claims and sites, exploration, and development as per the regulations at 43 CFR Subpart 3830 and 43 CFR Subpart 3809.
- The BLM generally approves a Plan of Operations and modifications thereto that meet all applicable statutory and regulatory requirements and would not cause unnecessary or undue degradation per 43 CFR 3809 and would not impair wilderness characteristics as per the 43 CFR 3802 regulations. The Authorized Officer may disapprove or withhold approval of a plan as per the provisions of 3809.411(d)(3).
- Locatable mineral operators may not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains or any historical or archeological site, structure, building, or object on federal lands. This and other performance standards that are found at 43 CFR 3809.420 apply to Notices and Plans of Operation filed on or after January 20, 2001 or modifications thereto. Failure to comply with any performance standard constitutes unnecessary or undue degradation.
- Notice-level activities (i.e., exploration that disturbs 5 acres or less or involves bulk sampling less than 1,000 tons) do not require approval from the BLM (i.e., they are not considered a federal action and also therefore require no NEPA analysis), but are still subject to the performance standards at §3809.420, including statutory restrictions due to cultural concerns (National Historic Preservation Act [NHPA]), the Endangered Species Act (ESA), and the requirement under FLPMA to prevent unnecessary or undue degradation of public lands.
- A Plan of Operations must be submitted and approved by the BLM for exploration causing more than 5 acres disturbance, the removal of bulk samples of 1,000 tons or more, or for surface-disturbing activities greater than casual use in special status areas such as designated ACECs, areas closed to cross-country vehicle use, etc.; see 43 CFR 3809.11(c).
- Withdrawals are discussed in context of a locatable mineral resource use because they would be or have been withdrawn from operations under the general mining law; i.e., location of claims and sites as well any level of operations under 43 CFR subpart 3809 – absent a

pre-existing claim are or would be precluded. Withdrawals may affect other land and mineral laws. Proposed withdrawals are processed as a lands and realty action pursuant to 43 CFR subpart 2310.

- Pre-FLPMA withdrawals issued pursuant to the provisions of the Pickett Act do not apply to metalliferous minerals (e.g., gold, silver, copper, lead, iron, uranium, etc.). Therefore these minerals are open to location unless a subsequent withdrawal closed the land to their location.
- Except for Alternative C, all existing pre-FLPMA mineral withdrawals would continue indefinitely.
- Locatable mineral activity in the planning area would continue at a level similar to what has transpired over the last 20 years (1989-2009).
- Known areas of precious gold mineralization are primarily located at South Pass, near Goat Mountain in the Rattlesnake Mountains, the Copper Mountains, and in the Granite Mountains at Tin Cup. Based on data available at the time of preparing the Mineral Occurrence and Development Potential Report (BLM 2009b), the occurrence potential for precious metals in the planning area is assigned a rating of M/D. The mineral potential classification system is based on the level of potential and the level of certainty of data supporting the possible existence of minerals. The system classifies level of potential as No (O), Low (L), Moderate (M), High (H), and Not Determined (ND). The system classifies level of certainty as A (lowest certainty), B, C, and D (highest certainty). See the Mineral Occurrence and Development Potential Report (BLM 2009b) or BLM Manual 3031, Energy and Mineral Resource Assessment for more information on the mineral potential classification system.
- Based on data available at the time of preparing the Mineral Occurrence and Development Potential Report (BLM 2009b), the occurrence potential for base metals deposits in the planning area is assigned a rating of L/C.
- Based on data available at the time of preparing the Mineral Occurrence and Development Potential Report (BLM 2009b), the occurrence potential for bentonite in the planning area is assigned a rating of M/C. This is based on the fact that the evidence existing thus far indicates some favorable geologic environments but little evidence to quantify how much is available and at what grade.
- Based on data available at the time of preparing the Mineral Occurrence and Development Potential Report (BLM 2009b), the occurrence potential for uranium in the planning area is assigned a rating of H/D. The development potential for uranium is assigned a rating of moderate to high, with a tendency to a high rating if market prices remain favorable.
- Due to low interest, and low occurrence potential, gemstones and other lapidary material are not evaluated. Although historical interest in jade in the planning area has been high, no current demand has been identified (BLM 2009b).
- Although discoveries of other valuable deposits of locatable minerals may occur during the planning period, principally uranium and to a lesser degree, gold and bentonite (in that order) will remain the dominant locatable minerals of interest with potential commercial mining in the planning area. See the Mineral Occurrence and Development Potential Report (BLM 2009b) for more information on the occurrence and development potential for locatable minerals within the planning area.
- However, RMP decisions do not withdraw lands from the operation of the General Mining Law; additional processes are required that include analysis of the minerals occurring and other factors. This process is not within the control of the Lander Field Office and may not result in withdrawal of the lands. For purposes of analysis, all alternatives assume that lands closed to pursue withdrawal under that alternative, if any, will result in withdrawal.
- As indicated above, the designation of ROW corridors helps to facilitate co-location of new ROWs. While realty avoidance and exclusion areas adversely impact mineral development,

designated corridors do not facilitate mineral development if operator location of needed pipelines and powerlines is limited.

If there is no identifiable impact from a particular resource, resource use or special designation, the topic is not discussed.

4.2.1.3. Detailed Analysis of Alternatives

4.2.1.3.1. Impacts Common to All Alternatives

Program Management

All alternatives include restrictions on authorized activities, but the degree of the restrictions varies by alternative. However, because of rights granted to those who stake locatable minerals and comply with the requirements of the General Mining Law and federal regulations, many of these restrictions do not apply to those claims. All alternatives apply the requirements of the cultural resources program and environmental protections, including the CWA, the CAA, and the ESA, to locatable minerals, and because they do not vary by alternative, they are not further analyzed as an adverse impact to locatable minerals.

Under all alternatives, surface-disturbing activities related to locatable mineral prospecting and development are subject to site-specific analysis before approval. The BLM is obligated to prevent undue or unnecessary degradation (43 CFR 3809.1[a]), but this assessment can be done only at a site-specific level, not in a land use plan. Limitations in the land use plan other than withdrawals do not apply to casual use (nonmechanized mining activities). 43 CFR 3809.420 identifies performance standards for locatable mineral activity under notices and Plans of Operation, but these standards are essentially BMPs designed to help operators avoid unnecessary or undue degradation, which may add cost and time to a claimant's operation and do not vary by alternative.

Mining claimants or operators must file a Plan of Operations and obtain BLM approval before beginning operations that constitute more than casual use in special status areas, or for exploration causing more than 5 acres of disturbance or the removal of bulk samples of 1,000 tons or more. The requirement of a Plan of Operations is not considered an adverse impact because such plans do not preclude development.

Limitations on surface disturbance to protect other resources, vary by alternative and are applied, to a limited extent to locatable mineral exploration. Mitigation and site-specific reclamation measures could prescribe certain activities or mitigation that could reduce the economic viability of a mining proposal (e.g., the application of standard mitigation guidelines such as slope restrictions and riparian-wetland setbacks, and timing restrictions to protect BLM-sensitive wildlife species). These limitations do not preclude development if needed to fully develop the mineral, which would be part of the analysis in the Plan of Operations. While the limitations are applied to exploration with a potential increase in cost, the limitations do not adversely impact exploration because it is likely that the BLM would allow the exploration despite the surface disturbance limitations if the applicant could establish the necessity for that entry.

Resources

Management to protect riparian-wetlands varies by alternative. Under Alternative B, surface-disturbing activities are prohibited within 1,320 feet of surface water, riparian-wetland

areas, playas, and 100-year floodplains, where mapped; under alternatives A and C these activities require a 500-foot setback. However, there is little, if any, resulting difference in impacts to locatable minerals as a result of these differences because they do not apply to locatable minerals except in very rare cases when it is determined that without such a restriction, unnecessary or undue degradation would result.

Wildlife restrictions on development of locatable minerals can adversely impact exploration and development activities when seasonal timing limitations apply. The BLM anticipates that the intensity of impacts would vary by alternative and be proportional to the actual demand. It follows that adverse impacts to locatable minerals are potentially greater when there are restrictions on areas with high occurrence or potential than when there are restrictions in areas of moderate to low occurrence or potential.

All alternatives maintain the minerals withdrawal to protect critical habitat for desert yellowhead, a threatened and endangered plant species. Although this would normally adversely impact the minerals program, it would result in little if any adverse impact because of the size and location of the withdrawal. Because the desert yellowhead is unique, the BLM determined that it would be unreasonable for any alternative to consider allowing the withdrawal for critical habitat to expire.

Timing limitations related to wildlife generally apply to exploration activities only and not mining development, although there could be certain operations under a mining plan that can be deferred to a time when there are fewer adverse impacts to other resources or uses. There could be a cost associated with the prohibition of certain activities (e.g., surface-disturbing or disruptive) during certain times of year due to unavailability of workforce, higher maintenance costs, or inclement weather, which would be proportional to the relative amounts or surface under those stipulations. For example, delaying a drilling exploration program in greater sage-grouse habitat until after greater sage-grouse brood-rearing season could incur additional costs to the operator but at another time would still allow an operator to gather the data required to evaluate a potential resource while still mitigating the impacts of the disturbance. Conversely, drilling through the brooding season could be deemed unnecessary or undue.

Such timing limitations, would not apply to the mining phase because the efficient extraction of the resource could require the operator to mine through habitat. For a variety of reasons, the mine would likely operate 24 hours a day, 365 days a year, and as stated earlier, the extraction of the resource is not unnecessary or undue.

Resource Uses

No alternative precludes development unless the level of disturbance rises to the level of unnecessary or undue degradation regardless of the acreage affected. While mining a resource is not generally considered unnecessary or undue, the particular methods used and the failure to adhere to certain performance standards in exploration and mining phases could preclude development if deemed unnecessary or undue.

Management actions common to all alternatives that adversely impact locatable minerals include continuing to manage all pre-FLPMA withdrawals (at the time called “segregations,” although that term now means something else) in the locatable minerals program. The BLM does not have the authority to modify these withdrawals; therefore, the withdrawals do not vary by alternative and are not further addressed here.

Withdrawals are summarized in Table 4.15, “Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values” (p. 681) below. All alternatives withdraw some portion of the South Pass area, East Fork, Warm Springs, Green Mountain recreation sites, and Castle Gardens from locatable mineral entry based on pre-FLPMA actions. Although an adverse impact to locatable minerals, this management does not vary by alternative because the withdrawals were established by Congressional action and cannot be changed in the land use plan. Alternative B expands the areas withdrawn. There is little mineral occurrence in these areas except for in South Pass because there is a low coincidence of mineral occurrences with existing withdrawals and withdrawals recognize and preserve valid existing rights.

Table 4.15. Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values

Purpose	Alternative A	Alternative B	Alternative C	Alternative D
Habitat protection	21,862	1,482,580	0	449,068
Cultural or paleontological value protection	927	563,640	0	352,429
Recreation or visual values and/or visitor protection	355	169,774	0	449,068

Source: BLM 2012a

Beneficial impacts to locatable minerals result from management actions that open access to federal locatable minerals, including allowing withdrawals or segregations to expire without seeking new withdrawals. Therefore, alternatives that do not extend expiring withdrawals or segregations would be more beneficial to locatable minerals than those that renew those withdrawals, which adversely impact locatable minerals.

Trails and travel management decisions can add costs to development by requiring a Plan of Operations if the area is closed to motorized vehicles (and claim staking would need to be done on foot unless an administrative exception were authorized). The route of access across public lands (that are open to mineral entry) to areas of locatable mineral exploration or mining can be addressed by the operator in their Notice or Plan of Operations (public lands being crossed must be open to mineral entry and the acreage of constructed-improved access is included in the total project acreage) or be included in an application for a ROW. The BLM can, however, designate access routes to avoid unnecessary or undue degradation. Table 4.16, “Areas and Acreage Closed to Motorized Travel” (p. 681) shows areas requiring a Plan of Operations because of closure to motor vehicle travel. Timing limitations related to travel management, generally apply to exploration activities only and not mining development for reasons described earlier for wildlife timing restrictions.

Table 4.16. Areas and Acreage Closed to Motorized Travel

Purpose and area	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Wildlife: Whiskey Mountain	0	6,010	0	0
Soils/viewshed: Dubois Badlands	4,903	4,903	0	4,761
Cultural: Castle Garden	78	78	0	78
Wilderness: Copper Mountain, Dubois Badlands, Lankin Dome, Miller Spring, Savage Peak, Split Rock, Sweetwater Canyon, Whiskey Mountain	0	55,338	0	12,016

Purpose and area	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Recreation: The Bus @ Baldwin Creek, Dubois Mill, Johnny Behind the Rocks/Blue Ridge, Sinks Canyon climbing area	0	7,500	0	5,195
Lands with wilderness characteristics: Little Red Creek Complex	0	5,490	0	4,954
Wild and scenic designations: Baldwin Creek Canyon	0	2,349	0	2,349
Wild and scenic designations: Sweetwater Canyon	0	9,135	0	0
Source: BLM 2012a				
WSA Wilderness Study Area				

Special Designations

Under all alternatives, WSA acres and prescriptions are the same and not further analyzed in this document, although WSA management results in adverse impacts to locatable minerals. The acres of land designated as ACECs varies by alternative, with Alternative B having the most acres designated and Alternative C designating no ACECs. ACEC designation would not adversely impact the locatable minerals program because designation only results in the need for a Plan of Operations unless the ACEC specifically withdraws a portion from locatable entry.

4.2.1.3.2. Alternative A

4.2.1.3.2.1. Program Management

Alternative A identifies 23,114 acres as withdrawn (post-FLPMA) from locatable mineral entry and 2,777,334 acres of BLM-administered mineral estate as open to location. Alternative A requires Plans of Operation on just under 100,000 acres because of ACEC designation or motorized-vehicle closures. Under this alternative, existing withdrawals are renewed but no new withdrawals are planned.

4.2.1.3.2.2. Resources

Impacts to locatable minerals from management restrictions to protect soil, water, and riparian-wetland resources apply primarily to the exploratory phase. As discussed above, this would result in a very small adverse impact to mine development unless development reaches the level of undue or unnecessary degradation. Operations conducted pursuant to the 43 CFR 3809 – surface management regulations can be precluded only if unnecessary or undue degradation would result. As cited before, operating conditions applicable to leasable and salable minerals do not necessarily apply to locatable mineral operations unless they rise to the level of unnecessary or undue degradation or the operator on their own initiative includes such conditions when submitting a notice or Plan of Operations. Alternative A generally requires avoiding soil-disturbing activities in areas with LRP soils, but this would not limit locatable mineral development if necessary to extract the mineral.

Lands with wilderness characteristics are not specifically managed to preserve their wilderness characteristics, so there would be no adverse impact to locatable minerals.

The greatest adverse impact of resource management on locatable mineral activities comes from decisions to withdraw areas to protect wildlife, special status species, cultural resources, or visual resources. However, the actual adverse impact to locatable minerals would be very minor because there is little overlap between the withdrawal areas and the areas of high potential for locatable minerals (BLM 2009b). However, the Lime Kiln Gulch area in the Whiskey Mountain withdrawal for bighorn sheep reportedly contained some potential for mineral activity, and 80 acres of mineral estate in that area was not withdrawn at the time of the original withdrawal.

Heritage/cultural/historic withdrawals under Alternative A are limited to Martin's Cove.

4.2.1.3.2.3. Resource Uses

The only recreation-related withdrawals under Alternative A are those related to NHT bicentennial sites. Travel management decisions that limit closed areas to motorized vehicle travel trigger a requirement for a Plan of Operations. See the analysis under *Impacts Common to All Alternatives*.

4.2.1.3.2.4. Special Designations

Alternative A Congressionally Designated Trails do not adversely impact locatable mineral entry because no portion of the NHTs are withdrawn (except for a few sites that are common to all). Access to locatable minerals might be limited in some areas but would not be allowed to restrict development.

Except for the Whiskey Mountain and East Fork ACECs, ACEC designations under Alternative A only trigger the requirement for a Plan of Operations and do not adversely impact locatable minerals, although additional operator costs and time are required for surface-disturbing activities greater than casual use. See Table 4.15, "Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values" (p. 681) for those wildlife related withdrawals.

Alternative A management of NWSRS-eligible Baldwin Creek and Sweetwater River units is determined by other special designations; the Baldwin Creek unit is part of the Lander ACEC, requiring Plans of Operations, and the Sweetwater River unit is managed as part of the Sweetwater River WSA.

4.2.1.3.3. Alternative B

4.2.1.3.3.1. Program Management

Alternative B would result in the most potential adverse impacts to locatable minerals compared to other alternatives because it withdraws the most areas from locatable mineral entry. There are 68 times more acres in the planning area withdrawn from mineral activity under Alternative B compared to Alternative A, but 278,906 of those acres are in areas of high potential. Depending on where current surface-disturbing activities intersect with withdrawals, surface disturbance as a result of locatable mineral development under Alternative B is expected to be less compared to Alternative A, although not substantially less because withdrawals are subject to valid claims. As claims within a withdrawal that are not maintained annually as per § 3830 are declared abandoned or void, withdrawals under Alternative B could result in increasingly adverse impacts to locatable minerals.

4.2.1.3.3.2. Resources

Alternative B manages the Little Red Creek Complex as non-WSA land with wilderness characteristics and closes the area to motorized vehicles, which requires a Plan of Operations for surface-disturbing activities greater than casual use. The Little Red Creek Complex in Dubois closes approximately 5,490 acres under Alternative B.

Special Designations addresses Alternative B mineral withdrawals for the benefit of wildlife because such withdrawals occur only in proposed ACECs; however, Alternative B management outside of the sage-grouse ACEC prohibits surface disturbance over a larger area than Alternative A. This protection would not preclude locatable mineral entry if necessary to obtain the mineral.

Alternative B identifies 562,713 additional acres for withdrawal due to heritage/cultural/historic protections compared to Alternative A. Additional withdrawals under this alternative are due to the expansion of the NHT withdrawals, and the proposed Beaver Rim Natural National Landmark (1,120 acres), Bison Basin Natural National Landmark (1,280 acres), and Warm Springs Canyon Flume site (834 acres). *Special Designations* addresses additional withdrawals for the protection of historic resources under Alternative B. Withdrawal of lands for mineral entry is a severe long-term adverse impact to locatable minerals; however, there is little overlap of high potential occurrence in these locations.

4.2.1.3.3.3. Resource Uses

In addition to the withdrawals for recreation common to all alternatives, Alternative B withdraws 5,594 acres in the Johnny Behind the Rocks area. This could be a substantial adverse impact to locatable minerals because of high bentonite potential in the withdrawn area. Trails and travel management decisions to support other resource values (e.g., WSAs and WSRs) can increase the cost or the processing time for surface-disturbing activities greater than casual use, but would not preclude locatable mineral activity (see Table 4.16, “Areas and Acreage Closed to Motorized Travel” (p. 681)). Alternative B expands the area closed to motorized vehicle use around WSAs to more effectively manage travel, which would increase the cost and timing of small mining disturbances; however, there is little mineral potential in these expanded areas.

Management closures to motorized travel for recreation values trigger a Plan of Operations for the Dubois Mill site (608 acres). Additional areas are closed to motorized vehicles, but are either already under a Plan of Operations requirement due to ACEC designation or are withdrawn from locatable mineral entry.

4.2.1.3.3.4. Special Designations

Special designations under Alternative B result in more adverse impacts to locatable minerals than under any other alternative. All withdrawals identified under Alternative A are maintained under Alternative B and substantial new areas are closed to pursue mineral entry withdrawal (1,632,605 acres). The largest closure is to protect the setting of the Congressionally Designated Trails, but additional areas to protect other cultural resources, such as Cedar Ridge and Castle Gardens, would also preclude mineral location. In addition, Alternative B designates 1,246,791 acres as an ACEC for the protection of greater sage-grouse and segregates (closes) the area to pursue withdrawal. A substantial portion of the greater sage-grouse ACEC overlaps other ACEC withdrawals; ACEC withdrawals under Alternative B total 1,492,990 acres.

There is more land withdrawn in East Fork for the protection of elk under Alternative B than under Alternative A, which would result in more adverse impacts to locatable minerals. Because there is little commercial potential in the expanded area, the actual impact of this expansion would not be likely to result in anything more than minor adverse impacts. However, expansion of the South Pass Historic Mining Area ACEC also includes a withdrawal of the entire expanded ACEC, including areas with potential for gold. While the expansion would not affect existing rights (and much of the area is claimed), the withdrawal would increase adverse impacts as claims within a withdrawal that are not maintained annually as per § 3830 are declared abandoned or void. However, actual impacts to the locatable minerals program are not clear because large-scale gold operations have not been developed in the past, even with historically high commodity prices. The more likely impact of management under Alternative B is to small operators who participate in small-scale gold mining, although those with existing claims would not be affected. Claims can be transferred, so closing the area could benefit existing claimants by making their claims the only ones available in the area.

NWSRS-eligible waterway segments managed as suitable for WSR designation under Alternative B include 31.8 lotic miles with ¼ mile on each side. Alternative B withdraws these segments; Alternative A does not; therefore, Alternative B has more adverse impacts to locatable minerals.

4.2.1.3.4. Alternative C

4.2.1.3.4.1. Program Management

Alternative C is less restrictive than alternatives A and B and has the fewest acres withdrawn from mineral entry and also the fewest special status areas where a Plan of Operations is required for explorations greater than casual use that disturb less than 5 acres.

Alternative C allows all pre-FLPMA existing withdrawals except the withdrawal for desert yellowhead to expire (post-FLPMA mineral withdrawals expire after 20 years) and does not manage any areas as ACECs. Under Alternative C, 2,800,467 acres of surface estate are open to mineral entry (or would become open over time), almost all of the total acreage available, more than any other alternative.

4.2.1.3.4.2. Resources

Alternative C includes the same restrictions on surface disturbance for the protection of soil, slope, riparian-wetland areas, and greater sage-grouse as Alternative A and substantially fewer than Alternative B. These restrictions would not preclude mining development and might impact only exploration or other activities short of actual mining. As noted above, operations conducted pursuant to the 43 CFR 3809 – surface management regulations can be precluded only if unnecessary or undue degradation would result. Operating conditions applicable to leasable and salable minerals do not necessarily apply to locatable mineral operations unless they rise to the level of unnecessary or undue degradation or the operator on their own initiative includes such when submitting a notice or Plan of Operation. Alternative C does not manage lands with wilderness characteristics; therefore, there is no travel limitation for the Little Red Creek Complex in Dubois and thus no requirement for a Plan of Operations.

Alternative C includes the fewest restrictions on locatable minerals for the benefit of wildlife of any of the alternatives. Because the locatable mineral management for wildlife is primarily in

ACECs, this management is analyzed under *Special Designations* below. Alternative C includes the same protections for greater sage-grouse as Alternative A and fewer than Alternative B, but the impact of this management is primarily in time and cost of processing applications rather than constituting adverse impacts to the locatable mineral program. There could also be a cost associated with the prohibition of certain activities (e.g., surface-disturbing or disruptive) during certain times of year due to unavailability of workforce, higher maintenance costs, or inclement weather, which would be proportional to the relative amounts of surface under those stipulations.

The Alternative C protections for greater sage-grouse are the same as Alternative A and much less restrictive than Alternative B.

Protections for cultural/historic resources are the least adverse to locatable minerals under Alternative C because no new areas are withdrawn for the protection of cultural/historic resources and existing withdrawals will not be renewed if they expire over time; see Table 4.15, “Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values” (p. 681) for a comparison. Because the areas that will become open to locatable minerals under Alternative C (that remain withdrawn under Alternative A) have low potential for locatable minerals, it is not likely that impacts under the two alternatives would be substantially different. Alternative C would result in substantially more beneficial impacts to locatable minerals than Alternative B, including in areas of moderate to high potential for locatable minerals, such as in the South Pass area for gold and other areas for uranium. Potential adverse impacts to locatable minerals development would be much less in the South Pass area under Alternative C than under Alternative B because the expanded withdrawals under Alternative B are expected to result in substantial impacts to locatable minerals activities beyond casual use as every dropped mining claim would be subsequently withdrawn from mineral entry, and over time, the entire area could be withdrawn.

4.2.1.3.4.3. Resource Uses

Recreation management under Alternative C would result in the same impacts to locatable minerals as Alternative A and fewer adverse impacts than Alternative B. The biggest difference is that Alternative B withdraws 3,897 acres near Johnny Behind the Rocks for recreation use and Alternative C does not. This area has high potential for bentonite. Alternative C has no Recreation Management Zones (RMZs) and no areas closed to motorized travel; therefore, there would be no additional cost or time to claimants from requiring a Plan of Operations for operations greater than casual use that would occur under Alternative B.

4.2.1.3.4.4. Special Designations

Alternative C does not designate any ACECs or manage NWSRS-eligible segments to maintain their suitability; therefore, there would be no adverse impacts to locatable minerals from these designations. WSA management as it relates to locatable minerals is uniform across the alternatives. Management of Congressionally Designated Trails under Alternative C results in the fewest adverse impacts of the alternatives because Alternative C does not manage these trails as ACECs and there is no requirement for a Plan of Operations for any operations greater than casual use in special status areas. No withdrawals are associated with the trails (except for the pre-FLPMA withdrawals that do not vary by alternative). NHPA protections would continue to be applied within ¼ mile of the NHTs, but these protections would result in few adverse impacts to locatable minerals.

Alternative C allows post-FLPMA withdrawals that are part of ACEC management to expire, which would be substantially less adverse to locatable minerals than Alternative B and somewhat less adverse than Alternative A. As identified in the *Cultural Resources* section, this difference would be particularly important in areas with high potential for uranium, the South Pass area, and in areas in the Government Draw/Upper Sweetwater Sage-Grouse ACEC designated under Alternative B.

4.2.1.3.5. Alternative D

4.2.1.3.5.1. Program Management

Alternative D identifies 449,068 acres as withdrawn (post-FLPMA) from locatable mineral entry and 2,351,399 acres of BLM-administered mineral estate as open to location. Alternative D requires Plans of Operation on approximately 275,000 acres because of ACEC designation or motorized-vehicle closures. Under this alternative, existing withdrawals are renewed and five new withdrawals are identified: Johnny Behind the Rocks for recreation; Cedar Ridge for cultural-Native American concerns; additional lands in East Fork for wildlife; the ruts and swales of the NHTs and approximately a 10-foot buffer on each side; and the Lander Front-Hudson-Atlantic City area for overlapping important values, including big game winter and crucial winter habitat, greater sage-grouse, cultural resources, and viewsheds (Johnny Behind the Rocks is within this larger withdrawal, but its values are focused on nonmotorized recreation for local populations).

4.2.1.3.5.2. Resources

Under Alternative D, management to protect soils would result in similar adverse impacts as alternatives A and C, with slightly more adverse impacts on slopes between 15 and 24 percent, where conditions over and above standard stipulations could be applied. These restrictions could require more mitigation or relocation of facilities but would not preclude locatable mineral development. Impacts to locatable minerals from management restrictions to protect soil, water, and riparian-wetland resources would apply primarily to the exploratory phase. This would result in few adverse impacts to mine development, unless development reached the level of undue or unnecessary degradation. As noted above, operations conducted pursuant to the 43 CFR 3809 surface management regulations can be precluded only if unnecessary or undue degradation would result. Although lands in the Little Red Creek Complex are managed as non-WSA lands with wilderness characteristics under Alternative D, the lands are not withdrawn and there would be no adverse impacts to locatable minerals.

The most adverse impact to locatable mineral activities from resource management would result from decisions to withdraw areas to protect wildlife, special status species, cultural resources, or visual resources. However, the actual adverse impact to locatable minerals would be minor because there is little overlap of the withdrawal areas with known mineral occurrence, except in the Twin Creek area where bentonite is present. The lands containing bentonite have been claimed in a few places; however, valid claims are not affected by the withdrawal. The economic consequences of this withdrawal on taxes and severance payments would be limited because of its relatively poor quality for commercial production, and would be offset by the increase in value to habitat and private property resulting from the withdrawal. In some places, such as the South Pass area, there has been gold mining in the past and recreational panning is currently

occurring. Identified resources in the area are claimed and would not be adversely impacted by the withdrawal.

Alternative D would result in the same adverse impacts to locatable minerals from protections of potential sole-source aquifers and groundwater recharge areas as Alternative B because surface occupancy is not allowed. Although Alternative D includes the same management to protect water quality as Alternative A (closing floodplains and riparian-wetland areas to surface occupancy), at most this would limit exploration and not development if necessary to obtain the mineral.

In addition to the adverse impacts to locatable minerals for the protection of wildlife common to all alternatives, Alternative D, like Alternative A, avoids roads in big game crucial winter range and parturition areas. This would result in a less adverse impacts than Alternative B's more restrictive approach to road building, but moderately more adverse than Alternative C. Under no alternative would road building required for locatable minerals preclude mining activity, but roads would be limited to the minimum necessary. Similarly, Required Design Features would require mining operations to limit surface disturbance as much as possible, but would not preclude development. Limitations on activities from a Notice in Core Area during March 15 to June 30 would be a moderate delay to exploration, but would not unduly restrict activities.

Alternative D includes the fewest restrictions on the use of chemical vegetation treatment in sensitive plant populations. However, this would not result in a beneficial impact to locatable minerals; surface mining in desert yellowhead critical habitat is not allowed under any alternative because the mapped locations are withdrawn.

Management for protection of greater sage-grouse under Alternative D results in a less adverse impact to locatable mineral exploration than Alternative B, but substantially more than alternatives A and C. Like Alternative B, Alternative D closes areas within 0.6 mile of greater sage-grouse leks to surface disturbance but locatable mineral development is not subject to this limitation by the BLM. (See *Cumulative Impacts to Greater Sage-Grouse from Management Actions* in the *Cumulative Impacts* section for constraints on locatable mineral activities that are imposed by the State of Wyoming.) Alternative D also places fewer restrictions on the height of objects in Core Area than Alternative B. The Alternative D determination that exploration activities in Core Area during seasonal timing restrictions for protection of greater sage-grouse nesting and early brood-rearing habitat would constitute unnecessary degradation would adversely impact the locatable mineral program, but only from a timing perspective, with perhaps increased operator cost as a consequence, but would not preclude development. The limitation would have the most impact in the areas containing uranium south of Jeffrey City to Green Mountain that are in Core Area; most areas with uranium potential are outside Core Area because of habitat loss related to earlier mining activities.

Management of reptile habitat under Alternative D would result in slightly more adverse impacts to locatable minerals than Alternative A or C and substantially fewer than Alternative B. Locatable mineral potential has not been mapped for reptile habitat.

Lands with important wildlife habitat and other resources, including cultural and paleontological values, historic trails, viewsheds, and other important resources, are withdrawn from locatable mineral entry. These withdrawals constitute less than 30 percent of the area withdrawn under Alternative B. However, an acreage comparison is not an indicator of impacts, because Alternative D would not withdraw areas with moderate to high potential for uranium, while these areas would be withdrawn under Alternative B. The adverse impacts to locatable minerals

under Alternative D are more similar to impacts on locatable mineral entry under Alternative A than under Alternative B.

Alternative D management for riparian-wetland protection has the same adverse impacts to locatable mineral exploration as alternatives A and C. This would be much less adverse than Alternative B, which closes 125,403 more acres. Alternative C riparian-wetland management results in the least potential adverse impacts to locatable minerals, but no alternative precludes mining activity required to extract the mineral resource although exploration could be limited.

VRM could adversely impact locatable mineral development that does not meet VRM requirements on a site-specific basis. Alternative D manages 6,410 acres with uranium potential as VRM Class I and Class II, which would make development more difficult because of additional stipulations to manage visual intrusions. This would be similar to the impact under Alternative B and slightly more adverse than the impact under Alternative A. Alternatives A, B, and D result in substantially more adverse impacts than Alternative C, which manages 3,630 acres with uranium potential as VRM Class IV.

4.2.1.3.5.3. Resource Uses

Although Alternative D (and Alternative B) closes more recreation and interpretive sites than alternatives A and C, these sites are not identified as having either gold or uranium potential; therefore, additional adverse impacts to the development of these resources would not be expected. Under Alternative D, the Johnny Behind the Rocks area is withdrawn from mineral entry for recreational use; however, this area is contained in the larger resource withdrawal discussed above. This would result in more potential adverse impacts because of bentonite occurrence in the area. However, the degree of the adverse impact depends on which existing claims continue to be held; where claims within a withdrawal that are not maintained annually as per § 3830 are declared abandoned or void, potential impacts would likely increase. Whether the bentonite resource in this area is of sufficient quality for commercial development is largely unknown; therefore, the economic impact cannot be analyzed. Offsetting the economic losses associated with precluding bentonite mining are the gains in economic and social welfare benefits associated with supporting recreational use, which has been local in nature and perhaps is increasing in use by non-local residents; see the Recreation section of Chapter 3.

ROW management under Alternative D is less adverse to the locatable mineral program than Alternative B because fewer restrictions are placed on ROWs and more designated corridors are provided. Less restrictive ROW management results in fewer adverse impacts to mining because allowing transportation, utilities, and other infrastructure decreases the cost of development and facilitates exploration. It is not possible to quantify these benefits because they depend on the development of ROWs rather than the management that would allow the ROWs. Alternative D is likely to be more adverse than Alternative C over time, because that alternative does not have the extent of ROW avoidance and exclusion areas contained in Alternative D. The area where ROW management is most likely to have adverse impacts to locatable mining is in the Jeffrey City area, where there are uranium potential and ROW restrictions (for the viewshed and setting of the NTMC). However, because Alternative D has designated corridors through the area in several locations, the likely impact of the limits on ROWs would be moderate. In no event can realty management preclude the development of a claim.

4.2.1.3.5.4. Special Designations

Alternative D Congressionally Designated Trails management in the NTMC does not adversely impact locatable minerals except to the extent that VRM may adversely impact certain exploratory activity by restricting disturbances. While the ruts and swales are withdrawn, this does not adversely impact locatable minerals because there is no mineral potential most of the NTMC. The portion of the NTMC that has moderate to high potential for locatable minerals is part of the resource protection withdrawal described above. However, as indicated above, the area with potential is extensively claimed, which limits the adverse impacts. Alternative D is therefore more similar in its adverse impacts to locatable minerals to Alternative A than Alternative B. Certain VRM stipulations could be developed, but VRM would not preclude mineral extraction itself.

Alternative D management of ACECs and the areas proposed as ACECs under other alternatives would result in far fewer adverse impacts to locatable minerals than management under Alternative B, and is more like Alternative A in its impacts, because the ACEC requirement for a Plan of Operations would not preclude development. The only withdrawals associated with ACECs are in areas with little to no locatable mineral potential in the Dubois area, and therefore would have unmeasurable adverse impacts.

Baldwin Creek and Warm Springs Creek segments that are suitable for inclusion in the NWSRS are withdrawn for other values. The Sweetwater River segment is not withdrawn for other values, so its management as suitable for inclusion in the NWSRS does not adversely impact the locatable minerals program.

4.2.2. Leasable Minerals – Coal

The BLM does not anticipate any reasonable foreseeable coal exploration, leasing, or development during the planning cycle. If the BLM receives an application for a federal coal lease, it will require an appropriate land use and environmental analysis, including a coal screening process, to determine whether the area(s) proposed for leasing are acceptable for further leasing consideration, as defined in 43 CFR 3420.1-8, after application of the unsuitability criteria, multiple use conflict, and surface owner consultation coal screens in 43 CFR 3420.1-4. If the BLM determines that public lands are acceptable for further consideration for coal leasing, it will amend the land use plan as necessary. The BLM accepts federal coal lease applications only for federal coal lands with development potential identified as suitable for further leasing consideration after application of the coal screens and unsuitability criteria. Therefore, impacts to coal resources from the management of other resources are not analyzed.

If an application for a lease (for coal, unconventional oil such as shale oil-tar sands, or otherwise) for a mineral activity that is not fully analyzed is received, it would be processed in the manner described in Section 1.5 of the NEPA Handbook (H-1790-1). The process requires a review of the plan direction, including the broad programmatic goals and objectives. However, Section 1.5 contemplates two outcomes that would allow the lease to be approved without an RMP amendment: (1) where the proposed action is not inconsistent with the plan or (2) where the proposal can be modified to be consistent. The analysis in the RMP is predicated on coal, unconventional oil, or “other” mineral development not occurring. The analysis of impacts from mineral development, particularly with regard to the cumulative effects of all disturbance, cannot properly be characterized if new development not considered occurs. Therefore, a lease or application for a mineral development of a type not analyzed here would be evaluated as either

warranted so as to be analyzed in an Environmental Impact Statement (EIS) to amend the RMP or not warranted for further consideration through an RMP amendment.

4.2.3. Leasable Minerals – Geothermal

Lands in the planning area have been classified as having low, very low, and negligible potential for geothermal development. Because of current policy direction guiding the development of renewable energy resources on public lands, there could be increased interest in geothermal exploration and development in the planning area over the next 10 to 20 years, particularly as co-located with deep oil and gas wells. Additional information and related studies on geothermal resources and development potential in the planning area can be found in the RFD Scenario for Geothermal Development, Lander Field Office Planning Area (BLM 2009d).

The impacts described in the *Leasable Minerals – Oil and Gas* section are the same as for geothermal exploration and development. In addition, adverse impacts to geothermal resources result from management of other resources that specifically limit or prohibit the use of geothermal resources. Beneficial impacts result from management that maintains or increases public use and access to geothermal resources.

Management of geothermal leasing on split-estate lands (federal mineral ownership and private surface ownership) will not limit or prohibit the use of warm-water or normal-temperature geothermal systems for non-utility-grade home heating or other applications.

4.2.3.1. Summary of Impacts

The primary impacts to geothermal exploration and development result from managing areas as closed, or open with moderate or major constraints. The area closed to leasable oil and gas exploration and development, and therefore leasable geothermal exploration and development, is largest under Alternative B, followed by alternatives D, A, and C. Therefore, adverse impacts to geothermal exploration and development would be the greatest under Alternative B, as identified in the *Leasable Minerals – Oil and Gas* section.

4.2.3.2. Methods and Assumptions

The analysis in this section is based on the following assumptions:

- BLM-administered land in the planning area that is open to oil and gas leasing is open to geothermal leasing, subject to appropriate mitigation developed through use of the mitigation guidelines described in the *Leasable Minerals – Oil and Gas* section.
- Unless otherwise noted, lands identified as closed for oil and gas leasing are closed for geothermal leasing. Scoping comments identified the possibility that geothermal potential exists in the Dubois area. Because of the types of resource values in Dubois, including special status species, the area would still be closed to geothermal leasing.
- There is minimal interest in development of geothermal resources during the planning period (BLM 2009d) and no well count and surface disturbance projections by alternative have been analyzed.
- No geothermal development has been identified in the RFD Scenario for Geothermal Resources as having more than negligible probability. In that context, the most likely type of geothermal use is from cogeneration as a by-product of oil and gas operations. Therefore, geothermal use would be considered a beneficial use of the oil and gas lease and would not

require a geothermal lease. Any such use would be site specific and is not further analyzed in this document.

4.2.3.3. Detailed Analysis of Alternatives

4.2.3.3.1. Impacts Common to All Alternatives

Management and restrictions for geothermal resources are the same as those for oil and gas resources. Areas open to oil and gas leasing are open to geothermal leasing, and areas closed to oil and gas leasing are closed to geothermal leasing. The units of the National Landscape Conservation System (NLCS), including WSAs, Congressionally Designated Trails, and WSRs, were closed by the 2008 Programmatic Geothermal ROD, which otherwise opened the planning area to geothermal leasing.

Accordingly, although potentially open to oil and gas leasing, these areas are closed to geothermal exploration and development under all alternatives. Exploration and development of geothermal resources are also subject to the same restrictions on surface-disturbing activities applied to oil and gas exploration and development. Therefore, impacts to geothermal exploration and development under each alternative are the same as those described in the *Leasable Minerals – Oil and Gas* section or, in the case of NLCS units, slightly more restrictive. Because commercial geothermal development requires drilling and facilities comparable to those associated with oil and gas development, management that affects oil and gas are expected to similarly affect geothermal development.

4.2.3.3.2. Alternative A

Alternative A is the baseline for determining impacts under the other alternatives. Because most of the planning area is open to oil and gas leasing under Alternative A, most is open to geothermal leasing and development or open with moderate constraints.

Table 4.17, “Acres of Mineral Estate Open, Open with Constraints, and Closed to Geothermal Leasing” (p. 692) identifies the acres of mineral estate open, open with constraints, and closed to geothermal leasing under each alternative, including Alternative A.

Table 4.17. Acres of Mineral Estate Open, Open with Constraints, and Closed to Geothermal Leasing

Management	Alternative A	Alternative B	Alternative C	Alternative D
Open	728,277	6,287	797,174	53,898
Open with moderate constraints	1,703,913	322,717	1,738,283	1,198,821
Open with major constraints	242,266	175,369	165,747	859,566
Closed	134,686	2,304,728	107,897	696,816
Source: BLM 2012a				

4.2.3.3.3. Alternative B

Alternative B closes substantially more areas to oil and gas development, and therefore geothermal development, than Alternative A, including all of the Dubois area and greater

sage-grouse Core Area. In general, Alternative B includes many more restraints on oil and gas development than Alternative A. However, the economic impacts to geothermal development associated with the more restrictive approach under Alternative B cannot be quantified.

4.2.3.3.4. Alternative C

Alternative C includes the fewest restraints on oil and gas development. Therefore, it would result in the fewest restrictions on geothermal exploration and development.

4.2.3.3.5. Alternative D

Alternative D includes fewer restrictions on oil and gas development than Alternative B, but more than Alternative A, and substantially more than Alternative C. These restrictions apply to geothermal leasing and development. As identified above, if there is geothermal potential in Dubois as suggested in scoping, management would adversely impact its exploitation, the same as under Alternative B. Because there is little information on this potential and because development would have adverse impacts to wildlife, special status species, viewsheds, and tourism, it would not be allowed. It is not possible to quantify the economic impact of this management because the potential is not known (no lease has been submitted) and the adverse impacts of a site-specific application to area resources cannot be evaluated.

4.2.4. Leasable Minerals – Oil and Gas

The potential for oil and gas occurrence in the planning area ranges from high to very low, as identified in the RFD Scenario for Oil and Gas (BLM 2009c). Lands in the planning area are classified as having potential for development of oil and gas resources. Projected drilling in existing oil and gas development areas accounts for a large proportion of the well numbers, with a smaller share attributed to additional new discoveries in both conventional and unconventional reservoirs. The RFD Scenario for Oil and Gas considers the potential for development of CBNG to be moderate, low, very low, or nonexistent.

Adverse impacts to oil and gas exploration and development would result from management actions that restrict or constrain the potential for oil and gas leasing, development, and exploration. Constraints to oil and gas development include NSO stipulations, CSU restrictions, timing limitation stipulations (TLS), and allocation of public land for management of other resource objectives that limit or prohibit oil and gas exploration and development. These restrictions could include provisions imposed prior to leasing under a Master Leasing Plan (MLP). Additional adverse impacts to oil and gas exploration and development could result from specific management actions that require mitigation, certain BMPs, or other lease stipulations to protect resources that could increase project costs and timeframes. Beneficial impacts to oil and gas exploration and development result from management actions that increase the potential for leasing, exploration, and development by limiting restrictions or opening areas for oil and gas exploration and development.

Management actions to protect other resource values would adversely impact new oil and gas leases, exploration, and development. An impact is an action that specifically prohibits or permits oil and gas leasing, exploration, or development. Adverse impacts include the management of areas as closed for new oil and gas leasing. Other impacts result from management actions that place or remove surface use restrictions or impose additional requirements on oil and gas

exploration and development (such as BMPs or impact mitigation measures). These actions do not explicitly permit or prohibit oil and gas exploration and development, but could influence an operator's decision whether to proceed.

BLM's 2010 oil and gas leasing reform (IM 2010-117) identified MLPs as a management tool for site-specific protection of resources that could be adversely impacted by oil and gas development. To the extent that the additional resource protections identified in the MLP analysis limit development, they would be considered adverse to the oil and gas program. However, they are less adverse than closing an area to oil and gas. The alternatives vary in their use of the MLP analysis concept.

4.2.4.1. Summary of Impacts

Under all alternatives, limitations and restrictions on surface-disturbing activities for oil and gas exploration and development also apply to geophysical exploration and development. Impacts to oil and gas development and geophysical operations under alternatives A and C are similar in type, although they vary in extent because of the different areas managed as closed to oil and gas leasing and different constraints applied under these alternatives.

The most substantial difference between alternatives A and C are adverse impacts to oil and gas development that are part of the special designations (primarily ACECs) under Alternative A but not under Alternative C. Alternative C has no areas with NSO restrictions except for a 1/4-mile buffer around greater sage-grouse leks and certain limitations imposed by the cultural resources program. Adverse impacts to oil and gas exploration and development would be the greatest under Alternative B, which closes greater sage-grouse Core Area to oil and gas leasing.

All of the alternatives include management that would restrict oil and gas leasing and development to varying levels compared to the projected unconstrained baseline scenario. In this sense, all of the alternatives would result in adverse impacts to oil and gas development because of the application of law and policy to this activity on BLM-administered lands. Primary impacts to oil and gas development would result from managing areas as closed or prescribing stipulations such as NSOs, CSUs, and TLS, which create moderate or major constraints to oil and gas development. The level of impacts varies among alternatives based primarily on the types of restrictions and the acreage of restrictions by alternative.

Areas closed for oil and gas development are fewest under Alternative C and most under Alternative B. Alternative C includes the largest amount of area open to oil and gas development subject to the standard lease form only, followed by Alternative A, Alternative D, and then Alternative B. Alternative A includes the most areas open to oil and gas development with moderate and major constraints, followed by Alternative C, Alternative D, and then Alternative B (because of the large portion of the planning area closed under Alternative B). Therefore, Alternative B would result in the most adverse impacts to oil and gas development and Alternative C the least. Under all alternatives, existing (Alternative A) management stipulations are applied in areas the RFD identifies as having high and moderate potential for oil and gas, except for areas in greater sage-grouse Core Area.

As described in Chapter 3, the Beaver Rim area was identified by the BLM as appropriate for analysis under an MLP. The Beaver Rim area is analyzed under Alternative D for MLP management (Alternative B manages this area as an ACEC and closes it to oil and gas leasing). Alternative D utilizes the MLP approach to apply more restrictive oil and gas management than

standard stipulations but not as adverse as the impacts from closing the Beaver Rim area to oil and gas leasing as under Alternative B.

4.2.4.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- An oil and gas lease grants the lessee the “right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits” on the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11, Lease for Oil and Gas). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms.
- The Authorized Officer requires reasonable measures to minimize adverse impacts to other resource values, land uses, or users not addressed in the lease stipulations at the time operations are proposed. Reasonable measures could include changes in siting or in facilities design, timing of operations, and specification of interim and final reclamation measures. These modifications will occur only through site-specific post-lease actions (e.g., Application for Permit to Drill [APD] and ROWs) supported by onsite conditions and/or project-specific NEPA analyses. Modifications of and waivers to lease terms and stipulations can be accomplished in accordance with applicable regulatory guidelines. Surface-disturbing and other disruptive activities will occur at existing authorized facilities.
- NSO restrictions identified in this RMP can be applied only to new oil and gas leases. Stipulations in existing leases will continue as they are without regard to management actions in the RMP. New constraints and requirements identified in the approved RMP could be applied to subsequent exploration and development activities on existing leases through the use of COAs, provided they are within the authority reserved by the terms and conditions of the lease.
- This analysis considers the baseline total unconstrained oil and gas development potential taken from the RFD Scenario for Oil and Gas (BLM 2009c), as summarized in Chapter 3, and applies the alternative constraints from the other programs as described in Chapter 2. As old leases expire and new ones are issued, new leases are subject to relevant stipulations in the RMP unless an exemption applies. However, in accordance with 43 CFR 3101.1–2, site-specific COAs can be applied to APDs to avoid adverse impacts to resource values by development on existing leases.
- The number of wells the RFD projected for oil and gas does not limit or cap the number of wells that can be drilled in the planning area, or the amount of surface disturbance associated with oil and gas development. This clarification reaffirms that the RFD is intended for analysis purposes only, to compare the management prescriptions of each alternative and is not a limitation on future oil and gas development. Individual implementation-level project proposals are subject to site-specific NEPA analysis to ensure conformance with the RMP and to evaluate impacts to other resources. The RFD Scenario for Oil and Gas based development potential on the anticipated drilling activity over the next 20 years and has most of the development occurring as infill wells in existing fields and development areas. Additional information regarding the RFD is provided in Appendix T (p. 1641).
- Oil and gas development potential is based on the following Wyoming State Office Reservoir Management Group categories for both conventional gas and CBNG (Maps 17 and 20):
 - High potential for hydrocarbon development indicates areas where the average well density is anticipated to be more than 100 wells per township.
 - Moderate potential for hydrocarbon development indicates areas where the average well density is anticipated to be between 20 and 100 wells per township.

- Low potential for hydrocarbon development indicates areas where the average well density is anticipated to be 2 to fewer than 20 wells per township.
- Very low potential for hydrocarbon development indicates areas where the average well density is anticipated to be fewer than two wells per township.
- No potential for hydrocarbon developments indicates areas where no wells are anticipated.
- Moderate and major constraints identified for each alternative (see Chapter 2) were applied to the unconstrained RFD Scenario for Oil and Gas development to develop Maps 29 through 32 and the RFD Scenario for Oil and Gas development for each alternative. Non-federal well numbers and related disturbance acreage are assumed to be the same under all alternatives. These are within the range of limitations between closed to leasing and standard stipulations.
- Areas are described as either open or closed to oil and gas leasing. Areas open to oil and gas leasing subject to major constraints have greater adverse impacts to oil and gas leasing, exploration, and development compared to acres subject to either moderate constraints or standard stipulations. All areas identified as open in this analysis are subject to at least standard stipulations.
- Major constraints are any stipulation that could restrict the timing or placement of oil and gas developments and might result in an operator dropping the development proposal. Major constraints include NSOs, areas of overlapping TLS that last more than 6 months, areas closed to surface-disturbing activity, areas where surface-disturbing activity is prohibited, and VRM Class I areas. Leaseholders have the right to explore, develop, and produce mineral resources from any valid, existing lease, even if the area containing the lease was proposed to be closed to future leasing.
- Moderate constraints are any stipulation that could restrict the timing or placement of oil and gas development, but would not otherwise restrict the overall development. Moderate constraints include all TLS, CSUs, areas where surface-disturbing activity is avoided, and VRM Class II areas.
- Because of overlaps between management restrictions on oil and gas leasing (i.e., CSUs, TLS, and NSOs), individual restrictions associated with resources and special designations described in this section are not additive. The BLM has factored these overlapping restrictions into the overall oil and gas constraints (major, moderate, open, closed) for each alternative, where appropriate. For example, while a TLS restriction is generally considered a moderate constraint, overlapping TLS that restrict the use of an area for 6 months or more are considered a major constraint. In areas where overlapping management is the same and applies year-round (e.g., two overlapping NSOs), there is no additional or additive effect. Finally, where different types of restrictions overlap (e.g., an area managed as an NSO for cultural resources and closed for wildlife values), the more restrictive management would apply. Maps 29, 30, 31, and 32 provide a visual representation of constraints by alternative.
- Surface-use restrictions, including TLS, NSOs, and CSUs, and those identified through MLP analysis, and designations of unavailable for leasing, cannot be retroactively applied to valid, existing oil and gas leases or to valid, existing use authorizations (e.g., APD). However, post-lease actions/authorizations (e.g., APDs and road/pipeline ROWs) could be encumbered by TLS and CSUs case by case, as required through project-specific NEPA analyses or other environmental review. If leases were to expire, the new constraints would be applied if the parcels were offered for lease again; there is no “lease renewal” which would grandfather in the older management.
- Surface disturbance projections for leasable oil and gas development assume one well per well pad and a support road and pipeline. Projected acres of short-term surface disturbance is 12.5 acres for each non-coalbed exploratory well, 6 acres for each non-coalbed development well, 5.5 acres for each coalbed well, and 16 acres for each deep well. Projected acres

of long-term surface disturbance is 9 acres for each non-coalbed exploratory well, 4 acres for each non-coalbed development well, 3.5 acres for each coalbed well, and 11 acres for each deep well. Some wells could be developed with fewer acres of disturbance than these projections, while other wells could result in substantially more disturbance. Multi-well pads are not precluded in the planning area, but are encouraged where possible. Multi-well pads result in less long-term disturbance per well.

- In areas of LRP, timeframes for successful interim and final reclamation of oil and gas well pads, flow lines, and access roads are affected.
- Other than the depletion of hydrocarbon reserves through authorized fluid mineral leasing, development, and production operations, the resource management actions developed through this plan would not physically impact the subsurface oil and gas resources in the planning area.
- Directional drilling can be used to access hydrocarbon resources under areas constrained by surface-use restrictions (e.g., slope restrictions, riparian-wetland area setback, NSOs, and buffers within a CSU zone around greater sage-grouse leks) that necessitate relocating wells. Directional drilling viability and offset distance varies with the target formation, the depth of the target formation, and down-hole equipment necessary for production. Generally, directional drilling can be addressed only on a site-specific basis. However, directional drilling is an approach to limit surface disturbance and reclamation challenges. The alternatives vary in the extent to which oil and gas operations are required to limit surface disturbance.
- Leasable mineral resources are considered unrecoverable in areas designated unavailable for leasing. Mineral resources are also considered unrecoverable in areas open to leasing but where surface-use constraints prohibit development operations on areas larger than can be technically and economically developed from offsite locations. Leasable mineral resources in leased in-holdings are considered recoverable.
- Provisions in lease agreements expressly provide Secretarial authority to deny or restrict development in whole or in part depending on an opinion from the USFWS regarding impacts to endangered or threatened species or habitats of plants and animals listed or proposed for listing. If the USFWS concludes that the development likely would jeopardize the continued existence of any endangered or threatened plant or animal species, then the development could be denied in whole or in part. The USFWS has determined that listing of the greater sage-grouse under the ESA is warranted but precluded. The BLM manages greater sage-grouse as a special status species.

4.2.4.3. Detailed Analysis of Alternatives

4.2.4.3.1. Impacts Common to All Alternatives

Under all alternatives, management that results in areas being open, open with constraints, or closed (also called “administratively unavailable” to leasing) would impact oil and gas development by allowing, limiting, or prohibiting exploration and development in certain areas. Impacts are similar across alternatives because the definitions of areas open subject to the standard lease form, open with moderate constraints, open with major constraints, and closed are the same under all alternatives. The severity of these impacts varies by alternative based on the amount of acreage and the associated oil and gas development potential. Protective measures for other resources, including limiting or prohibiting access and development in areas where there are specific resources, or controlling the timing or nature of development that can occur, would result in adverse impacts. Restrictions on oil and gas development under each of the alternatives would also result in adverse impacts to the rate of oil and gas exploration, development, and extraction. These impacts would increase the cost, to both the producer and the user of the end

products, of exploring for, developing, and extracting oil and gas. Under all alternatives, BMPs must be implemented in the exploration, development, production, and abandonment of oil and gas resources.

In areas closed to oil and gas leasing, valid existing lease rights are honored; however, if the lease expires or is cancelled, the lease acreage will not be re-offered. In these cases, if drainage of federal oil and gas is determined to be occurring, leasing could be authorized on a case-by-case basis with NSO restrictions.

In areas of high and moderate potential for oil and gas as identified in the RFD, existing (Alternative A) management stipulations are applied under all alternatives except for areas within the boundaries of greater sage-grouse Core Area under Alternative B. This management allows continued development in existing oil and gas development areas.

Under all alternatives, areas closed to oil and gas leasing will also be closed to geophysical exploration, and areas that are open to oil and gas leasing are open to geophysical exploration. Therefore, managing areas as closed would result in adverse impacts to exploration and development of fluid mineral resources by prohibiting both oil and gas exploration and subsequent development and extraction. Alternatively, allowing geophysical exploration in areas open to oil and gas development would result in beneficial impacts to oil and gas exploration and development. Requiring geophysical exploration to be performed within the constraints (such as NSOs or CSUs) necessary to protect other resources would result in adverse impacts to oil and gas exploration.

Adverse impacts to exploration, such as increased costs to the operator from the use of more expensive but less surface-disturbing techniques (such as small, portable, foot- or helicopter-transported surveying equipment in areas with surface-use restrictions) are impacts to operators but extremely difficult to quantify on a planning area basis. These additional costs to the operator are not analyzed here or compared among alternatives unless the costs are so great as to preclude development. However, if surface-use restrictions prevent an operator from effectively surveying and exploring oil and gas resources and development locations are sited based on incomplete information, this would affect the operator's ability to develop the leases. These limitations would result in both increased expense to the operator and also in nonproductive disturbances to land and surface resources. Further adverse impacts may be lost royalty income and valuable reservoir data.

In areas where federal oil and gas leases are or have been issued without stipulations, subsequently placing additional mitigation measures on exploration and development could result in adverse impacts to ongoing or future oil and gas development. Requiring additional stipulations on new leases could constrain exploration, development, production, or other actions that increase the timeframe and cost of operations. Mitigating measures attached to an APD as COA influence how an activity is accomplished, but rarely preclude the activity from occurring. Such management actions in complex areas involving impact avoidance to several resources could limit oil and gas operations.

Special designations (ACECs, NHTs, WSRs) and other special management areas such as those for recreation could result in adverse impacts to oil and gas exploration and development, depending on their locations in relation to oil and gas potential and the oil and gas management prescriptions applied, such as NSO. Special designations do not necessarily apply management prescriptions on oil and gas developments. For example, the 1987 RMP designated nine ACECs; of these, three had no oil and gas management restrictions and, therefore, no adverse impacts

to oil and gas development. Adverse impacts to oil and gas development as a result of special designations are analyzed under each alternative.

All alternatives manage WSAs in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*. Management does not vary by alternative and is not further analyzed except to the extent relevant for an individual alternative, such as management of lands adjoining a WSA to support wilderness values.

The number of acres closed to oil and gas leasing vary by alternative. For example, Alternative B closes the entire greater sage-grouse Core Area to oil and gas leasing. The more acres closed to oil and gas leasing, the more adverse impacts to the oil and gas program. Table 4.18, “Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative” (p. 699) lists the number of acres closed to oil and gas leasing under each alternative. The economic impacts from closing areas to oil and gas leasing are analyzed in the *Socioeconomic Resources* section.

Table 4.18. Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative

Restriction	Alternative A	Alternative B	Alternative C	Alternative D
Open with standard conditions	731,144	32,952	804,794	44,945
Percent of federal mineral estate	26	1	29	2
Open with moderate restrictions	1,715,341	309,100	1,755,628	1,260,715
Percent of federal mineral estate	61	11	62	45
Open with major restrictions	337,481	187,524	248,601	1,336,867
Percent of federal mineral estate	12	6	9	48
Closed for leasing	25,136	2,279,525	78	166,574
Percent of federal mineral estate	1	82	Less than 1	6
Source: BLM 2012a				

Management actions that require the use of special mitigation, such as protections for cultural resources, would impact all alternatives on a project-specific basis depending on the overall constraints under each alternative. Standard mitigation measures and BMPs are design features required under all alternatives and are not analyzed further in this document. In general, constraints (such as NSOs, CSUs, and TLS) on exploration, development, production, and abandonment of oil and gas resources are real costs to the proponent but not environmental impacts to be analyzed here unless they preclude development. Such constraints could result in beneficial impacts by consolidating surface-disturbing activities, thereby reducing the cost of construction in a given area. These impacts are quantifiable only on a site-specific basis, if at all.

Major constraints to oil and gas exploration and development, such as NSOs or overlapping TLS, result in adverse impacts to oil and gas exploration and development by limiting or prohibiting development in these areas or requiring certain drilling techniques, BMPs, or other mitigation. The RFD Scenario for Oil and Gas development considers constraints in determining the likelihood of overall production. The economic implications to the oil and gas program are analyzed in the *Socioeconomic Resources* section. Alternatives are compared using the number of acres of potential under various management prescriptions.

Companies typically cannot use directional drilling to develop CBNG because the reservoirs are relatively shallow and costs are greater because of the maintenance of the down-hole pumping equipment. An operator could decide to not develop oil and gas resources in an area with major constraints because of the increased cost associated with restrictions compared to the economic risk factor. The RFD considers these factors.

The number of acres open to leasing with an NSO stipulation vary by alternative. The more acres with an NSO stipulation, the more adverse impacts to the oil and gas program. Table 4.18, “Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative” (p. 699) lists the acres with major leasing constraints, including an NSO stipulation, under each alternative. The *Socioeconomic Resources* section identifies and analyzes the economic impacts associated with each category.

On split-estate lands (areas with private surface ownership and federal mineral estate), determination of access road and well pad locations in conjunction with the surface owner and other considerations could result in additional costs to the operator. This analysis does not address that impact to operators which varies in accordance with site-specific issues.

When necessary to protect important habitats, the BLM would attach COAs for operations proposed on existing oil and gas leases in areas designated as unavailable for leasing, which would exclude surface occupancy and surface disturbance. This is done to the maximum extent possible without violating lease rights. Such restrictions on occupancy and surface disturbance could limit the operator’s ability to extract the federal oil and gas resources under lease. For example, directional drilling from an area outside such a lease to a bottom-hole location in a leased area targeted by the operator might not be technically or economically feasible.

Under all alternatives, management to suppress INNS is required. Although INNS requirements will increase the cost to the operator, this is not an adverse environmental impact and will not preclude oil and gas development. Because INNS management is the same across all alternatives, it is not further analyzed.

Under all alternatives, special status species inventories could be required for surface-disturbing projects in known or suspected special status species habitat. Postponing or modifying projects that could affect special status species would lead to a delay in the development and/or the relocation of wells, access roads, pipelines, or ancillary facilities. These impacts do not vary by alternative.

Oil and gas leasing processes were established through the Mineral Leasing Act of 1920, as amended. This act promotes the mining of coal, phosphates, oil, oil shale, gas, and sodium on the public lands, to the fullest extent possible. The act also makes leasing discretionary. The objective is to promote the orderly and efficient exploration, development, and production of oil and gas. Oil and gas management around intensively developed existing fields would result in beneficial impacts to oil and gas exploration and development by allowing for full development and ultimate recovery of known oil and gas resources. Each alternative varies in the management of developed fields and the protections afforded to resources.

Typical impacts from cultural resource management actions on oil and gas exploration and development would include increased well development costs associated with cultural resource inventories, relocation of projects (well pads, roads, and pipelines) to avoid a cultural site, implementation of offsite drilling (directional drilling) techniques, and/or site excavation if avoidance is not possible. Discovery of previously undocumented cultural features during project

construction would delay project implementation while the site is evaluated, but would not be likely to prevent development of a lease.

Moderate constraints to oil and gas exploration and development result in adverse impacts by limiting the time of construction and operation activities or requiring specific mitigation or lease stipulations. Moderate constraints do not remove the area from oil and gas exploration and development or require directional drilling. Under TLS, development could become more intensive over a shorter timeframe to complete operations before timing restrictions apply. In areas with overlapping TLS, companies could be limited to narrow timeframes to complete work which can compromise safety, or the activity will be drawn out over a longer period of time. Overlapping CSUs that restrict oil and gas operations to less than 6 months in a 12-month period are analyzed here as a “major” constraint. NSOs are the more typical “major constraint.”

The more acres with moderate constraints rather than standard stipulations, the more adverse impacts to the oil and gas program. Table 4.18, “Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative” (p. 699) lists the acres of federal mineral estate subject to moderate constraints. The *Socioeconomic Resources* section analyzes the financial implications of moderate constraints under each alternative.

Under all alternatives, management actions for ROWs would impact oil and gas development by allowing, limiting, or prohibiting facilities and infrastructure necessary for the development and extraction of oil and gas resources, including access roads, powerlines, and pipelines. Federal regulations require ROW grants for access roads, powerlines, or pipelines outside the boundaries of a lease or unit agreement. Avoiding or excluding these authorizations would limit or prohibit legal access and infrastructure to well pads. Management that limits or prohibits ROW authorizations (ROW avoidance and exclusion areas) would result in adverse impacts to oil and gas development.

Oil and gas exploration and development often occur in grazing allotments. Oil and gas operators would be required to abide by mitigation measures specified in lease stipulations or in the COAs for those operations. Mitigation measures required to minimize adverse impacts to livestock grazing would increase the cost of oil and gas exploration and development. These measures would include providing for the upkeep and repair of fences and gates and implementing measures to prevent loss of or injury to livestock. Livestock mitigation would not be expected to substantially affect the technical or economic viability of oil and gas development and are not analyzed in this document.

Under all alternatives, pre-FLPMA lands withdrawn for recreation and cultural purposes are managed as NSO. These designated recreation sites are small and could be developed through directional drilling techniques; therefore, the impact to the oil and gas program would be small. These recreation sites are in areas where there is very low or no oil and gas potential, and therefore would result in negligible impacts to overall development in the planning area. These impacts would not vary by alternative and are not further analyzed.

Reclaiming areas of surface disturbance with a desired plant community to prevent erosion, monitor and treat invasive plant species that occupy areas disturbed by oil and gas development and production, and returning vegetation and habitat to predetermined conditions is required under all alternatives. Interim reclamation composition varies by alternative and by area and has impacts on how quickly an area may return to usable habitat.

Under all alternatives, the extent of impacts to oil and gas development from constraints and limitations on exploration and development are directly related to the potential for oil and gas in an area. Management actions that constrain development of oil and gas in high potential areas would generally result in more adverse impacts to development than similar management actions that constrain development in low potential areas. The RFD describes the potential for oil and gas occurrence and development potential in the planning area.

Any conflicts of overlapping resource uses, such as locatable mineral entry, ROWs, and mineral leasing, including oil and gas resources, would be resolved on a case-by-case basis.

Any areas closed to oil and gas leasing could be reviewed for potential leasing if drainage is determined to be occurring (i.e., if a well on state or patented lands drains the oil and gas resources from federal mineral estate resulting in a loss to the federal government).

In areas open to oil and gas leasing, all leases are subject to standard lease stipulations; some additional stipulations could be applied at the time of leasing. All geophysical exploration is subject to identified COAs, and if geophysical operations can be performed within identified constraints to protect other resources, the operations are allowed. Constraints to geophysical exploration are the same as for oil and gas development.

Many impacts from resource management restrictions result in increased cost of operations for oil and gas development. As for other resources and uses, additional costs and expenses that to the proponent (the oil and gas developer) are not considered impacts to the oil and gas program unless development is precluded. Any economic impacts to the oil and gas program (wells drilled and produced or not) identified under the range of alternatives are addressed in the *Socioeconomic Resources* section.

4.2.4.3.2. Alternative A

4.2.4.3.2.1. Program Management

Oil and gas management under Alternative A requires that oil and gas exploration and development consider all other surface uses and resource values. No areas are identified as primarily for oil and gas development; only the Whiskey Mountain and East Fork ACECs are closed to leasing. See Table 4.18, “Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative” (p. 699) for acres open, areas open with certain constraints, and areas closed for leasing. Areas withdrawn from locatable mineral entry are usually managed as an NSO for oil and gas or closed.

4.2.4.3.2.2. Resources

Under Alternative A, restrictions and constraints on oil and gas development result from management for the protection of resources. The most wide-ranging adverse impacts to oil and gas leasing from management of resources under Alternative A result from wildlife TLS where overlapping moderate constraints become a major constraint (although not identified as an NSO), and cultural resource impact mitigation.

As a result of the oil and gas constraints under Alternative A, projected drilling is reduced from the baseline unconstrained projections. The baseline scenario projects 2,367 federal wells could be drilled in the planning area. These include 1,849 conventional wells and 518 CBNG wells.

Under Alternative A, 2,274 wells are projected, comprised of 1,794 conventional wells and 480 CBNG wells. This represents a decrease from the baseline, or 55 fewer federal conventional wells and 38 fewer federal CBNG wells.

Alternative A does not require any MLPs, so there are no adverse impacts to the oil and gas programs through limitations imposed by an MLP.

Management of surface resources resulting in adverse impacts to oil and gas development range from air quality, soil, water, grasslands/shrublands, riparian-wetlands, invasive pests, fish, wildlife, special status plants, special status fish, special status wildlife, to cultural, paleontological, and visual resources.

Wyoming air quality standards set limits on emissions, GHGs, and particulates from construction including drilling of wells and transportation. Limiting emissions would adversely impact oil and gas development by slowing the pace of development and increasing the costs associated with mitigating the emissions, and would require special management limiting emissions associated with transportation. Management under Alternative A is the least restrictive available that still complies with the CAA.

Management of soil resources under Alternative A would adversely impact oil and gas development by requiring movement of proposed locations and roads around slopes greater than 25 percent and avoiding areas of LRP. The largest impact from managing soil resources is from an increase in costs of interim and final reclamation in areas of LRP.

Water resource management would adversely impact development through increased costs associated with additional road and well pad construction design to avoid impacts from storm water discharges and the costs of additional surface casing to protect groundwater, and would cause more expensive management of production water. Management of water resources would result in a qualitative impact to development and would not affect the number of wells planned over the planning cycle.

Riparian-wetland area resource management prohibits surface-disturbing activities within 500 feet of surface water and riparian-wetlands unless the impacts can be mitigated; the areas are managed using an NSO. A setback of 500 feet would not affect the number of wells necessary to develop oil and gas. Oil and gas wells can be sited outside riparian-wetland areas and adequately recover the oil and gas resources.

Management of fish, wildlife, special status plants, special status fish, and special status wildlife would adversely impact development through implementation of TLS, CSUs, and NSOs. In virtually all parts of the planning area, development activities are delayed or relocated for the protection of big game winter range, raptor nesting areas, parturition areas, and special status wildlife. Relocation of development proposals is required for special status fish and special status plants. Implementing timing restrictions and/or relocating proposed roads and project locations could make projects either uneconomical or unattractive to potential operators.

Management of greater sage-grouse, a high-profile special status species, under Alternative A does not incorporate the Core Area concept and applies a ¼-mile buffer around greater sage-grouse leks. Nesting areas are avoided by 2 miles. Alternative A does not specially manage the areas identified by the Wyoming Governor as the greater sage-grouse Core Area and has no density or disturbance caps in those areas or any other. Therefore, the adverse impacts to the oil and gas program are limited.

Cultural and paleontological resource management under Alternative A would adversely impact oil and gas development and can result in avoidance areas and additional costs associated with monitoring. Cultural and paleontological resource protections would require limited relocation or redesign of facilities, roads, and operations, limiting development, but are unlikely to preclude development or reduce the number of wells.

VRM adversely impacts oil and gas development if visual resource objectives cannot be achieved and development is precluded. VRM could also increase costs of development, but these are not considered adverse impacts to oil and gas unless development is precluded or well numbers are reduced on a site-specific basis. Adverse impacts to oil and gas under Alternative A come from management such as NSO in Red Canyon to protect important scenic vistas and other values. These adverse impacts cannot be quantified in this analysis because they are site specific.

4.2.4.3.2.3. Resource Uses

For the most part, management for the development of other resource uses would not adversely impact oil and gas development under Alternative A. Designating ROW exclusion and avoidance areas would result in adverse impacts to oil and gas development by prohibiting or limiting ROW authorizations for roads, pipelines, or other infrastructure that could be necessary for the development of oil and gas resources. Beneficial impacts would result from concurrent resource use development (so long as one resource use development does not legally impede the other) by building infrastructure such as roads and transmission lines.

Management of other resource uses under Alternative A would not adversely impact oil and gas development because there are few limiting restrictions. Avoidance areas for major ROW in ACECs already closed or managed as an NSO for oil and gas due to resource protection needs would not result in additional adverse impact. Under Alternative A, these adverse limitations on resource uses are qualitatively not substantial.

Alternative A does not have any recreation management that would adversely impact oil and gas development. Alternative A does not close any area to motorized vehicle traffic except in the Castle Garden area and in two ACECs. No area with moderate or high potential for oil and gas is closed to motorized vehicle travel.

Because Alternative A does not impose a disturbance cap on areas important to greater sage-grouse, there would be no adverse impacts to oil and gas development from surface disturbance caused by other resource uses (e.g., uranium development or ROWs).

4.2.4.3.2.4. Special Designations

Resource values managed using special designations under Alternative A would adversely impact oil and gas development in special designations that have oil and gas prescriptions in areas with oil and gas potential. Under Alternative A, 13,207 surface acres are closed to leasing because of ACECs and 95,090 acres are NSO, including 27,728 acres for Congressionally Designated Trails. These areas have low to no potential for oil and gas resources. Alternative A does not recommend any waterways as suitable for inclusion in the NWSRS but protects eligible waterways under the interim management prescriptions.

4.2.4.3.3. Alternative B

4.2.4.3.3.1. Program Management

Alternative B manages the oil and gas program to avoid adverse impacts to other programs, particularly wildlife. Greater sage-grouse Core Area is closed to new oil and gas leasing. However, the areas of highest potential for oil and gas are not included in the greater sage-grouse Core Area which limits the adverse impacts resulting from this constraint. But, lands outside the Core Area are managed to avoid adverse impacts to greater sage-grouse through NSO stipulations within 0.6 mile of a greater sage-grouse lek and development timing limitations in nesting habitat. Alternative B applies timing limitations to oil and gas operations and maintenance (O&M) activities. Alternative B would result in the most adverse impacts to oil and gas operations of any of the alternatives. However, much of the area closed to oil and gas leasing has low to no potential for oil and gas. Areas that were identified for management with an MLP to reduce resource conflicts are, instead, closed to leasing under Alternative B which is a more adverse impact to oil and gas than the constraints that could be applied under an MLP.

4.2.4.3.3.2. Resources

Under Alternative B, restrictions and constraints on oil and gas development result from management for the protection of other resources. The most wide-ranging adverse impacts to oil and gas development result from greater sage-grouse protections.

In areas open to oil and gas leasing, all leases are subject to standard lease stipulations. All areas open to geophysical exploration are subject to identified COAs, except for lands identified as closed or subject to major constraints. Under Alternative B, geophysical exploration is constrained by limiting motorized travel and restrictions on surface-disturbing and disruptive activities. These restrictions to geophysical exploration would reduce the number of projects developed because geophysical information provides data needed to commit to the high cost of oil and gas exploration and development. Under Alternative B, 1,898,090 surface acres are closed or have major restrictions for geophysical exploration. The areas unavailable to geophysical exploration are identified as low, very low, and no potential for oil and gas resources. Alternative B closes the most areas to geophysical operations and therefore would result in the most adverse impacts to the oil and gas program.

Under Alternative B, 32,952 acres of federal mineral estate are open to oil and gas leasing subject to the terms and conditions of the standard lease form with major constraints. Alternative B has the fewest acres open to oil and gas operations and the most acres open with moderate and major constraints. The *Socioeconomic Resources* section addresses the economic impacts of this restrictive management.

As a result of the oil and gas constraints under Alternative B, projected drilling is reduced from the baseline unconstrained projections. The baseline scenario projects 2,367 federal wells could be drilled in the planning area (1,849 conventional wells and 518 CBNG wells). Under Alternative B, 1,528 federal wells are projected (1,439 conventional wells and 93 federal CBNG wells). This represents a decrease from the baseline of 321 fewer federal conventional wells and 425 fewer federal CBNG wells. This analysis does not address limits on oil and gas development because of surface disturbance caps (discussed below), which can only be calculated on a site-specific basis.

Management of surface resources resulting in limiting oil and gas development range from air quality, soil, water, grasslands/shrublands, riparian-wetlands, invasive pests, fish, wildlife, special status plants, special status fish, special status wildlife, to cultural, paleontological, and visual resources.

Wyoming air quality standards set limits on emissions, GHGs, and particulate matter from construction. Limiting emissions would adversely impact oil and gas development by slowing the pace of development or precluding development for at least some period of time. Under Alternative B, the BLM will cooperate with the Wyoming DEQ to implement the Wyoming air quality standards and be proactive in reducing and managing emissions below state limits. This would result in a short-term adverse impact to oil and gas development by potentially limiting the amount of development. A beneficial impact would result if air quality in the region improves, allowing oil and gas development without air quality restrictions.

Management of soil resources under Alternative B would adversely impact oil and gas development by requiring the movement of proposed locations and roads on slopes greater than 15 percent outside areas identified as having high and moderate potential for oil and gas, and 25 percent inside areas identified as having high and moderate potential for oil and gas. Alternative B also prohibits development in soils identified as LRP. Soil management under Alternative B would result in a relatively small adverse impact to oil and gas development.

Water resource management under Alternative B would adversely impact oil and gas development through prohibiting road crossings in floodplains and riparian-wetland areas of low, very low, and no potential for oil and gas (because standard stipulations are applied in areas with higher oil and gas potential). However, the potential number of wells identified in the low, very low, and no potential areas, is relatively small.

Alternative B increases the setback from riparian-wetlands from 500 feet to 1,320 feet in areas of low to no potential for oil and gas, which would not result in any substantial adverse impact because most drilling operations would be able to accommodate the setback distance and still adequately recover the oil and gas resources.

Management of the Little Red Creek Complex near Dubois as non-WSA land with wilderness characteristics under Alternative B would not adversely impact the oil and gas program, since there is very low to no oil and gas potential in the area.

Management of fish, wildlife, special status plants, special status fish, and special status wildlife under Alternative B would adversely impact development through closure of areas to oil and gas leasing, and implementing major restrictions through TLS, CSUs, and NSOs. To manage and protect sensitive species in the Dubois area, oil and gas leasing is closed under Alternative B. This closure would adversely impact oil and gas development in the Dubois area. However, the RFD identifies the area as having a very low potential for oil and gas.

Under Alternative B, approximately 66,661 acres with very low potential for conventional oil and gas are closed and 49,156 acres with very low potential for CBNG potential are closed. These closures reduce the potential number of new wells by 5.8 conventional and 4.2 CBNG wells. See Table 4.18, "Total Acres of Federal Mineral Estate Open, Open with Constraints, and Closed to Oil and Gas Leasing by Alternative" (p. 699) for a comparison of total acreage closed to oil and gas leasing under Alternative B to Alternative A. See the *Socioeconomic Resources* section for an analysis of the economic impact associated with these closures.

Alternative B manages areas identified as having high and moderate potential for oil and gas using existing (Alternative A) management stipulations, except within the boundaries of the proposed Government Draw/Upper Sweetwater Sage-Grouse ACEC, which is closed to leasing. This closure adversely impacts oil and gas leasing. See the *Socioeconomic Resources* section for an analysis of the economic impact associated with this closure.

In virtually all parts of the planning area, development activities are delayed or relocated for the protection of big game winter range, raptor nesting areas, parturition areas, and special status wildlife. Compared to Alternative A, Alternative B would confer some beneficial impacts to oil and gas development through the implementation of species-specific TLS for raptors where species-specific dates reduce the impact of overlapping stipulations from major to moderate constraints.

Compared to Alternative A, greater sage-grouse management under Alternative B would result in substantially more adverse impacts to oil and gas development. Alternative B manages areas utilizing the Core Area identified by the Governor of Wyoming. The Core Area is closed to oil and gas leasing, and development of existing leases must meet density limitations and a surface disturbance cap that considers disturbance from all resource uses on public, state, and private lands. Inside and outside the Core Area, the buffers around leks are substantially larger under Alternative B than under Alternative A thus preventing surface disturbance in approximately two and one half times the acres as Alternative A. While the adverse impacts from the disturbance cap can be calculated only on a site-specific basis, the disturbance cap has the potential to result in substantially more adverse impacts to oil and gas development than Alternative A, which does not impose such a limitation. However, the surface caps are applied in areas of lower oil and gas potential. Adverse impacts to oil and gas development from the increased lek buffer were considered when calculating the decrease in the baseline unconstrained projection identified above.

Under Alternative B, seasonal protections for wildlife are expanded to include O&M activities when they would be detrimental to wildlife. While this management would result in a potential loss of income to operators because they will either not be able to complete a well for production or will not be able to resume production from a well shut in due to mechanical problems, it would not preclude development or limit the number of wells and would result in no more adverse impacts than management under Alternative A, which does not have timing limitations on O&M.

VRM in Alternative B has more acres managed to VRM Class I and II objectives than under Alternative A; the more restrictive VRM would likely have more adverse impacts than applying lower class objectives. However, VRM does not in and of itself preclude oil and gas development, but requires that development be designed and mitigated so as to meet VRM objectives. It is not possible to quantify the adverse impacts to oil and gas development from the more restrictive VRM compared to Alternative A. Impacts would be site dependent, although VRM under Alternative B would be likely to result in some additional adverse impacts over Alternative A. However, because most oil and gas potential is in areas already disturbed and therefore inventorying at a lower VRM Class, it is likely that VRM under Alternative B would result in little adverse impact to oil and gas development under any alternative.

4.2.4.3.3.3. Resource Uses

In general, management of other resource uses under Alternative B would not result in restrictions and constraints on oil and gas development because areas identified as having high and moderate

potential for oil and gas are managed under existing management (Alternative A) stipulations except in the greater sage-grouse Core Area. Under Alternative B, the impacts of all other resource uses to oil and gas development, including in areas of moderate and high potential, would be the same as under Alternative A.

Restrictions under Alternative B that limit acres open to surface-disturbing activities regardless of the program (ROW, locatable minerals, industrial wind-energy development) would result in a beneficial impact to oil and gas development in greater sage-grouse Core Area outside the Government Draw/Upper Sweetwater Sage-Grouse ACEC or within the ACEC for existing leases. Alternative B closes the ACEC to new leasing (see *Special Designations*), but it also closes the ACEC to all other mineral and ROW activities and new rangeland improvements. Although Alternative B applies a cap on surface disturbance, which neither Alternative A nor Alternative C does, Alternative B limits on non-oil and gas development make it less likely that the disturbance cap would be reached.

Alternative B management of other resource uses to protect greater sage-grouse, particularly closing all of the greater sage-grouse ACEC to surface disturbance, including locatable minerals withdrawals, make it less likely that the greater sage-grouse would be listed under the ESA than under Alternative A and much less likely than under Alternative C.

Restrictions for handling produced water, which would avoid surface discharge of produced water in all new oil and gas development projects, would adversely impact any new development in areas with low and very low potential for oil and gas and could conflict with regulations in Onshore Oil and Gas Order Number 7, Disposal of Produced Water, which makes reinjection the preferred method but allows surface discharge. In areas of high and moderate oil and gas potential and in existing development areas, produced-water handling is managed under existing (Alternative A) management prescriptions. By prohibiting water discharge for new development in the low and very low potential areas, produced-water handling costs could make new discovery uneconomical or be a disincentive to develop oil and gas resources; this would result in the loss of recoverable reserves.

Management of resource uses that could limit oil and gas development include ROWs and corridors, livestock grazing, and recreation. Other resource uses could enhance the development of oil and gas resources, such as locatable minerals, other leasable minerals, mineral materials sales, and ROWs and corridors. Impacts would be similar to impacts identified under Alternative A, except for the reduction in other mineral development and ROWs, which would not benefit oil and gas development.

Under Alternative B, additional recreation areas and special recreation management areas (SRMAs) increase the acres that would adversely impact oil and gas development. Recreation management under Alternative B limits mineral and realty actions within existing recreation sites identified under Alternative A and the following sites managed as closed to leasing: Castle Gardens Archeology Site (78 acres), Devils Gate Interpretive Site (112 acres), Martins Cove Trail (927 acres), Split Rock Rest Interpretive Site (242 acres), and Steamboat Lake Overlook (128 acres). These designated recreation sites are small and oil and gas could be developed through directional drilling techniques; therefore, the impact to oil and gas development from these recreation sites would be small. In addition, these recreation areas are in areas with very low or no potential for oil and gas, and would therefore result in negligible impacts to the overall oil and gas development in the planning area.

4.2.4.3.3.4. Special Designations

Resource values managed as special designations under Alternative B would result in more adverse impacts to oil and gas development than under Alternative A, because more acres in special designations are closed or managed as an NSO under Alternative B. In addition, approximately 1,772,943 acres of mineral estate, less the approximate 66,661 acres administratively closed in the Dubois area, are closed to oil and gas leasing in identified special designations. These special designation areas would result in adverse impacts when areas were closed or made closed for oil and gas leasing whereby directional drilling would not be feasible. Alternative B manages all of the NWSRS-eligible waterways as suitable for inclusion in the NWSRS. Although theoretically an adverse impact to the oil and gas program, this management would result in little actual impact because only ¼ mile on each side of the segment is NSO for oil and gas development. The segments occur mostly in areas with very low or no potential for oil and gas and could be directionally drilled.

4.2.4.3.4. Alternative C

4.2.4.3.4.1. Program Management

Alternative C manages the oil and gas program to maximize oil and gas production and minimize constraints from other programs, such as wildlife. While all alternatives manage oil and gas considering other resources, such as the greater sage-grouse – a BLM sensitive species, Alternative C minimizes restrictions from the management of other resources. Like Alternative A, Alternative C does not apply additional prescriptions through MLPs.

4.2.4.3.4.2. Resources

Under Alternative C, management of other resources would result in the least impact to oil and gas development of any of the alternatives. This alternative minimizes impacts to oil and gas leasing from management of other resources and manages oil and gas development with standard lease stipulations, TLS, and CSUs. Like Alternative A, there are no MLPs analyses applied, so no constraints above standard stipulations are applied.

As a result of the oil and gas constraints under Alternative C, projected drilling is reduced from the baseline unconstrained projections. The baseline scenario projects 2,367 federal wells could be drilled in the planning area (1,849 conventional wells and 518 CBNG wells). Under Alternative C, 2,284 federal wells are projected (1,800 conventional wells and 484 federal CBNG wells). This represents a decrease from the baseline, or 49 fewer federal conventional wells and 34 fewer federal CBNG wells.

Wyoming air quality standards set limits on emissions, GHGs, and particulate matter from construction. Limitations to oil and gas development from management of air quality would be fewer than identified for Alternative B and the same as Alternative A.

Management of soil resources under Alternative C would adversely impact oil and gas development by requiring movement of proposed locations and roads around slopes greater than 25 percent. This impact would be the same as Alternative A and less adverse than Alternative B. However, the slope limitation would result in very few actual impacts to oil and gas operations because well locations can be changed to accommodate the slope restriction.

Water resource management under Alternative C is the least restrictive of any alternative and would allow development and surface disturbance in riparian-wetlands so long as mitigation is adequate to comply with CWA provisions. This different management would result in fewer adverse impacts than Alternative A, B, or D, because it is relatively easy to relocate wells to accommodate setbacks for most types of drilling scenarios.

Alternative C is the least restrictive concerning setbacks from riparian-wetland areas. Management requires a setback of 500 feet from riparian-wetland areas. However, less distance could be authorized if it is shown that equivalent protection of the surface water and riparian-wetland areas could be accomplished. Impacts to oil and gas development under Alternative C restrictions would be less than under alternatives A and B.

Management of fish, wildlife, special status plants, special status fish, and special status wildlife under Alternative C would adversely impact oil and gas development through closure of areas to oil and gas leasing, and implementing restrictions through TLS, CSUs, and NSOs. Under Alternative C, oil and gas leases have stipulations for the protection of fish, wildlife, special status plants, special status fish, and special status wildlife, but these stipulations have the lowest level of restrictions on oil and gas development that meets BLM's obligation for minimum resource protections. Site-specific applications of moderate stipulations would not adversely impact oil and gas development beyond a very limited amount. The difference in moderate and major constraints among alternatives A, B, and C are reflected in the variation from baseline discussed above. Alternative C has the least reduction from baseline.

Cultural and paleontological resource management under Alternative C would not be likely to adversely impact oil and gas development because the resource can generally be avoided. Development would continue, with impacts similar to Alternative A, using minimum restrictions so long as adverse impacts are avoided for National Register of Historic Places (NRHP) eligible properties and activities proceed in accordance with current Wyoming State Protocol and NHPA regulations.

VRM adversely impacts oil and gas development, as addressed under Alternative A. Under Alternative C, most of the planning area (97 percent) is managed as VRM Classes III and IV, which would result in no adverse impacts to oil and gas development.

4.2.4.3.4.3. Resource Uses

Under Alternative C, there would be few adverse impacts to oil and gas development from management for the development of resource uses in programs such as locatable minerals and ROWs.

Restrictions for handling produced water under Alternative C would result in the same impacts as Alternative A. Alternative C manages produced-water handling under existing management prescriptions (Alternative A) identified in regulations in Onshore Oil and Gas Order Number 7, Disposal of Produced Water. This is less restrictive than Alternative B, which prohibits surface discharge for new development in areas with low and very low potential for oil and gas.

Management of resource uses that could limit oil and gas development include ROWs and corridors, livestock grazing, and recreation. Other resource uses could enhance the development of oil and gas resources, such as locatable minerals, other leasable minerals, mineral materials sales, and ROWs and corridors by providing infrastructure such as roads and powerlines that can

be used for oil and gas developments. Impacts to oil and gas development under Alternative C would be similar to impacts under Alternative A and substantially less than under Alternative B.

Recreation areas and SRMAs do not restrict oil and gas resources. Therefore, management of recreation resource uses would not impact oil and gas development.

4.2.4.3.4.4. Special Designations

Resource values managed as special designations under Alternative C would not adversely impact oil and gas development in the planning area. Alternative C does not manage any areas as ACECs, so all areas would be open to oil and gas leasing with standard stipulations. Congressionally Designated Trails are NSO for ¼ mile or less on either side of the trails, which would not preclude oil and gas development. Alternative C does not manage any waterways to maintain their suitability for inclusion in the NWSRS.

4.2.4.3.5. Alternative D

4.2.4.3.5.1. Program Management

Alternative D manages the oil and gas program to maximize oil and gas production in areas with moderate and high potential for oil and gas while avoiding adverse impacts to other programs, particularly wildlife. The areas with the highest potential for oil and gas are not included in the greater sage-grouse Core Area, but are still managed to protect greater sage-grouse leks and impose timing limitations on development in nesting habitat. Under Alternative D, the BLM would institute Required Design Features for the protection of greater sage-grouse, some of which are applied outside of Core Area, primarily as BMPs to be considered on a site-specific basis. Alternative D has Designated Development Areas (DDAs) for oil and gas with different reclamation objectives. Outside DDAs, Alternative D applies TLS to oil and gas O&M activities if those activities would be detrimental to wildlife. Alternative D would result in the second most adverse impacts to oil and gas operations of any of the alternatives behind Alternative B. Alternative D uses an MLP analysis in the Beaver Rim area (150,782 acres) as a tool to limit resource conflicts.

4.2.4.3.5.2. Resources

Under Alternative D, restrictions and constraints on oil and gas development result from management for the protection of other resources. The most wide-ranging impacts to oil and gas leasing from management of other resources result from greater sage-grouse protections and from management that closes the area to oil and gas leasing or makes it an NSO for the protection of wildlife, or applies cultural resources mitigation measures. This management is primarily in *Special Designations* (see below). The entire Dubois area is also closed to oil and gas development to benefit wildlife, including special status species. Adverse impacts to oil and gas result from the closing of approximately 8,500 acres to leasing to the east of Boysen Reservoir to benefit the Park to Park Highway, recreational values associated with the State Park, viewshed, water quality and wildlife and special status species habitat. Because of very low potential, the resulting impact would unlikely be more than moderate.

In areas open to oil and gas leasing, all leases are subject to standard lease stipulations. Additional stipulations may be applied in some areas to the lease or as COAs. Alternative D has Required

Design Features that are applied to all leases; the Required Design Features vary between what is required inside and outside of Core Area, although some Required Design Features, such as the design of impound ponds, apply to the entire planning area in an approach to limiting WNV through reducing breeding grounds for mosquitoes.

All geophysical exploration is subject to identified COAs adopted at the project level. Under Alternative D, geophysical exploration is constrained by limiting motorized travel and restrictions on surface-disturbing and disruptive activities. Limits on geophysical exploration would reduce oil and gas development because producers are unlikely to invest in development without supporting data. Alternative D closes or places major restrictions on geophysical exploration on 1,898,090 surface acres which is the second highest restriction of the alternatives, exceeded only by Alternative B. The areas unavailable to geophysical exploration under Alternative D are identified as having low, very low, and no potential for oil and gas resources, so the impact of these closures, while adverse, could have little actual effect.

Under Alternative D, 44,945 acres of federal mineral estate are open to oil and gas leasing subject to the terms and conditions of the standard lease form and major constraints. Major constraints to oil and gas exploration and development are the same constraints identified and described under *Impacts Common to All Alternatives*, such as NSOs or overlapping TLS. These restrictions would adversely impact oil and gas exploration and development by limiting or prohibiting development in these areas or requiring certain drilling techniques, BMPs, or impact mitigation measures. Alternative D includes the second fewest acres open to oil and gas operations and the most acres open with moderate and major constraints. The *Socioeconomic Resources* section addresses the economic impacts of this restrictive management.

In contrast to the other alternatives, Alternative D conducted an MLP analysis in the Beaver Rim area, east of the Beaver Rim ACEC established in the existing plan. Protective measures identified in the MLP analysis have adverse impacts to the oil and gas program to the extent that development is limited or constrained. MLP analysis identifies tools to reduce conflicts between development and identified resource values. As described below, the Beaver Rim MLP includes NSO and CSU stipulations that could adversely impact oil and gas development. However, given the low oil and gas development potential in the area, the degree of impact is limited. These impacts are more adverse than the impacts under alternatives A and C but less adverse than the lease closure under Alternative B. The BLM assumes that there will be little economic impact from this management in light of the relative low potential and that oil and gas development is still allowed, albeit with more constraints.

As a result of the oil and gas constraints under Alternative D, projected drilling is reduced from the baseline unconstrained projections of 2,367 federal wells (1,849 conventional wells and 518 CBNG wells). Under Alternative D, 2,125 federal wells are projected (1,719 conventional wells and 406 federal CBNG wells). This represents a decrease from the baseline, or 130 fewer federal conventional wells and 112 fewer federal CBNG wells.

Management of surface resources that result in limiting oil and gas development range from air quality, soil, water, grasslands/shrublands, riparian-wetlands, invasive pests, fish, wildlife, special status plants, special status fish, special status wildlife, to cultural, paleontological, and visual resources. Constraints on oil and gas leasing identified in the MLP analysis are also applied to the Beaver Rim area. The 29,527 acres with NSO stipulations have the most adverse impacts, although the low potential in the area limits the degree of impacts. Those portions of the area with oil and gas development potential recognized by industry are already leased; the NSO stipulation

would apply only if the leases ended. The areas for which NSO stipulations apply include the areas that are NSO under all alternatives for the protection of the ESA-listed threatened plant species desert yellowhead. The adverse impacts associated with this management are greater than alternatives A and C.

The remainder of the MLP analysis area (121,255 acres) is subject to CSU stipulations. The impact to oil and gas leasing in this area would be somewhat more adverse than under either Alternative A or C because the timing of development and locations would be more constrained. However, this management is far less adverse than under Alternative B which closes almost all of the area to oil and gas leasing for the protection of greater sage-grouse. The oil and gas potential in the CSU portion of the MLP analysis area is low to none; therefore, the adverse impacts from MLP management in the area would likely be modest. The other aspects of MLP management such as protections for paleontological resources or Native American consultation could result in minor adverse impacts such as relocation of facilities. Requiring no more than 5 percent disturbance in the township in which a leased parcel in the Beaver Rim MLP is located until interim reclamation goals are achieved, would result in adverse impacts to oil and gas management but would not preclude full recovery of oil and gas. Designation of two ROW corridors through the MLP would beneficially impact oil and gas by expediting approval of needed utility and transportation grants. The limitations on disturbance would have more adverse impacts than under either Alternative A or C which have no similar management. The economic consequences of MLP management are anticipated to be limited given that oil and gas development is still allowed and the relative low potential for oil and gas in the area.

Wyoming air quality standards set limits on emissions, GHGs, and particulate matter from construction. Limiting emissions would adversely impact oil and gas development by slowing the pace of development and increasing the costs associated with mitigating emissions, as identified under Alternative A. Air quality management under Alternative D is the same as under alternatives A and C, except to the extent that the Lander Air Resources Plan (Appendix F (p. 1491)) requires more extensive modeling and collection of baseline data. Limits on emissions could adversely impact oil and gas by making exploration and development more expensive, including possibly limiting development because of limits on emissions.

Management of soil resources under Alternative D is similar to alternatives A and C, but would result in somewhat more adverse impacts to oil and gas development, because on slopes between 15 and 25 percent outside of DDAs, more roads and other developments might need to be relocated to avoid damage to soils. Alternative D would result in fewer impacts to oil and gas development from management of soil resources than Alternative B, which not only prohibits surface disturbance on slopes greater than 15 percent but also restricts development in soils with LRP outside of DDAs. While Alternative D (as well as alternatives A and C) would theoretically result in fewer adverse impacts to oil and gas development, it is likely to result in limited actual adverse impacts because of the low or no potential for oil and gas outside of DDAs. A primary area where the difference in impacts could be important is in the Green Mountain area. Requiring groundwater monitoring on a site-specific basis will adversely impact the oil and gas program by increasing costs and potentially limiting operations, depending on the results of monitoring. These impacts would be later in time and limited to projects where conditions required monitoring. Required Design Features to limit adverse impacts to soils would adversely impact oil and gas development by potentially increasing infrastructure cost, but would be offset to some degree by having smaller areas subject to interim and final reclamation. Required Design Features to reduce the spread of vectors of WNV would adversely impact soil resources, and therefore vegetation resources, to the extent that impoundment ponds are larger, deeper, and more permanent.

Water resource management under Alternative D, like Alternative A, would result in slightly fewer adverse impacts to oil and gas development than Alternative B, because road crossings in floodplains and riparian-wetland areas would be managed. However, the potential number of wells identified in these areas is relatively small. Requiring existing wells that were drilled before modern casing requirements to be assessed for potential to degrade groundwater quality could adversely impact re-completions, but because this management is subject to the provisions of 43 CFR 3162.3–2 “Subsequent Well Operations,” these impacts would be small and limited in effect.

Alternative D includes the same setback from riparian-wetlands as alternatives A and C (which has some additional flexibility). Therefore, adverse impacts to the oil and gas program would be the same as under Alternative A, slightly less than Alternative C, and less than Alternative B. However, this management is applied only in areas other than those with high and moderate potential for oil and gas, as identified under *Impacts Common to All Alternatives*. Generally, operators are able to accommodate riparian-wetland setbacks, so there would be limited adverse impacts. To the extent that Required Design Features limit surface disposal of produced water, there would be impacts to oil and gas operations, particularly in areas where produced water volumes are large. The extent of this impact cannot be fully analyzed except on a site-specific basis, because produced water varies geographically and geologically in the planning area.

Management of the Little Red Creek Complex near Dubois as non-WSA land with wilderness characteristics would not adversely impact the oil and gas program because there is no oil and gas potential in that area.

Alternative D management of fish, wildlife, special status plants, special status fish, and special status wildlife would adversely impact oil and gas development through closing areas to oil and gas leasing, and implementing major restrictions in the form of TLS, CSUs, and NSOs, as well as Required Design Features. To manage and protect sensitive species in the Dubois area, like Alternative B, Alternative D closes the area to oil and gas leasing. This closure would adversely affect oil and gas development in the Dubois area; however, the RFD identifies the area as having very low potential for oil and gas. Under Alternative D, approximately 66,661 acres with very low potential for conventional oil and gas are closed and 49,156 acres of with very low CBNG potential are closed. These closures reduce the potential number of new wells by 5.8 conventional and 4.2 CBNG wells. See the *Socioeconomic Resources* section for an analysis of the economic impacts associated with these closures.

Management for important wildlife values, including winter ranges for elk and mule deer, greater sage-grouse habitat, visual resources, cultural resources, and historic trails in the Lander Front-Hudson-Atlantic City area would adversely impact oil and gas through the use of NSO stipulations on new leases. In addition, timing limitations that are applied to crucial winter mule deer habitat are applied to all mule deer habitat. The extent of the adverse impact would likely be no more than moderate because the stipulations do not apply to the areas already leased, which include those areas with greater than very low oil and gas potential. Existing leases in production do not expire, so no adverse impacts to oil and gas from NSO management under Alternative D would continue in the future and would not limit secondary recovery or enhanced oil and gas recovery. Alternative D management is less adverse than Alternative B, which closes the area to oil and gas leasing. NSO management is a major constraint on oil and gas development. However, leasing is still allowed, and the NSO mineral estate could be accessed through directional drilling.

Alternative D manages areas identified as having high and moderate potential for oil and gas, including DDAs, using existing (Alternative A) management stipulations, except within the area

from Hudson to Atlantic City which is managed as NSO, a substantial adverse impact. Alternative D would impose more restrictions on oil and gas development associated with greater sage-grouse management in the Core Area than alternatives A and C, but fewer than Alternative B, depending on existing surface disturbance, regardless of which program caused the disturbance. While most areas with moderate and high potential for oil and gas are outside the Core Area, greater sage-grouse management would adversely impact existing and projected oil and gas development. The degree of this adverse impact can only be quantified on a site-specific basis, but management under Alternative D could result in the relocation of or limitations to oil and gas development because of existing, unreclaimed disturbance. For example, historic mining disturbances such as uranium mines where sagebrush habitat had not been restored would be included in the calculation for purposes of meeting the Alternative D 5-percent cap. This would be less adverse than the 2.5-percent cap under Alternative B, but more adverse than alternatives A and C.

Required Design Features to reduce impacts to greater sage-grouse (both inside and outside of Core Area) would adversely impact oil and gas development. However, the Required Design Features would not be applied to existing leases, and exceptions would be allowed if the lease holder were able to show that the Required Design Features would preclude development. Additional BMPs identified for the benefit of greater sage-grouse would adversely impact oil and gas if applied as COAs following site-specific analysis. The BMPs would be applied unless technically unfeasible; the adverse impacts to oil and gas would be analyzed in site-specific NEPA documents.

In many parts of the planning area, development activities are relocated for the protection of big game winter range, raptor nesting areas, parturition areas, and special status wildlife. However, resulting adverse impacts to oil and gas development under Alternative D would be more similar to Alternative A than to Alternative B outside the Core Area. Some beneficial impacts would result through the implementation of species-specific TLS for raptors compared to Alternative B, but the impact of this management is generally not considered a beneficial impact unless it results in changing overlapping TLS that would otherwise be NSOs. As under Alternative B, Alternative D expands seasonal protections for wildlife to include O&M activities when they would be detrimental to wildlife. This could result in an adverse economic impact to operators, but is not considered an adverse impact to the oil and gas program because development would not be precluded.

Cultural and paleontological resources management under Alternative D would adversely impact oil and gas development although with fewer adverse impacts than under Alternative B. Most other restrictions from cultural and paleontological resources protections would not be any more restrictive or result in any more impacts than those under alternatives A and B.

VRM adversely impacts oil and gas development, as addressed under Alternative A, and could result in substantial impacts in VRM Class I, II, and III areas. Alternative D includes the second most areas managed with VRM objectives that could adversely impact oil and gas development. This is especially true in connection with VRM objectives for Congressionally Designated Trails (discussed below under *Special Designations*). Areas south of the Green Mountain ACEC, including some of the proposed expanded ACEC under Alternative B, are NSO because of steepness of slope, but primarily because of visual resources impacts due to their highly prominent location.

4.2.4.3.5.3. Resource Uses

In general, management for the development of resource uses under Alternative D would not adversely impact oil and gas development, and there could be beneficial impacts in the form of increased infrastructure such as roads and powerlines built to support non-oil and gas resource use. The Alternative D application of seasonal limitations to mule deer winter habitat would be an adverse impact, particularly with regard to the limitation on O&M. However, this adverse impact would be limited to those areas with oil and gas potential, and much of the winter habitat is outside of the areas of likely oil and gas development or in areas that are closed for the benefit of other resources. However, in the greater sage-grouse Core Area, Alternative D restrictions on surface disturbance by other uses such as phosphate leasing, uranium mines, ROW, and extensive disturbance from rangeland improvement projects, would beneficially impact the oil and gas development program because those restrictions reduce the amount of newly disturbed acres that would be counted toward the disturbance cap applied to energy products such as oil and gas. Alternative D includes more areas closed to non-oil and gas surface disturbance for resource uses than Alternative A or C; therefore, Alternative D would result in more beneficial impacts to oil and gas development than Alternative A or C. The extent of this beneficial impact depends on the amount of development that might otherwise have occurred; these areas have little potential. Management of uranium under Alternative D, however, is far less beneficial to oil and gas than Alternative B, because moderate and high potential areas are not withdrawn under Alternative D and could be developed and counted toward the 5 percent surface cap. In areas such as near Green Mountain that contain both uranium and oil and gas potential and greater sage-grouse Core Area, uranium mining could be a limiting factor for oil and gas development. The State of Wyoming determined that development of the Lost Creek uranium mine that spans the Lander and Rawlins field office boundaries, and is located in Core Area, was not precluded by the Wyoming Governor's Core Area Executive Order. Development of uranium resources in the planning area is possible, although no Plan of Operations for a mine in Core Area has been received by the BLM as of the date of this document. However, two Plans of Operation are being analyzed under an EIS for uranium mining just outside Core Area, in lands that were determined to be not suitable for inclusion in Core Area because of previous uranium mining impacts to habitat. Both the existing disturbance and any disturbance authorized under these two Plans of Operation would be included in disturbance cap analysis.

In restricting road and ROW development, Alternative D would adversely impact oil and gas development by limiting the ability of operators to construct infrastructure and supply equipment needed to support their operations. The limits on these uses adversely impacts oil and gas development, although less so than the limits under Alternative B. Under Alternative D, the designation of almost as many ROW corridors as Alternative C is not necessarily a benefit to the oil and gas program if it limits the use of other ROW locations. However, BLM management preference to co-locate new ROWs near existing disturbance already would limit complete freedom of choice in ROW location. The Required Design Features described above for the benefit of greater sage-grouse would further limit ROW development and adversely impact oil and gas development. However, because the ROW restrictions are generally outside the areas of moderate to high potential for oil and gas, these adverse impacts are likely to be moderate, although higher than under either Alternative A or C.

Restrictions for handling produced water under Alternative D are the same as under alternatives A and C, which manage produced water in accordance with regulations in Onshore Oil and Gas Order Number 7, Disposal of Produced Water (Alternative A restrictions). This would result in

fewer adverse impacts to oil and gas development than Alternative B, which could make new development in areas with low and very low potential for oil and gas less likely. The costs of handling produced water could still make new discovery uneconomical or be a disincentive to develop, resulting in the loss of recoverable reserves. The Required Design Features associated with produced water identified above would adversely limit oil and gas development, but would not preclude surface disposal.

Management of resource uses that could limit oil and gas development include ROWs and corridors, livestock grazing, and recreation. As previously discussed, in the greater sage-grouse Core Area, any surface disturbance from resource uses that contributes to the 5 percent cap has the potential to adversely impact the oil and gas program by making it more likely that caps would preclude oil and gas development. The disturbance caps include disturbances not permitted by the BLM, such as disturbances on private or state lands and county roads.

Outside the greater sage-grouse Core Area, Alternative D impacts to the oil and gas program would be similar to the impacts identified for Alternative A although some Required Design Features apply outside of Core Area. Alternative D includes more acres closed for the benefit of recreation, which would result in the same adverse impacts to oil and gas development as those closures under Alternative B.

Under Alternative D, additional recreation areas and SRMAs would increase adverse impacts to oil and gas development. Recreation management under Alternative D limits mineral and realty actions within existing recreation sites identified in Alternative A and the following additional sites that are managed as closed to leasing: Castle Gardens Archeology Site (78 acres), Devils Gate Interpretive Site (112 acres), Martins Cove Trail (927 acres), Split Rock Rest Interpretive Site (242 acres), and Steamboat Lake Overlook (128 acres). These designated recreation sites are small and oil and gas resources could be developed through directional drilling techniques. Therefore, the impact to oil and gas development from management of recreation resource uses would be small. These recreation areas are in areas with very low or no potential for oil and gas; therefore, they would result in negligible impacts to overall oil and gas development in the planning area.

4.2.4.3.5.4. Special Designations

Under Alternative D, management of the NTMC would have adverse impacts to the oil and gas program through NSO management. However, these adverse impacts are limited by the extremely low oil and gas potential. The limited nature of these impacts is not a function of limits in technology, but because the geologic formations make it unlikely that oil and gas is present. Because of limited potential, the adverse impacts of NSO management would be very similar to the impacts under Alternative A, and much less adverse than under Alternative B.

Under Alternative D, resource values managed as special designations would adversely impact oil and gas development in the planning area depending on the type of special designation. In the existing ACECs redesignated under Alternative D, the adverse impacts would be the same as under Alternative A because the same oil and gas management is applied, except for the Dubois ACEC, which would be closed to oil and gas. These impacts are more adverse than Alternative C but limited in scope to those ACECs having more than very low oil and gas potential. In those ACECs that are expanded in size from under Alternative A, the adverse impact would be correspondingly greater. However, the adverse impact would likely be limited because the oil and gas potential in areas with ACECs is low to none, except for the Green Mountain ACEC. In the Dubois area, the impacts under Alternative D would be more adverse because the entire

area including the special designation areas are closed to leasing. In Dubois, the adverse impacts would be comparable to those under Alternative B. Alternative D manages two NWSRS-eligible waterways as suitable WSRs, but this would not adversely affect oil and gas development because only ¼ mile on each side of the segment is NSO for oil and gas. The NWSRS-eligible segments are in areas with low or no potential for oil and gas, but they likely could be directionally drilled to recover any oil and gas resources.

Alternative D expands the Green Mountain ACEC over Alternative A but less than Alternative B. The acres that were not designated under Alternative D would be managed as open to oil and gas subject to an NSO stipulation. For the Green Mountain ACEC, the adverse impacts to the oil and gas program would be the same under Alternative D as B.

Alternative D conducted an MLP analysis of the Beaver Rim area, a portion of which would be designated as the expanded Beaver Rim ACEC under Alternative B. The MLP analysis authorized leasing with surface occupancy but would provide additional protections for visual resources and Native American sacred sites. These resource protections would have moderately adverse impacts to oil and gas but much less adverse than the closure of the Beaver Rim area to oil and gas leasing under Alternative B.

4.2.5. Leasable Minerals – Oil Shale-Tar Sands

In 2008, the BLM released a PEIS for Oil Shale and Tar Sands (BLM 2008c) that amended existing plans for Wyoming and other states. The only areas of Wyoming addressed in the Programmatic EIS were the Washakie and Green River Basins in the southwestern part of the state. The southern edge of the planning area was included as oil shale-tar sands resources; however, the area identified is not considered economically feasible to produce. Additional evaluation and an RMP amendment would be required for the exploration, development, and leasing of oil shale in the planning area. Therefore, impacts to oil shale-tar sands from management of other resources are not analyzed. The same approach to leasing identified for coal leasing would be applied; that is, to determine if the application met the broad programmatic goals sufficiently to warrant being analyzed in an RMP amendment, or whether it would be denied without further analysis.

4.2.6. Leasable Minerals – Other Solid Leasable Minerals

The only solid leasable mineral with substantial occurrence and development potential in the planning area is phosphate. Therefore the discussion is restricted to that mineral. Phosphate is only present in the Permian-age Phosphoria Formation and equivalent beds that crop out along the eastern edge of the Wind River Range uplift. Smaller exposures of Phosphoria strata also occur in several isolated areas in the planning area where deformation has uplifted the host formation such as the Sheep Mountain and Conant Creek anticlines, Crooks Mountain near Happy Springs, the Owl Creek Mountains between Copper Mountain and Lysite Mountain, and other scattered areas east of the Wind River Range in the Dubois area.

4.2.6.1. Summary of Impacts

Phosphate resources occur in three main areas in the planning area, and impacts are clear where land use decisions have resulted in designations as either open or closed to solid mineral leasing. Impacts due to seasonal or CSU restrictions are less clear because there has not been any phosphate or other solid mineral leasing activity during the last planning cycle, and the

impacts of such restrictions are not understood. Unlike locatable minerals, the decision to make solid leasable mineral resources available for exploration and development at BLM discretion, and the intersection of areas closed or open to phosphate leasing with known areas of phosphate occurrence potential is paramount to understanding impacts to phosphate resources. The alternatives vary in the acres open or closed to phosphate exploration and leasing. Table 4.19, “Phosphate Potential” (p. 719) displays how many acres of mineral estate with phosphate potential are open or closed to phosphate leasing under the alternatives.

Table 4.19. Phosphate Potential

	Alternative A	Alternative B	Alternative C	Alternative D
Acres of Phosphate with Development Potential	42,291	42,291	42,291	42,291
Acres of Phosphate with Development Potential-Open	32,244	2,699	40,570	127
Acres of Phosphate with Development Potential-Closed	10,047	39,592	1,721	42,164
Source: BLM 2012a				

Phosphate potential (as defined under *Methods and Assumptions*) in the planning area comprises lands totaling 42,291 surface acres and 60,374 acres of subsurface mineral estate. Under Alternative A, approximately 9,600 acres are specifically closed in the National Natural Landmark (NNL) and the crucial elk winter range in the Red Canyon ACEC. Of this, 86 percent of the acres have phosphate potential. Alternative B closes 39,592 acres of land with phosphate potential (approximately 94 percent of the potential), while Alternative C closes only 1,721 acres. Alternative D would result in the largest adverse impact to developing the known phosphate resource, followed by Alternative B. Under the restrictions imposed under Alternative B, there is little likelihood that any exploration or development of phosphate resources would occur anywhere because most of the reserves would be precluded from development. Impacts to phosphate development under Alternative D are approximately that of Alternative B.

The 1,721 acres closed under Alternative C would not be likely to have any substantial bearing on the likelihood of phosphate development. For example, although the acreage of phosphate resource closure under Alternative A is more than under Alternative C, because the closure to phosphate development under Alternative A represents one specific area (Red Canyon) the likelihood of this closure resulting in any material impacts to phosphate development would be small to none.

4.2.6.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Solid mineral exploration activity can take place under either prospecting permits, an exploration license, or by acquiring a lease either by preference right or competitive bidding. Potential operators must obtain a prospecting permit, an exploration license, or a lease from the BLM Wyoming State Office before commencing operations. In the case of prospecting permits or exploration licenses, operators must submit a detailed exploration plan that meets the standards at 43 CFR 3505.45, and the exploration proposal must be analyzed under the NEPA process. Before performing any operations under any solid mineral lease, the operator

must submit an operating plan in accordance with 43 CFR 3592.1, and operations proposals must be analyzed under the NEPA process. The surface-disturbing activities allowed (short of an actual mine development) and the resulting impacts to resources are not necessarily, by definition, different under either method.

- Management resulting from the regulatory requirements for cultural resources and threatened and endangered species consultations is identical under all alternatives; these requirements are outside the realm of RMP decision making.
- The BLM issues prospecting permits to explore for leasable mineral deposits on lands where the BLM has determined that prospecting is necessary to determine the existence of a valuable deposit. Applications for prospecting permits are also subject to review for conformance to land use plans, environmental requirements, and unsuitability criteria; therefore, the BLM decision to approve a prospecting permit application is completely at BLM discretion. The total acreage allowed under a phosphate prospecting permit is limited to 2,560 acres; the BLM will not issue prospecting permits if the applicant's phosphate holdings in permits and licenses exceed 20,480 acres nationwide. Prospecting permits for phosphate are issued for an initial 2-year term and could be extended for up to 4 years. The permittee may only remove enough material to prove the existence of a valuable mineral deposit.
- A proven discovery of a valuable deposit of phosphate under a prospecting permit entitles the permittee to a preference right lease. The BLM issues the lease for a period of 20 years subject to readjustment at the end of the 20-year period. The BLM could reject a preference right lease application if it is determined that mining is not the preferred use of the lands in the application. In making this determination, the BLM considers land use plans, unsuitability criteria, any environmental impacts, the purpose of the statute under which the lands were acquired, and whether the surface-management agency (if not the BLM) does not consent to a lease.
- The BLM grants an exploration license only to explore known and unleased phosphate deposits to obtain geologic and environmental information about the deposits. Exploration licenses are granted for a period of 2 years and may not be extended. Upon expiration, the former licensee may apply for a new exploration permit. Exploration licenses confer no right to lease, regardless of the outcome of the exploration effort regarding discovery of phosphate mineralization. Similar to prospecting permits, the BLM decision to approve an exploration license application is completely at BLM discretion.
- Phosphate leases of any type are issued only for lands where the BLM has determined there is a valuable mineral deposit (e.g., in a known leasing area [KLA]), or where prospecting has proven the existence of a valuable mineral deposit. The availability of solid leasable minerals outside existing lease rights are subject to BLM discretion.
- In areas where fluid mineral leasing is stipulated with an NSO, it is assumed that solid mineral leasing would carry the same stipulations. Because exploration mostly requires occupancy of the surface, and surface mining is the preferred method of phosphate development because of the configuration of deposits in the planning area, any NSO stipulation would effectively close the area to phosphate exploration or mining.
- Competitive lease sales may be initiated by an expression(s) of interest or on BLM motion and are issued for areas where there is a known deposit of a valuable leasable mineral. Prospecting permits are not allowed in such areas, but exploration licenses may be granted. Areas held under a lease are limited to 2,560 acres, and lessees are limited to a maximum of 20,480 acres under permits and leases nationwide. Leases will not be issued for unsurveyed lands.
- The Phosphate Leasing Handbook (H-3510-1) states that permits shall not be issued to prospect in Congressionally designated wilderness areas or BLM WSAs, or in an ACEC. The handbook does not address the application of these restrictions to exploration licenses

or competitive leasing. However, the solid mineral leasing regulations (43 CFR 3503.10) state that the Secretary of the Interior may not lease lands the surface-management agency recommends for wilderness allocation, lands in BLM WSAs, or lands in Congressionally designated wilderness areas. Therefore, while not specifically mentioning ACECs, the BLM assumes that new competitive leases, because they can be issued only in KLAs, would not be within the boundaries of an ACEC. Any lease predating the designation of an ACEC would be subject to prior existing rights and would be valid. ACEC management, however, is required to address phosphate leasing for self-nominated parcels.

- Solid minerals development projects that meet certain thresholds in the BLM Department Manual (BLM 2008d), or would result in impacts that cannot be mitigated (making a Finding of No Significant Impact not possible), require NEPA analysis in an EIS. The cost of preparing an EIS is borne by the licensee, permittee, or lease applicant, as required by current cost-recovery regulations.
- Phosphate is the only solid leasable mineral specifically analyzed because there is little information about occurrence of other solid leasable minerals such as salts of sodium (e.g., trona) or potassium (potash). The restrictions and impacts to other solid leasable minerals from management of resources and resource uses are assumed to be the same restrictions and impacts to phosphate resources. All solid leasable minerals are managed under the same regulations and have the same requirements for development. However, specific impacts to solid leasable minerals other than phosphate cannot be determined because the occurrence of such minerals across the planning area is not clear. If the BLM receives applications for other solid leasable minerals, the agency would follow the process identified for coal leasing. That is, the agency would determine if the application warrants being considered for an RMP amendment or denied as not meeting the programmatic values identified for the area. Because phosphate is the only solid leasable mineral analyzed, the term “solid mineral leasable” in this document generally refers to phosphate.
- The occurrence potential for phosphate in the planning area as discussed in the Mineral Occurrence and Development Potential Report for the Lander Planning Area (BLM 2009b), is assigned a rating of high with a certainty level of D (H/D). However, only the following phosphate resources are considered to have phosphate potential for the purposes of this analysis: (1) the phosphate resources rated high in favorability and shown on Figure 4-1 of the Mineral Report and (2) the phosphate potential classified as surface resources south and southeast of the Wind River Indian Reservation (WRIR) boundary as shown on Figure 3-9 of the Mineral Report, which includes the part of the phosphate resource from the surface to a depth of 600 feet below land surface (Map 19).
- The potential for phosphate exploration and development is anticipated to be low for the next planning cycle because of the relative thinness of phosphate beds, thickness of overburden, low to moderate grade of phosphate (compared to viable deposits elsewhere in the western phosphate field), and distance to processing facilities in the planning area.

4.2.6.3. Detailed Analysis of Alternatives

4.2.6.3.1. Impacts Common to All Alternatives

The analysis of impacts from management decisions are limited to impacts to areas where solid mineral potential has been identified. Without potential being identified, the impacts from management cannot be analyzed.

Adverse impacts to exploration and development of solid leasable minerals could result when seasonal timing limitations apply for the protection of wildlife. The intensity of impacts is anticipated to vary by alternative and be proportional to actual demand. It follows that impacts would be potentially greater when there are restrictions on areas with high occurrence or potential than in areas of moderate to low occurrence or potential.

Restrictions on development of solid leasable minerals adversely impact exploration and development activities when locatable minerals are withdrawn because the Lander Field Office manages solid leasable minerals in the withdrawn areas as closed to leasing. The intensity of impacts anticipated from locatable mineral withdrawal vary by alternative and would be proportional to actual demand. It follows that impacts would be potentially greater when there are withdrawals in areas with high occurrence or potential than in areas of moderate to low occurrence or potential.

Beneficial impacts to solid leasable minerals result from management actions that open access to federal mineral estate, including allowing post-FLPMA withdrawals or segregations to expire without seeking new withdrawals or segregations.

Under all alternatives, activities related to solid leasable minerals prospecting, exploration, and development are subject to site-specific analysis before approval. Approval of such activities under any permit, license, or lease would require appropriate mitigation and site-specific reclamation based on a current mining and reclamation plan. Mitigation and a site-specific reclamation measures could prescribe certain activities or mitigation measures that could reduce the economic viability of a mining proposal and result in indirect adverse impacts to operators (e.g., the application of standard mitigation guidelines such as slope restrictions, riparian-wetland setbacks, and timing restrictions to protect BLM-sensitive species). These impacts would vary by alternative.

Under all alternatives, pre-FLPMA (1976) withdrawals do not expire and can be retired only through Congressional action. Accordingly, these withdrawals do not vary by alternative. Withdrawals protect other resource values or public investments (e.g., campgrounds) and these objectives are equally important when considering solid leasable minerals. These pre-FLPMA withdrawals are not addressed further in this section.

There are no designated WSAs in the planning area with phosphate potential.

4.2.6.3.2. Alternative A

4.2.6.3.2.1. Program Management

Alternative A closes approximately 10,047 acres to phosphate exploration and development, which would impact approximately 24 percent of the area with phosphate potential. This closure would prohibit prospecting permits, exploration licenses, and any type of leasing activity. Under Alternative A, the majority of land with phosphate potential would remain open to phosphate development activity.

4.2.6.3.2.2. Resources

For the protection of geologic and visual resources, Alternative A closes approximately 1,440 acres of land with phosphate potential in Red Canyon NNL.

Soil protections under Alternative A prohibit surface disturbance on slopes greater than 25 percent, which is approximately a 14 degree slope. Unless phosphate mining would occur entirely underground with no or minimal need for surface occupancy, small areas along the Wind River Range front would not be available to phosphate development due to slope restrictions. Most of the dip slope along the range front is situated at approximately 12 degrees, but the flanks of stream canyons exceed 25 percent; therefore, phosphate mining in these areas would be prohibited under Alternative A. In addition, approximately 10 percent of the Sheep Mountain and Conant Creek anticlines is effectively closed to surface activity due to slope restrictions under Alternative A.

Alternative A prohibits surface-disturbing activities within 500 feet of surface water, riparian-wetland areas, playas, and 100-year floodplains. These prohibitions would affect phosphate mining on the flanks of stream canyons along the Wind River Range front, but would have little impact on the Sheep Mountain or Conant Creek anticlines.

Alternative A specifically closes approximately 1,375 acres of land with phosphate potential in the Red Canyon area because of wildlife concerns related to elk crucial winter range. In addition, virtually all of the phosphate potential in the Dubois area along the Wind River Range front carries NSO stipulations for oil and gas, which apply to solid mineral leasing as well. Because of the mineral withdrawals in the Dubois area (Whiskey Mountain and East Fork) to benefit wildlife such as bighorn sheep and elk (see Table 4.15, “Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values” (p. 681) in the *Locatable Minerals* section), it is not likely that phosphate leasing would be allowed in these areas either.

Heritage/cultural concerns in areas with phosphate potential under Alternative A include a mineral withdrawal in Warm Springs Canyon of 557 acres. It is not clear whether this withdrawal specifically applies to solid mineral leasing, but because such leasing is discretionary, it is not likely that leasing would be allowed in withdrawn areas.

4.2.6.3.2.3. Resource Uses

There are very few resource uses that would adversely impact phosphate resource development. Management for locatable minerals has an undefined adverse impact on the availability of phosphate resources for exploration and development. The number of valid mining claims that encumber lands with phosphate potential is not known and frequently changes. However, because of the occurrence potential for locatable minerals which has little if any tie to the Phosphoria Formation, there is little coincidence of overlapping claims with phosphate resources.

Realty management under Alternative A has somewhat adverse impacts to the phosphate program in that there are no designated corridors in areas that would facilitate phosphate development and the South Pass, Lander Slope, and Red Canyon areas are avoided for major ROWs such as would be helpful to support phosphate mining. Although much of the Phosphoria Formation is accessible using existing county roads, limitations to protect ACEC values could result in adverse impacts. See the discussion below under special designations.

There are no recreation-related withdrawals or management actions that would impact this program area under Alternative A other than those common to all alternatives.

4.2.6.3.2.4. Special Designations

NWSRS-eligible waterway segments do not intersect areas with phosphate potential, with the exception of a few tens of acres along Baldwin Creek that already carry NSO stipulations. Impacts to phosphate development from WSR management under Alternative A would be low to none.

Under Alternative A, designation of ACECs does not specifically close areas to phosphate development. However, because of the extremely high coincidence of ACECs with lands carrying phosphate potential, and the NSO management for ACECs with phosphate potential, most land with phosphate potential in the planning area is unavailable for surface exploration or surface mining.

4.2.6.3.3. Alternative B

4.2.6.3.3.1. Program Management

Alternative B would result in the second most adverse impacts to phosphate development of all of the alternatives. Under Alternative B, 39,592 acres of surface estate are specifically closed to phosphate development in areas of phosphate potential. This is equal to 94 percent of the phosphate potential in the planning area.

4.2.6.3.3.2. Resources

Alternative B includes the same protection of the Red Canyon NNL as Alternative A, so the adverse impacts to solid mineral leasing are the same from this resource.

Soil protections under Alternative B include substantially more acres than Alternative A. Unless phosphate mining would take place entirely underground with no or minimal need for surface occupancy, most of the phosphate potential along the Wind River Range front would not be available to phosphate development due to the 15 percent slope restriction alone, because almost the entire dip slope along the Wind River Range front exceeds 15 percent. In addition, approximately 60 percent of the phosphate potential at Sheep Mountain and Conant Creek anticlines is effectively closed to surface activity under Alternative B due to slope restrictions, rather than 10 percent under Alternative A. Under Alternative B, all the Dubois area north of the WRIR with phosphate potential have NSO stipulations because of slope restrictions. Impacts from management in the Dubois area would differ little from those under Alternative A, because it is not likely that Alternative A would allow surface mining due to resource conflicts.

Alternative B manages the Little Red Creek Complex for wilderness characteristics and closes it to solid mineral leasing, which would result in more adverse impacts than Alternative A, which has no such limits. However, it is likely that under Alternative A the BLM would not authorize leases in the Little Red Creek Complex because of its proximity and overlap with the Whiskey Mountain ACEC.

Alternative B protections for riparian-wetland areas, while more stringent than Alternative A protections, would result in only slightly more adverse impacts because there is only a small increase in acreage compared to the total amount of phosphate potential away from riparian-wetland areas.

Wildlife management under Alternative B would result in more adverse impacts to solid mineral leasing than Alternative A because Alternative B limits development of roads in crucial winter range or parturition areas. However, this impact would be wholly contained in areas managed under Alternative B as special designations and closed to solid mineral leasing.

Heritage/cultural concerns in areas with phosphate potential under Alternative B include increased closure acreage in Warm Springs Canyon (totaling 834 acres), which would result in greater adverse impacts to the small amount of phosphate potential compared to Alternative A, which includes only 577 acres of withdrawal.

4.2.6.3.3.3. Resource Uses

Restrictions to phosphate development in areas of travel management are discussed above in relation to the resource values driving travel management decisions.

Under Alternative B, ROW management would have important adverse impacts to phosphate development because of the ROW exclusions surrounding most areas having phosphate potential. South Pass is closed to new ROWs which would limit the ability to develop phosphate leases. These impacts are relatively unimportant, however, because of Alternative B closes areas with potential for phosphate development. While leasing with some restrictions is possible under Alternative A albeit not likely, Alternative B would result in far more adverse impacts.

4.2.6.3.3.4. Special Designations

Although Alternative B manages more NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS than Alternative A, this difference is not substantial because all of the segments managed under Alternative B are in areas closed to solid mineral leasing through ACEC management.

Under Alternative B, ACEC management would result in substantially more adverse impacts to solid mineral leasing from closures in ACECs and NSO areas. The exact acreage that intersect phosphate potential is not calculated, but there would be substantially more adverse impacts to phosphate availability under Alternative B than under Alternative A. The adverse impacts in the Lander Slope, Red Canyon, and Whiskey Mountain areas would be similar to that of Alternative A because these ACECs remain the same in acreage. However, adverse impacts in the East Fork area would likely increase because more acreage would be unavailable under Alternative B. The biggest difference would be in the NHT and the greater sage-grouse ACECs, where there would be adverse impacts to a substantially larger area of phosphate potential because of the expansion of these ACECs under Alternative B. The 16-fold increase in acreage would likely adversely impact phosphate development proportionally in the area of phosphate potential from Schoettlin Mountain south to the planning area boundary.

4.2.6.3.4. Alternative C

4.2.6.3.4.1. Program Management

Alternative C would result in the fewest adverse impacts to phosphate development in the planning area of all the alternatives. Under Alternative C, only 1,721 acres of surface estate and 2,300 acres of subsurface mineral estate are specifically closed to phosphate development in

areas of phosphate potential. This results in almost the entire area of phosphate potential in the planning area being open to phosphate development activities.

4.2.6.3.4.2. Resources

Soil and riparian-wetland area protections under Alternative C are the same as under Alternative A, which is less adverse to solid mineral leasing than Alternative B. These prohibitions (due mostly to slope restrictions) would be exercised only on the flanks of stream canyons along the Wind River Range front and would result in little adverse impact, including in the Sheep Mountain or Conant Creek anticlines.

Adverse impacts to phosphate availability would be reduced under Alternative C compared to Alternative B, which closes most of the resource along the Wind River Range. The remaining restrictions due to wildlife concerns that could impact phosphate availability would not affect areas with phosphate potential, except for approximately 300 acres in various scattered places in the planning area.

There would be no impacts due to heritage/cultural concerns in areas with phosphate potential under Alternative C, a less adverse impact to phosphate development than Alternative A or Alternative B because the potential number of acres under Alternative C is very small (approximately 577 acres in the Warm Springs Canyon near Dubois).

4.2.6.3.4.3. Resource Uses

Under Alternative C, there would be no impacts to phosphate resources from recreation management because restrictions due to recreation protections would not intersect phosphate resources. There would be no impacts to phosphate availability from trails and travel management, because areas closed to motorized travel and with seasonal travel limitations would not coincide with areas of phosphate potential.

Alternative C would have the fewest limitations on phosphate development through ROW management. The South Pass area contains a designated ROW corridor and no limitation on other ROWs. Phosphate development and the infrastructure required for it would be beneficially impacted by ROW management, in contrast to the severe restrictions in Alternative B.

4.2.6.3.4.4. Special Designations

Under Alternative C, no NWSRS-eligible waterway segments would be recommended for inclusion in the NWSRS. Therefore, adverse impacts to phosphate availability, while small in these areas under any alternative, would be the smallest under Alternative C.

Alternative C does not contain any ACEC designations, which would result in a substantial beneficial impact to the availability of phosphate resources compared to Alternative B, effectively opening most of the highest-quality phosphate resources along the Wind River Range front.

4.2.6.3.5. Alternative D

4.2.6.3.5.1. Program Management

Alternative D would result in the most adverse impacts to phosphate development in the planning area of all the alternatives. Though the closed acreage is much greater under Alternative B, the affected phosphate resources are almost the same because of where specifically the closures occur under alternatives D and B. Under Alternative D, 42,164 acres of surface estate and 60,212 acres of subsurface mineral estate are specifically closed to phosphate development in areas of phosphate potential. All of the available phosphate resource in the Townships 40 and 41 (north of the Lysite DDA and the Dubois area) and the Lander Front-Hudson-Atlantic City area are closed to leasing; this includes almost all identified phosphate in the planning area.

4.2.6.3.5.2. Resources

In addition to limits on solid mineral leasing, resource protections for the benefit of other values would further limit phosphate development. Soils would be subject to about the same adverse impacts as under alternatives A and C, with slightly more adverse impacts to soils with slopes between 15 and 24 percent, where conditions over and above standard stipulations could be applied. These restrictions could require more mitigation or relocation of facilities, but would not necessarily preclude solid minerals leasing.

Protections of sole-source aquifers and groundwater recharge areas and other water quality and riparian-wetland protections would provide no additional limits on phosphate leasing, because all identified areas would already be closed to leasing for the protection of other resources because surface occupancy is not allowed. Alternatives A and C do not include these protections, and would result in fewer impacts.

The closure for the protection of wildlife and special status species under Alternative D includes the area managed under that alternative as non-WSA lands with wilderness characteristics, unlike alternatives A and C, which manage the Little Red Creek Complex with standard stipulations.

In addition to adverse impacts to solid mineral leasing for the protection of wildlife common to all alternatives, Alternative D would result in the same highly adverse impacts to solid mineral leasing as Alternative B by closing the Lander Front-Hudson-Atlantic City and other areas. Like Alternative B, impacts to solid mineral leasing under Alternative D would be somewhat more adverse than under Alternative A and substantially more adverse than under Alternative C, which allows solid mineral leasing with standard stipulations on 40,570 acres with phosphate potential.

Alternative D applies timing restrictions for the protection of spawning fish, but would not adversely impact solid mineral leasing. Therefore, Alternative D would not result in more adverse impacts than Alternative C, which applies no seasonal restrictions.

Although Alternative D includes the fewest restrictions on the use of chemical vegetation treatments in sensitive plant populations, this would not impact solid mineral leasing because leasing in areas with those plants would not be allowed under any alternative.

Wildlife management, including management for the protection of greater sage-grouse and other resource values (e.g., cultural and viewshed resources) would result in the same adverse impacts to solid mineral leasing as Alternative B, and substantially more than alternatives A and C. Core

Area management would apply to phosphate leases, but this would not, by itself, have any impact because phosphate potential in Core Area would be closed to leasing for broad resource values, rather than just limited to greater sage-grouse management.

Alternative D management of reptile habitat would be slightly more adverse to solid mineral leasing than Alternative A or Alternative C, and substantially less adverse than Alternative B, although reptile habitat outside of the broader resource protection area closed to phosphate leasing has not been mapped.

Alternative D management to protect the cultural resources in the Warm Springs Flume Site has the same adverse impacts to solid mineral leasing as Alternative B and fewer adverse impacts than alternatives A and C. Solid mineral potential is believed to be low, so there is little difference among the alternatives.

VRM could adversely impact solid mineral leasing on a site-specific basis. Alternative D manages 40,671 acres with phosphate occurrence potential that have VRM Classes I or II, which would make it unlikely that surface mining would be allowed. This is similar to the impact under Alternative B and slightly more adverse than the impact under Alternative A. All alternatives would result in substantially more adverse impacts than Alternative C, which manages 10,950 acres with phosphate potential with VRM Class IV.

4.2.6.3.5.3. Resource Uses

Differences in management of resource uses across the other alternatives appear to result in no difference in impact as compared to Alternative D because phosphate resources are not generally involved. For example, although Alternative D closes more acreage for recreation/interpretive sites common to all alternatives (same as Alternative B), these sites are not identified as having phosphate potential and this would be an adverse impact. Alternative D withdrawal of the Johnny Behind the Rock area would have the effect of closing the area to solid mineral leasing, but because there is no identified phosphate potential, there would be no adverse impact to solid minerals program.

Under Alternative D, ROW management would have similar adverse impacts to phosphate leasing as Alternative B, which are far more adverse than either Alternative A or C. Most of the ROW actions needed to support phosphate development would be precluded by Alternative D with the same adverse impacts as Alternative B. However, in light of the extensive closures of areas with phosphate potential to leasing in Alternative D, these additional ROW restrictions would not have further adverse impacts.

4.2.6.3.5.4. Special Designations

Alternative D manages the NTMC as closed to phosphate leasing. However, areas with phosphate potential would have been closed by the broad phosphate closure for the benefit of wildlife analyzed above.

Management of river segments suitable for inclusion in the NWSRS would result in no additional adverse impacts to the solid mineral program because the eligible segments are in areas closed to solid mineral leasing to protect other values.

Alternative D management of ACECs and the areas proposed as ACECs under other alternatives would result in more adverse impacts to solid mineral leasing than management under Alternative

A and substantially more than under Alternative C, and very similar to Alternative B. However, these areas would have been closed to solid mineral leasing to protect other values, even in the absence of ACEC designation.

4.2.7. Salable Minerals

Salable minerals (mineral materials) include sand, gravel, decorative stone such as common granite or moss rock, and other mineral materials not subject to mineral leasing or location under the mining laws. The BLM's principal authority to dispose of such materials is the Materials Act of 1947, as amended (30 U.S.C. 601 et seq.), which applies to sale and free use of the subject materials. The BLM has the most flexibility in managing mineral material disposals of any mineral activity because salable minerals are readily available throughout the planning area and conflict with other resources can generally be avoided while still meeting demand.

4.2.7.1. Summary of Impacts

Alternative B has the most adverse impacts to mineral material disposals because the most lands are closed to disposals. Alternative D has the next greatest impacts in that ACEC and other areas of importance to resources such as the portions of the Lander Front-Hudson-Atlantic City area outside of ACECs that are closed to disposal for the benefit of a broad range of resources. Alternative A has the next to the least adverse impacts. It does not specifically close ACECs to mineral materials disposal, but the BLM management approach is to disallow mineral materials developments because of incompatibility with management of other resource values, such as the designation of ACECs. Alternative C which places no restrictions on disposals other than standard stipulations has the fewest adverse impacts particularly with regard to ACECs in comparison to other alternatives. However, under all alternatives, it is anticipated that the demand for mineral material disposals will be satisfied although it may be necessary to transport the materials over a longer distance because more convenient sites are closed, particularly in Alternative B. Transporting mineral materials over longer distances would adversely impact other programs such as health and safety (more accidents), air quality (more vehicle emissions), and wildlife and livestock (more road kills), as well as substantially increasing the delivered cost of the material at the point of use.

Alternative C has the most beneficial impacts to mineral materials by allowing ROWs for roads and utilities in more areas and with fewer restrictions on size, which beneficially impacts access to mineral materials. It has the least restrictive VRM and the fewest protections for wildlife although its management of greater sage-grouse is the same as Alternative A. Alternative A has somewhat fewer beneficial impacts because of ACEC management. Alternative D has less beneficial impacts because resources such as greater sage-grouse, visual resources, and cultural properties are given emphasis in some areas and ACECs are closed to mineral material disposal as well as the Dubois area. Alternative B has the fewest beneficial impacts because so much of the planning area is closed to disposal.

4.2.7.2. Methods and Assumptions

This analysis is based on occurrence potential for mineral materials as identified in the Mineral Occurrence and Development Potential Report for the Lander Planning Area (BLM 2009b). “Potential” refers to the potential for or the presence (occurrence) of a concentration of one or more mineral resources. It does not refer to or imply potential for development and/or extraction

of the mineral resource(s). It does not imply that the potential concentration is or could be extracted profitably. The mineral potential classification system is based on the level of potential and the level of certainty of data supporting the possible existence of minerals. The level of potential is classified as None (O), Low (L), Moderate (M), High (H), or Not Determined (ND). The level of certainty is classified as A (lowest certainty), B, C, or D (highest certainty).

Implementation of management actions under the alternatives could result in impacts that open, limit, or deny access to and disposal of mineral materials from public lands in the planning area. Adverse impacts to mineral materials disposal could result from management actions that restrict or limit mineral materials disposals, or that place specific stipulations or mitigation requirements on development activity. Conversely, beneficial impacts to mineral materials disposal could result from management that encourages these activities by relaxing stipulations or opening areas to disposal. To the extent that management actions streamline the processing of applications, those actions would result in beneficial impacts, although this is not strictly an environmental impact.

In the planning area, land use decisions generally affect mineral materials disposal less than other non-mineral resources and other resource uses, primarily because of the ubiquitous nature of mineral materials occurrence and the relatively low demand for mineral materials from public lands. Most adverse impacts to mineral materials disposals are short-term (e.g., seasonal restrictions to protect wildlife, seasonal road closures, and delays resulting from the requirement for cultural resource surveys before the BLM issues permits. Long-term impacts include restricting or closing certain areas to mineral materials disposal to protect higher-value resources, or transferring federal mineral estate to private ownership through realty transfers or sales, thereby potentially removing the mineral materials resources from public access.

The BLM has discretionary authority to permit mineral materials disposals. It may choose to approve or disapprove such sales or permits, case by case, in the planning area. In accordance with regulations at 43 CFR 3601.10-11, the BLM will not dispose of mineral materials if it determines that the aggregate damage to public lands and resources would exceed the public benefits the BLM expects from the proposed disposal. Consistent with 43 CFR 3601.12, the BLM also will not dispose of mineral materials from wilderness areas, or other areas expressly prohibited by law, including national parks and monuments. The BLM also will not dispose of mineral materials from areas identified in land use plans as not appropriate for mineral materials disposal.

It is assumed that wherever NSO stipulations apply for oil and gas leases, the area is managed as closed to mineral materials disposals. This management was established in the 1987 RMP and carried forward. In all alternatives, it is assumed that if resource values exist that justify NSO for oil and gas operations, then mineral material disposal would be directed to another location.

Generally, a withdrawal closes lands to the exercise of discretion to dispose of mineral materials only if the Secretary of the Interior intends that result, usually by an express reference in the withdrawals. Case law has established that pre-FLPMA withdrawals or segregations that closed land to the operation of the public land laws, including the mineral leasing laws either expressly or by interpretation, also closed land to the Materials Act. Any other withdrawal or segregation has no impact on the Materials Act. Current BLM policy is to not use FLPMA withdrawals to close land to discretionary action, but to exercise this discretion through land use planning decisions. In any case, it is assumed for purposes of analysis that all mineral withdrawals apply to mineral materials disposals.

In most cases, demand for mineral materials during the planning period will be directly proportional to the rate of other resource development in a given area. Based on data collected

for the period 1989 through 2009, mineral materials disposals have averaged 183 acres per year throughout the planning area. This value is likely high because the data from this period include multiple large sales related to Abandoned Mine Land (AML) projects in the Gas Hills that will likely not be repeated. However, for purposes of analysis, it is assumed that the activity related to mineral materials disposals will continue at a similar rate for the next planning cycle because it would be speculative to arbitrarily reduce the activity by some amount, and other types of development (e.g., oil and gas and ROWs) are increasing.

The BLM does not guarantee access through private surface. Where the BLM cannot grant access across the public lands to a mineral materials site due to legal barriers such as ESA restrictions, the purchaser will need to obtain access through non-federal land.

The BLM will not sell soil that is essential for the growth of vegetation at the site of disposal.

There is potential for mineral materials occurrences across the planning area, and the principal mineral material occurrence types will continue to be sand and gravel, limestone, shale, granite, and to a lesser degree, moss rock. As discussed in the Mineral Occurrence and Development Potential Report (BLM 2009b) potential for occurrence and certainty level for these materials throughout the planning area is H/D. Known sand and gravel deposits with a rating of H/D are present particularly along major drainages, glacial deposits, and alluvial basins throughout the planning area (see Figure 3-17 of the Mineral Occurrence and Development Potential Report).

Known common-variety limestone in the Madison Formation or the Chugwater Group (Alcova Limestone) is rated H/D. Such occurrences are present along parts of the perimeter of the planning area.

Known common-variety granite is present over large areas, such as the Dubois area, South Pass, Sweetwater Canyon, Sweetwater Rocks, and Copper Mountain, and in these areas is rated H/D.

There are weathered rocks of sandstone, siltstone, limestone, or granite covered in part with lichens throughout the planning area. Sandstone and siltstone outcrops, primarily in the Flathead, Cloverly, Muddy, Frontier, and Mesaverde formations, are commonly considered to be moss rock if they are partially adorned with colorful lichens. In these formations, the occurrence potential and certainty level for moss rock is H/D. Based on current use at existing moss rock common use areas and negotiated sales sites, the potential for future commercial development of moss rock from federal mineral estate in the planning area is estimated to be high in areas where there are resources and those resources are available for disposal.

4.2.7.3. Detailed Analysis of Alternatives

4.2.7.3.1. Impacts Common to All Alternatives

Restrictions on development of mineral materials could adversely impact exploration and development activities when closures or prohibitions to surface-disturbing activities apply, because the mineral materials could not be accessed. The intensity of impacts would vary by alternative and be proportional to actual demand. It follows that the impacts would be potentially larger when closures or prohibitions fall on areas with high occurrence or potential than in areas of moderate to low occurrence or potential.

Management actions common to all alternatives that would adversely impact mineral materials include continuing to maintain all pre-FLPMA withdrawals and segregations that closed land to operation of the public land laws, including the mineral leasing laws, either expressly or by interpretation (see *Methods and Assumptions*). The *Lands and Realty* section in Chapter 3 lists these areas, and they are not further analyzed because they do not vary by alternative.

Under all alternatives, the requirement for cultural resources and threatened and endangered species consultations would be maintained as these regulatory requirements are outside the realm of RMP decision making.

Under all alternatives, new mineral materials disposals in areas open to mineral materials disposal are subject to site-specific analysis before approval. Approval of mineral materials disposals would require appropriate mitigation and site-specific reclamation based on a current mining and reclamation plan. Mitigation and a site-specific reclamation requirements could prescribe certain activities or mitigation that could reduce the economic viability of mineral materials disposals and result in indirect adverse impacts to mineral materials disposals (e.g., the application of standard mitigation guidelines such as slope restrictions and riparian-wetland setbacks, and timing restrictions to protect for BLM-sensitive wildlife species).

Case law has established that there is no authority for the Secretary to make sales of mineral materials from unpatented mining claims under the provisions of the Surface Management Act of 1955. Therefore, mining claims could adversely impact the availability of mineral materials disposals if the BLM was not successful in contesting the validity of such mining claims by establishing the lack of discovery if a valuable mineral deposit.

Management of WSAs is the same under all alternatives in regards to the management of salable minerals; all WSAs are closed to mineral materials disposal. This would adversely impact mineral materials availability, and some areas, such as Sweetwater Rocks and Sweetwater Canyon, contain large quantities of igneous rock material (primarily granite) that is off limits to disposal. In addition, Copper Mountain includes some rock formations of varying color and texture that could be desirable as decorative stone. These adverse impacts are not further analyzed because they do not vary by alternative.

Mineral materials availability decisions, such as the designation of common use areas, result in beneficial impacts to the availability of mineral materials. All alternatives continue existing common use areas, including the Little Popo Agie, Diamond Springs, and Agate Flats common use areas, which in total designate 262 acres of surface estate available for streamlined “over-the-counter” disposals. There are no community pits identified under any alternative, but it is likely that this would be allowed under all alternatives; no decision under an RMP revision is required for such designations.

4.2.7.3.2. Alternative A

4.2.7.3.2.1. Program Management

Alternative A continues management of resources on BLM-administered surface and subsurface mineral estate in the planning area under the 1987 RMP. Through land use planning decisions, Alternative A only specifically closes areas to mineral materials disposal that are withdrawn from the mining laws under pre-FLPMA or post-FLPMA withdrawal orders (assuming that mineral

withdrawals will continue to be maintained), areas closed to oil and gas development (Whiskey Mountain and East Fork), and two areas closed to phosphate development in Red Canyon.

ACECs and other special designations do not necessarily close areas to mineral materials disposal under Alternative A, but management under Alternative A generally specifies that mineral materials disposals are incompatible with the values managed under those special designations, effectively rendering those areas closed to mineral materials disposals.

As discussed under *Methods and Assumptions* and the *Impacts Common to All Alternatives*, withdrawals and segregations might or might not contain express language to close lands to mineral materials disposal, but existing management under Alternative A specifies that mineral materials will be provided “on a demand basis and consistent with the limitations and restrictions imposed on oil and gas, locatable minerals, and phosphate exploration and development in the planning area”, thus effectively closing these areas to mineral materials disposals. Therefore, other than areas under mineral withdrawal or segregation, special designations, or areas specifically closed to leasable minerals (see Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45)), the entire planning area is open to mineral materials disposals case by case consistent with the limitations and restrictions imposed on oil and gas, locatable minerals, and phosphate exploration in the planning area.

Alternative A closes a total of 229,014 acres of surface estate.

4.2.7.3.2.2. Resources

Soil-related adverse impacts to mineral materials disposals include prohibitions in areas where slopes are greater than 25 percent. These areas represent approximately 182,345 acres in the planning area. Alternative A does not address soils with LRP.

Riparian-wetland area restrictions under Alternative A prohibit mineral materials disposals within 500 feet of surface water and riparian-wetland areas. These areas represent 102,361 acres of surface estate.

Wildlife-related impacts under Alternative A include restrictions such as closures, NSOs, and timing and surface-use restrictions. Greater sage-grouse leks are considered NSO on or within a ¼-mile buffer around occupied leks, and under Alternative A would result in closures of 16,283 acres of surface. This would adversely impact mineral materials disposals. In addition, surface-disturbing and surface-disruptive activities are to be avoided in greater sage-grouse nesting habitat within 2 miles of occupied leks from February 1 through July 31. This stipulation would adversely impact the availability of mineral materials from new surface disturbance by constraining activities to only a few months out of the year in these areas, which total 794,452 acres of surface estate. This is an economic and convenience issue for the applicant rather than an adverse impact that closes the areas.

Alternative A greater sage-grouse management increases the likelihood the species would be listed under the ESA because a ¼-mile buffer and a 2-mile buffer area are less than the science recommends, and because other program management that contributed to a downward trend in greater sage-grouse populations is continued. Listing would result in fewer potential impacts to the mineral materials program than to the locatable minerals program because the BLM's ability to control locatable mineral development is more limited even though it must comply with the ESA.

Other protections for special status wildlife and plants under Alternative A could result in delays or timing restrictions case by case, which would adversely affect the availability of mineral materials. Total acres of crucial winter range for all species that carry timing and distance restrictions include 605,898 surface acres (identical across all alternatives). In addition, mineral materials disposals are seasonally avoided in elk winter range (166,525 surface acres). Surface-disturbing and disruptive activities related to mineral materials disposals are prohibited within $\frac{3}{4}$ mile of active raptor nests (301,237 surface acres). Surface-disturbing activities are also avoided in pygmy rabbit habitats and prairie dog colonies, which would adversely impact the disposal of mineral materials.

Management under Alternative A states that mineral materials disposals could also be restricted or prohibited for the protection of important heritage/cultural/historic sites case by case.

4.2.7.3.2.3. Resource Uses

Alternative A does not identify recreation-related withdrawals or segregations other than the pre-FLPMA withdrawals and segregations common to all alternatives.

The ROW program under Alternative A would offer few adverse impacts to mineral material sales. The areas that are avoided for new ROWs would be of little desirability for source material. In most places in the Lander Field Office with resources that are in close proximity to areas of use, there would not be a conflict with authorizing the purchaser to access the material.

Restrictions to mineral materials disposals in areas with travel management are discussed in relation to the resource values driving the travel management decisions.

4.2.7.3.2.4. Special Designations

Interim management for NWSRS-eligible waterway segments under Alternative A would protect free-flowing characteristics, but would not result in adverse impacts to mineral materials disposals in and of themselves because they are subject to other management to protect various resources. These areas do have mineral materials potential, including large quantities of granitic rock for decorative or aggregate use in Sweetwater Canyon, but this area is within a WSA and is managed according to BLM Manual 6330, *Management of Wilderness Study Areas*.

Special designations such as ACECs, WSAs, and Congressionally Designated Trails, adversely impact the availability of mineral materials. Consistent with 43 CFR 3601.10-11, under Alternative A, these areas, while not expressively closed to mineral materials disposals, are managed to effectively prohibit mineral materials disposals where such disposals would be inconsistent with the values the special designations are designed to protect. Under Alternative A, 119,622 acres are under ACEC management and therefore effectively unavailable for mineral materials disposal.

4.2.7.3.3. Alternative B

4.2.7.3.3.1. Program Management

Alternative B emphasizes conservation of physical, biological, heritage, and visual resources, with constraints on resource uses. Compared to other alternatives, Alternative B conserves the most land area for physical, biological, and heritage resources; designates the most ACECs; and is the

most restrictive to motorized travel and mineral development. Management actions for resources that restrict, prohibit, or limit mineral materials disposals would result in adverse impacts by preventing or substantially restricting development in these areas. Under Alternative B, adverse impacts to mineral materials would generally be much larger than under alternatives A and C.

Closure of public lands to mineral materials disposals would result in impacts similar to those under Alternative A, although to a greater degree because more land is closed, and more land is specifically closed when included under a special designation (e.g., ACEC, WSA, Congressionally Designated Trails, or WSR). Alternative B represents the greatest adverse impact to the mineral materials program due to mineral estate closures totaling 2,208,943 acres, the most of any alternative. Sufficient area remains open to mineral materials disposals under Alternative B to meet demand, but applicants might need to travel long distances at greater expense to obtain the materials.

4.2.7.3.3.2. Resources

Soil-related restrictions under Alternative B are greater than under Alternative A. Alternative B closes 413,670 acres to mineral materials disposals, more than twice the 182,345 acres under Alternative A. In addition, Alternative B closes 86,735 surface acres in areas with LRP soils; Alternative A avoids, but does not close, areas with LRP soils. It is not likely that the BLM would allow mineral materials disposals in some of the areas closed under Alternative B but open under Alternative A out of concern for impacts to other resources, but that would be addressed in site-specific analyses.

Riparian-wetland area restrictions under Alternative B prohibit mineral materials disposals within 1,320 feet of surface water and riparian-wetland areas totaling 227,764 acres of surface estate in the planning area. Alternative A only requires 500-foot setbacks. Therefore, acres of available surface estate that would be adversely impacted for mineral materials disposals would approximately double under Alternative B compared to Alternative A.

Wildlife-related impacts to mineral materials availability are largest under Alternative B and include restrictions such as closures, NSOs, and timing and surface-use restrictions. Adverse impacts to mineral materials disposals due to greater sage-grouse concerns increase in acreage under Alternative B because the buffer of NSO is increased to 0.6 mile around occupied leks, resulting in closures of 93,410 acres of surface estate (a minor increase over Alternative A).

Under Alternative B, other protections for special status wildlife and plants could result in delays or timing restrictions case by case. This would increase applicant costs and therefore have some impact on the applicant or decrease the likelihood for some operators to pursue development, but would not preclude the mineral materials disposals at the same time of the year.

Restrictions due to raptor concerns under Alternative B would result in the largest impacts to mineral materials disposals because buffers around active raptor nests would be twice the size of those under Alternative A (1.5 miles versus $\frac{3}{4}$ mile). Therefore, surface-disturbing and disruptive activities related to mineral materials disposals under Alternative B are subject to timing stipulations on 781,643 surface acres, which is more than twice as restrictive as Alternative A. Alternative B also avoids surface-disturbing activities in pygmy rabbit habitats and prairie dog colonies, which would adversely impact mineral materials disposals.

Mineral materials disposals under Alternative B could be restricted or prohibited for the protection of important heritage/cultural/historic sites case by case. Under Alternative B,

more acres of surface estate would be unavailable for mineral materials disposals due to heritage/cultural/historic sites compared to Alternative A. This would result in greater adverse impacts to mineral material availability.

4.2.7.3.3. Resource Uses

Alternative B would result in the most adverse impacts to the availability of mineral materials from resource uses compared to the other alternatives.

While Alternative B's ROW management has adverse impacts to mineral material disposals because of limits on the location of ROWs and roads, the more adverse impacts would come from program management and the extensive areas closed to mineral material disposals under this alternative.

Under Alternative B, recreation management emphasizes protection of resources and recreational experiences, and includes more restrictions on resource uses than the other alternatives. Under Alternative B, a total of 2,208,943 surface acres are closed to mineral materials disposal. Alternative B adversely impact mineral materials disposals approximately nine times more than Alternative A.

Recreation-related withdrawals or segregations under Alternative B that apply to mineral materials disposal (based on presumed intent of the withdrawal/segregation order) apply to 169,774 acres (see Table 4.15, "Acreage of Withdrawals for the Benefit of Habitat, Cultural or Recreational Values" (p. 681) in the *Locatable Minerals* section) more than the acres common to all alternatives, which is the most of any alternative. The increase of closed acreage under Alternative B is due partially to the addition of interpretive sites such as Castle Gardens; and NHT sites such Devil's Gate, Martin's Cove, and Split Rock Rest; RMZs such as The Bus @ Baldwin Creek and Sinks Canyon; and SRMAs such as the Dubois Mill Site and Sweetwater Rocks.

Expanded recreation management under Alternative B, such as the designation of additional SRMAs, would increase adverse impacts to the availability of mineral materials compared to Alternative A. The three SRMAs under existing management (Alternative A) are not specially managed to preclude mineral materials disposals. Under Alternative B, seven SRMAs are designated and carry NSO restrictions that effectively close 307,183 acres in these areas and therefore would result in more adverse impacts to mineral materials availability.

Alternative B also designates seven RMZs within the SRMAs. These are zones where management is more finely tuned toward a specific outcome. Because these RMZs are within the SRMAs, they do not represent impacts to mineral materials availability additional to the impacts from management under the SRMAs. Neither Alternative A nor C designates RMZs.

Under Alternative B, 13 Extensive Recreation Management Areas (ERMAs) are designated to address local recreation issues (in addition to general Lander ERMA that does not address specific management). These areas total 799,504 acres that would impact the availability of mineral materials; management in these areas would avoid mineral materials development because it would be incompatible with recreation management objectives.

Alternative B has the far more adverse impacts to mineral materials disposals because of travel management limitations in comparison to Alternative A.

4.2.7.3.3.4. Special Designations

Alternative B manages mineral actions within 5 miles of each side of NHTs with NSOs and stronger restrictions (i.e., closed to mineral materials disposals) unless the proposed project would not be visible from the NHTs. This would result in substantially larger adverse impacts to mineral materials availability than management under Alternative A, which requires closures to mineral materials disposals within ¼ mile of the NHTs. Alternative B would be particularly more adverse because it precludes disposals in areas that have historically been in high demand. In addition, mineral materials disposals are prohibited 45,394 along the CDNST (in the Sweetwater Mining RMZ) under Alternative B. There is no similar action under Alternative A.

Under Alternative B, the BLM closes all 8 WSAs to motorized and mechanized travel, which, considering the need for motorized equipment to mine and transport mineral materials, would effectively result in closures to mineral materials disposals. This would not result in more adverse impacts than Alternative A, because the acreage and management are the same under alternatives A and B.

The retention and expansion of existing ACECs and the addition of several new ACECs under Alternative B would result in more adverse impacts to mineral materials disposals than Alternative A. Alternative B includes 15 ACECs – nine existing areas (five of which the BLM proposes to expand) and six new ACECs. Management in ACECs would preclude mineral materials disposals. Under Alternative B, total acreage in ACECs is 1,492,990, more than the 119,622 acres in ACECs under Alternative A.

Alternative B WSR management would adversely impact mineral material disposal more severely than Alternative A because all eligible waterways would be closed to disposals.

4.2.7.3.4. Alternative C

4.2.7.3.4.1. Program Management

Alternative C emphasizes resource uses and reduces constraints on resource uses to protect physical, biological, heritage, and visual resources. Compared to other alternatives, Alternative C conserves the least land area for physical, biological, and heritage resources and is the least restrictive to motorized vehicle use and mineral development. Under Alternative C, closures would adversely impact 141,409 acres of surface estate, substantially less than under Alternative B, which closes 2,208,943 acres of surface estate to mineral materials disposals. Alternative C closes approximately half the acreage of Alternative A.

4.2.7.3.4.2. Resources

Alternative C management actions for resources such as soil, riparian-wetland areas, and wildlife that restrict, prohibit, or limit mineral materials disposals would result in adverse impacts by preventing or substantially restricting development. Under Alternative C, adverse impacts to mineral materials availability would be slightly less than under Alternative A and much less than under Alternative B.

Alternative C protections for riparian-wetland areas would adversely impact mineral materials availability less than Alternative B because of the difference in riparian-wetland setbacks.

Alternative C riparian-wetland setbacks are the same as Alternative A, unless less distance would protect the riparian-wetland area.

Wildlife-related impacts to mineral material availability would be much less under Alternative C than under Alternative B and Alternative C would have similar impacts compared to Alternative A. Similar to the other alternatives, Alternative C avoids surface-disturbing activities in pygmy rabbit habitats and prairie dog colonies, which would adversely impact the availability of mineral materials since it would diminish the likelihood that management would approve a disposal in those habitats. This acreage would be determined on a site-specific project basis.

Mineral materials disposals under Alternative C could be restricted or prohibited for the protection of important heritage/cultural/historic sites case by case, but no new areas are identified other than the ones common to all alternatives. This would result in fewer adverse impacts to mineral materials disposals than Alternative B, and similar to but fewer than Alternative A.

4.2.7.3.4.3. Resource Uses

Alternative C would result in the fewest adverse impacts to the availability of mineral materials from resource uses compared to alternatives A and B.

Under Alternative C, management of ROWs would have no adverse impacts to mineral material sales. It would be far more beneficial than Alternative B and somewhat more beneficial than Alternative A.

Protections for recreation-related resource uses under Alternative C result in a total 59,992 acres of surface estate with NSO or stricter management, which would close these areas to mineral materials disposals. This is less adverse to mineral resources than either Alternative A or B. Recreation management under Alternative C includes the designation of only one SRMA.

Alternative C designates only one ERMA, with no restrictions on mineral materials disposal, which would result in a far smaller adverse impact than Alternative B which has recreation management that limits disposal.

Alternative C has the fewest adverse impacts on mineral materials disposals as a result of travel management limitations.

4.2.7.3.4.4. Special Designations

Under Alternative C, adverse impacts to mineral materials availability would be substantially fewer than the other alternatives, particularly Alternative B.

Alternative C manages the entire CDNST as an ERMA and designates ¼ mile on either side of the trail as an NLCS landscape (both of which generally result in a goal of avoiding incompatible activities), while Alternative B closes 5 miles on either side along most of the CDNST. Under Alternative A, the entire CDNST is included in an SRMA, but there are no allowable use decisions for the area. Therefore, regarding the CDNST, Alternative A would result in the smallest impact to mineral materials availability.

As under Alternative A, Alternative C manages mineral and realty actions within ¼ mile of each side of the NHTs as closed to mineral materials disposals which is far less adverse than

Alternative B's 5-mile buffer. A large portion of this area is included in the greater sage-grouse ACEC under Alternative B.

Alternative C does not recommend any of the nine NWSRS-eligible waterways as suitable for inclusion in the NWSRS.

Alternative C does not designate any ACECs, as opposed to the nine ACECs under Alternative A and the new and expanded ACECs under Alternative B.

4.2.7.3.5. Alternative D

4.2.7.3.5.1. Program Management

Alternative D emphasizes a mixture of resource uses and protections of physical, biological, heritage, and visual resources. Although less restrictive of mineral material disposals than Alternative B, all ACECs are closed to disposals as are the lands in the Lander Front-Hudson-Atlantic City area outside of ACECs. Additional lands are closed because of proximity to greater sage-grouse leks and the Dubois area. In total, 956,011 acres are closed to disposals which is the second largest closure of the alternatives; 1,853,090 acres are available for disposal subject to a site-specific analysis.

4.2.7.3.5.2. Resources

Alternative D management to protect soils would result in the same adverse impacts as alternatives A and C, with slightly more adverse impacts in soils with slopes between 15 and 24 percent, where conditions over and above standard stipulations could be applied. These restrictions could require more mitigation or relocation of facilities, but will not preclude mineral materials disposals. In any case, the prevalence of mineral material occurrences should mitigate most adverse impacts to mineral materials disposals from slope restrictions.

Under Alternative D, adverse impacts to mineral materials disposals from protections of sole-source aquifers and groundwater recharge areas would be the same as under Alternative B. Although alternatives A and C do not prohibit disposals in groundwater resource areas, disposals would likely be denied on a site-specific basis because of the extremely flexible management the BLM uses to manage mineral materials.

Outside of areas closed to disposal for other resource values, Alternative D would result in the same adverse impacts to mineral materials disposals from management to protect water quality as Alternative A because floodplains and riparian-wetland areas are closed to surface occupancy. This could represent a substantial adverse impact to sand and gravel disposals because floodplains and riparian-wetland areas usually have prime occurrence potential for materials of this type. Floodplain and riparian-wetland management under Alternative D would result in very small adverse impacts to other types of mineral materials. In general, however, management under Alternative D for these resources would result in more adverse impacts to mineral materials disposals than management under Alternative C, but fewer than management under Alternative B. See Chapter 2 for a comparison of the areas closed to mineral materials disposals under each alternative.

Alternative D management to protect lands with wilderness characteristics would result in more adverse impacts to mineral materials disposals than Alternative C but no more than would be

closed in any case because all of the Dubois area, including the Little Red Creek Complex, is closed to mineral materials disposals, which would result in the same adverse impacts as Alternative B. Under Alternative A it is unlikely that the BLM would authorize mineral materials disposals in the Little Red Creek Complex because of its proximity to the Whiskey Mountain ACEC and WSA and the high resource conflict. With respect to these resources, there is little difference among alternatives A, B, and D in their potential adverse impacts to mineral materials disposals compared to Alternative C, which would not result in adverse impacts because disposals are allowed. In any case, the demand for such disposals in the Little Red Creek Complex is low.

In addition to the adverse impacts to mineral materials disposals from the protection of wildlife common to all alternatives, Alternative D would result in the same moderate adverse impacts to mineral materials disposals as Alternative A by avoiding roads in big game crucial winter range and parturition areas. The timing restrictions that are applied to crucial winter mule deer habitat have been extended to mule deer winter habitat. This is a minor timing matter and has little adverse impacts to the program. This management limits the areas available for disposals and could limit demand for mineral materials. This would be less adverse than the Alternative B more restrictive approach to road building, but moderately more adverse than Alternative C.

Alternative D applies timing restrictions for the protection of spawning fish, but this would not adversely impact mineral materials disposals. Therefore, Alternative D would not result in more adverse impacts than Alternative C, which applies no seasonal restrictions.

Although Alternative D imposes fewer restrictions on the use of chemical vegetation treatments in sensitive plant populations, this would not beneficially impact mineral materials disposals because surface mining in areas with such plants would not be allowed under any alternative.

Alternative D management for protection of wildlife including greater sage-grouse and other resources, including cultural and viewshed, would result in fewer adverse impacts to mineral materials disposals than Alternative B, but many more than alternatives A and C. Alternatives B and D close the area within 0.6 mile of leks to surface disturbance, including surface mining of leasable minerals, and many other areas for resource protections, including wildlife. (The current demand for mineral materials in the Dubois area is not well known and has been generally limited to sand and gravel in several designated pits in the Overlook area.) Alternatives A and C close 16,283 acres. Alternative D would be somewhat less adverse than Alternative B in the amount of surface disturbance allowed both inside and outside greater sage-grouse Core Area because Alternative B applies limits to all disturbance, including mineral materials disposals. However, disturbance limits under Alternative D do not apply to mineral materials disposals, rangeland improvement projects, or other ROWs and are limited geographically to the Core Area. Outside the Core Area, Alternative D restricts surface disturbance to within ¼ mile of leks. This reduces the areas protected from surface disturbance outside the Core Area in comparison to Alternative B. Alternative D also places fewer restrictions on the height of objects in the Core Area.

Alternative D management of reptile habitat would be slightly more adverse to mineral materials disposals than Alternative A or C, and much less adverse than Alternative B. Mineral material potential has not been mapped for reptile habitat.

Cultural resource management of Cedar Ridge and Castle Gardens Traditional Cultural Properties (TCPs) and the Regional Historic Trails and Early Highways (RHT&EHs) are analyzed under *Special Designations*.

VRM could adversely impact mineral materials disposals on a site-specific basis. Alternative D manages 25 percent more of the planning area than Alternative A as VRM Classes I and II, which would make it unlikely that mineral materials disposals would be allowed unless visual intrusions could be mitigated by terrain. However, only a portion of this acreage has potential for mineral materials. This would result in impacts similar to Alternative B and slightly more than Alternative A. All alternatives would result in more adverse impacts than Alternative C, which manages more acreage as VRM Class IV. Depending on site-specific situations, mineral materials disposals could be authorized in VRM Class II and III areas if analysis in accordance with BLM guidance determined that the contrast would be acceptable. It is not possible to quantify the differences in adverse impacts to mineral materials disposals among alternatives.

4.2.7.3.5.3. Resource Uses

ROW management under Alternative D would have some long-term adverse impacts to mineral material disposals because of limitations on where new ROWs could be located which would make some areas more difficult to access than under Alternative A. However, the more important adverse impacts are the result of the areas that are closed to sales in this alternative. The areas that are open for sales would likely be able to be reached by ROWs although it is possible that some areas would remain inaccessible.

Alternative D specifically closes acreage related to recreation/interpretive sites in addition to closures common to all alternatives (the same as Alternative B). However, it is likely that this adverse impact to mineral materials disposals would also be the same as under alternatives A and C because the BLM would likely deny a disposal in these areas because of the traditional recreation-related use of the areas. Although Alternative C emphasizes resource uses, there are so many other sources for materials that the BLM would likely deny disposals in developed interpretive sites.

4.2.7.3.5.4. Special Designations

Management under Alternative D to protect values associated with Congressionally Designated Trails in the NTMC would more adversely impact mineral materials disposals than alternatives A and C, but less than Alternative B. Additionally, other resource values in the NTMC contribute to more restrictions in the corridor. The adverse impacts to the mineral material disposal program from Alternative D management would be somewhat limited, because disposals would be allowed if the VRM objectives were met.

Management of river segments suitable for inclusion in the NWSRS would result in no additional adverse impacts to the mineral materials program because these segments are in areas otherwise closed to disposals to protect other values.

Alternative D management of ACECs and of the areas proposed as ACECs in the other alternatives (but not carried forward in Alternative D) would result in more adverse impacts to mineral materials disposals than management under Alternative A, substantially more than under Alternative C, and less than under Alternative B. See Chapter 2 for acres closed to mineral materials disposals under each alternative. The primary difference between Alternative B and Alternative D regarding adverse impacts to mineral materials disposals is that, while lands in the Lander Front-Hudson-Atlantic City area (including the Twin Creek ACEC under Alternative D) are closed to mineral materials disposals under both alternatives, Alternative B closes more area to mineral materials disposals in the proposed Government Draw/Upper Sweetwater Sage-Grouse

ACEC. The closures in the Government Draw/Upper Sweetwater Sage-Grouse ACEC are not included in management under Alternative D because mineral materials disposals are not subject to the surface disturbance limitations applied to oil and gas leasing and energy projects.

4.3. Fire and Fuels Management

This section describes potential impacts to fire and fuels management from management actions for other resource programs. Restrictions on fire and fuels management are considered direct impacts. Indirect impacts from alternatives include actions resulting in a change in risk or incidence of wildland fires; size, intensity, or destructive nature of wildland fires; fire-suppression costs; and fuel loading.

Fire plays an important and natural part in ecosystem function; however, a number of factors have altered the natural fire regime in the planning area. Although alteration of the natural fire regime is considered an adverse impact to fire ecology, actions contributing to an increase in the incidence of wildland fires or limiting the ability to effectively fight wildland fires are considered adverse impacts to fire management. This analysis focuses on impacts to fire management. For example, actions limiting fire-suppression tactics, thereby resulting in larger burn areas or more intense fires, are considered adverse impacts. Conversely, actions contributing to a decrease in the incidence of resource-damaging wildland fires or enhancing the ability to fight fires are considered beneficial impacts. For example, the use of unlimited tactics or full suppression may, in some cases, protect a resource against potential fire damage, a beneficial impact.

Regarding planned (prescribed) fire and fuels management, actions restricting the acreage or effectiveness of prescribed fire and fuels treatments are considered adverse. For example, stipulations to protect other resources (e.g., wildlife or livestock grazing) that restrict or prevent prescribed fires and fuels treatments in certain areas or at certain times of the year are considered direct adverse impacts to prescribed fire and fuels management. Conversely, the absence of stipulations or actions that may increase the acreage or effectiveness of prescribed fire and fuels management are considered beneficial impacts. This may also be true for stipulations or actions that support the suppression tactics that allow the use of wildland fire for resource benefit. Decreasing the use of prescribed fire is likely to decrease the number of acres receiving vegetation treatments.

For purposes of this analysis, short-term impacts to fire and fuels management include impacts occurring within 5 years. Long-term impacts remain or occur after 5 years. The BLM anticipates short- and long-term impacts to fire and fuels from management under all alternatives.

The following description of impacts is organized into three sections: wildfires (unplanned ignitions); prescribed fire (planned ignitions) and fuels management that are utilized to achieve resource benefits, and stabilization and rehabilitation following fire. Analysis methods and assumptions described in the *Unplanned/Wildfire* section apply to all three sections.

Seventy percent of the planning area is in Core Area. Both the National Technical Team (NTT) Conservation Strategy and the Wyoming Governor's Core Area Executive Order limit the use of prescribed fire in areas of Core Area receiving less than 12 inches of annual precipitation. Seventy-six percent of the Core Area (and 70 percent of the planning area) receives less than 12 inches of annual precipitation. Therefore, all alternatives have management in common that limits the use of prescribed fire across 70 percent of the planning area. Fire suppression in Core Area is emphasized as a priority (after public and firefighter safety) for all alternatives, so that the

impacts for fire suppression do not vary by alternative for 70 percent of the planning area. The following analysis is for the 24 percent of Core Area in which prescribed fire may be used as a fuels or vegetation treatment and for the 30 percent of the planning area where full suppression is not mandated.

Summary of Impacts

Alternative B would result in complex management strategies regarding limitations on the ability to use fire to achieve resource objectives, while Alternative C would be the most direct by employing full suppression in all cases. Alternatives A and D apply a similar management strategy that allows flexibility in wildfire suppression activities while minimizing damage to resources, and use suppression on a case-by-case basis, allowing for ecosystem benefit. Alternative B provides for the greatest opportunity to allow fire to return to its natural role in the ecosystem, utilize fuels treatments to protect wildland urban interface (WUI) areas, and restore ecosystems but only over the very long term. Not only would fire risk be reduced with additional treatments, but not expanding range infrastructure would decrease the need for suppression efforts and increase the BLM's ability to allow for fire to fulfill its natural role in the ecosystem. Alternative B, however, would result in the highest short- and long-term adverse impacts to areas outside greater sage-grouse habitat.

4.3.1. Unplanned/Wildfire

4.3.1.1. Summary of Impacts

Wildfire management within the planning area is a cooperative program with adjacent federal and state agencies as well as the local fire departments. Stipulations for resource management programs that prohibit management decisions to successfully contain an undesired wildfire are considered adverse impacts. Management decisions that increase development and activity in high fuel load areas within the planning area may lead to an increase in undesired human-caused fires and would be considered an adverse impact. Management of other resource programs that allow certain wildland fire suppression decisions is considered beneficial. Such is the case with wildland fire used to meet resource objectives.

4.3.1.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the followings (these methods and assumptions also apply to the analysis presented in the Stabilization and Rehabilitation section):

- There is a direct relationship between fuel loads (standing and non-standing vegetation) and potential fire size and intensity. Higher fuel-loading levels increase the size and intensity of fires.
- The area specific fire management plan (Southern Wyoming Zone Fire Management Plan [FMP] [BLM 2004b]) implements the fire and fuels management direction on BLM-administered lands in the planning area.
- Wildland fires that do not threaten human life, private properties, or important resources can be used as a tool to reduce fuel loads, improve plant communities, and enhance wildlife habitats. However, protections for greater sage-grouse require suppression in greater sage-grouse habitat. The types of tools available for wildland fire management, including the use of wildland fire to accomplish specific resource management objectives, are described in

more detail in the Southern Wyoming Zone FMP, although the limits on the use of prescribed fire in sagebrush communities limits this tool in the planning area.

- Development of infrastructure such as for oil and gas or wind-energy development limit or close areas to use of fire as a vegetation treatment tool.
- Compared to limited suppression tactics, unlimited tactics reduce the amount of acres burned annually, but potentially increase the amount of surface disturbance and result in the need for more extensive rehabilitation. Unlimited suppression tactics also alter the condition class of the vegetation by preventing wildland fire to play its appropriate role in maintaining fire-adapted ecosystems.
- The increasing presence of invasive plant species and cheatgrass in the planning area can change fire behavior, alter the natural fire regime, result in poor reestablishment of native species post-burn, and restrict future fuels treatment options.
- The BLM Emergency Stabilization and Rehabilitation standards in the DOI Interagency Burned Area Emergency Response Guidebook (DOI 2006b) and the BLM Burned Area Emergency Stabilization and Rehabilitation Handbook (BLM 2007d) could be implemented for wildland fires to protect and sustain healthy ecosystems and protect life and property.
- In cases where human life or safety may be at risk, full fire-suppression tactics would be used and would become a higher priority than any resource protection or management stipulations.
- Since most unplanned fires are caused by lightening strikes in comparison to human activities, the impacts of the ROW management under each alternative would have relatively limited effect on the likelihood of fire. However, the more limited the road network, the more difficult access to remote areas for fire suppression. Since most travel management decisions will be deferred to implementation, impacts to fire suppression will need to be addressed during that analysis.

4.3.1.3. Detailed Analysis of Alternatives

All alternatives have the potential to impact wildfire suppression and management; therefore, they could also impact other resources, including resource protection. For example, fires burning more acreage for longer periods emit more particulate matter into the air, thereby affecting air quality. In addition, fire can affect rangeland health, wildlife habitat quality and quantity, and plant community health. Impacts to other resources (e.g., physical and biological resources) from fire management are addressed under the appropriate resource section.

4.3.1.3.1. Impacts Common to All Alternatives

The use of wildland fire as a management tool in forests and woodlands facilitates the reintroduction of fire to its natural role in the ecosystem and may help to restore aspen stands that depend on fire. In light of depressed demand and oversupply of wood products, forest and woodlands management is not expected to substantially contribute to future wildland fire management under any alternative.

Lands and realty actions may result in adverse impacts to fire and fuels management because some areas with mixed ownership patterns not identified for disposal are very difficult to access and provide challenges for suppression actions. These areas may also have a higher potential for fire due to increased human activity associated with WUI areas. Notable examples are found on the Lander Slope and in the Dubois area. Limitations on new roads or the closure of existing roads can limit fire suppression. While this is likely to vary by alternative (more roads would be

closed and fewer new roads would be authorized under Alternative B, while Alternative C would likely have more roads), this can be assessed only during travel management implementation.

Potential reduction of nonnative species by the BLM and partners, such as the Fremont County Weed and Pest District, results in a beneficial impact to wildfire suppression by reducing unnatural fuel loading. Reducing nonnative species such as cheatgrass, which increases the intensity of fire behavior and may increase wildfire size and extent, would beneficially impact all resources and the fire program; infested sites generally result in poor reestablishment of native species after a wildfire event.

Actions that suppress the natural role of fire in the ecosystem may result in fuels buildup and eventually lead to larger and more landscape-level fires. However, suppressing fires in these areas may help to protect habitat important to sagebrush obligate species such as the greater sage-grouse. Establishing fuels treatments at strategic locations to minimize the size of wildfires and limit further loss of greater sage-grouse habitat would result in long-term benefits to fire and fuels management by reducing the incidence and spread of fire in greater sage-grouse habitat.

Maintaining connectivity between large blocks of undisturbed habitat for wildlife may adversely impact fuels management by limiting the size and extent of prescribed fire and other fuels treatment options, as well as limiting the use of wildland fire for resource benefit to maintain these large blocks of untreated land in similar vegetation types. Seasonal limits in crucial winter range and parturition areas would limit the time that fuels-reduction activities can take place and limit the effectiveness of the fuels management program over the next 20 years, unless an administrative exception is granted. Other potential adverse impacts include the limits on cross-country travel in areas with special status plant species, and restrictions on fire suppression strategies in greater sage-grouse critical areas.

Maintaining wild/feral horse objectives in Herd Management Areas (HMAs) could benefit fuels management because those regulations mitigate adverse impacts to vegetation communities from horses. Horses may also benefit from wildfire suppression by reducing the natural fuel loading associated with areas ungrazed by commercial livestock. These beneficial impacts would be the same for livestock. Adverse impacts from livestock and, in some cases, horses occur due to moderate to high utilization levels that alter potential healthy vegetation community fuel loading in areas where fire is a desired tool, as well as hampering recovery of sites post-burn.

Management actions restricting fire suppression or wildland fire planning within Special Designation areas would result in adverse impacts to wildland fire management.

Maintaining WSAs results in beneficial impacts to natural management strategies for fire and fuels such as the use of wildland fire for resource benefit and prescribed fire. Adverse impacts associated with WSAs are due to restrictions on vehicle access to suppress fires and perform beneficial fuels treatments. ACEC actions common to all alternatives complement fuels management by authorizing fuels management treatments in the WUI and not closing the ACECs to fuels treatments. However, adverse impacts may result from seasonal limitations in ACECs on treatments that would reduce fuel loads and complement suppression tactics.

All alternatives authorize the use of heavy equipment for fire suppression in consideration of resource values, which would benefit fire and fuels management.

4.3.1.3.2. Alternative A

4.3.1.3.2.1. Program Management

Decisions in the RMP guide management actions regarding fire suppression. The Southern Wyoming Zone FMP (BLM 2004b) will be modified to meet RMP goals, which are set through the fire program. Wildland-fire suppression tactics follow direction and guidance in the Federal Wildland Fire Management Policy (DOI and USDA 2009). This guidance provides for consistent implementation of the Federal Wildland Fire Management Policy on BLM-administered lands. Under Alternative A, fire suppression is driven by property threats or resource benefits derived. Full suppression is used where it is clearly warranted because of potential resource damage and threats to persons or property (BLM 1987a). Soil-disturbing activities, such as the use of heavy equipment to fight fires, are allowed on a case-by-case basis.

4.3.1.3.2.2. Resources

Under Alternative A, restrictions on soil-disturbing activities on slopes over 25 percent would restrict fire suppression actions. The use of heavy equipment in certain strategic locations may limit the extent to which wildfires threaten critical resource values or health and human safety. Restricting the use of heavy equipment to suppress fires may result in adverse impacts to the management of wildland fires. Similarly, avoiding the aerial application of fire-suppressant chemicals within 300 feet of perennial waters and restricting the use of fire-retardant chemicals as appropriate to protect rock art and water quality would result in adverse impacts to the management of wildland fires by limiting the potential to effectively control fires in these areas. The Agency Administrator can waive all of these limitations.

Forest and woodland management complements wildfire suppression. Forest and woodland management works to achieve a variety of seral classes across the wooded landscape, which aids in reducing fire intensity, and assists with potential suppression strategies. Examples are found in treated juniper woodlands throughout the planning area and on Green Mountain, where a history of clear-cuts has altered the forest canopy and reduced fuel loading. Adverse impacts would result from human-caused fires in cutting areas from unintended ignitions and vehicle use in these areas.

Avoiding surface-disturbing activities in special status species habitat, such as greater sage-grouse nesting areas and pygmy rabbit habitat, would adversely impact fire suppression because of potential limitations on suppression tactics in these areas. These limitations may allow fires detrimental to landscapes to grow larger and result in more impacts in terms of acres burned.

4.3.1.3.2.3. Resource Uses

Under Alternative A, most of the planning area is open to wind-energy and mineral development. This development may result in adverse impacts to fire suppression in terms of increased potential for human-caused ignitions and increased infrastructure associated with this type of development, which makes fire suppression actions more challenging than when working on an undisturbed landscape. For example, placing wind turbines in an area with high wind potential would limit the use of aerial suppression techniques because of safety concerns. A beneficial impact may be the increased supporting road network associated with this development, which could be used strategically to suppress wildfires.

Livestock grazing management would result in short-term and long-term impacts to fire and fuels management. Livestock grazing primarily affects the distribution, amount, height, and vigor of herbaceous species such as perennial grasses, which can determine fire characteristics. Livestock grazing is beneficial to fire suppression efforts by reducing fine fuels. A decrease in fire spread may result in an accumulation of larger fuel sources such as shrub vegetation between fires, which may contribute to larger fires in the long term. Livestock grazing may also reduce flame length, fire-line intensity, and rate of spread, which would result in beneficial impacts to suppression activities. Fire-line intensity and flame length are important measures of potential suppression success.

Trails and travel management would result in both adverse and beneficial impacts to management of wildland fires. Travel designations provide access throughout the planning area, which may result in adverse impacts by increasing the incidence of human-caused fires. Increased access may also increase the potential for fire in more remote locations that are more difficult to respond to and control. Alternatively, motorized vehicle routes may result in beneficial impacts by increasing access, response time, and management flexibility when responding to fires.

Recreational activities can result in adverse impacts to wildland fire suppression due to the increased likelihood for fire starts in SRMAs and ERMAs, where both concentrated and dispersed use increases the likelihood for unintended ignitions. This impact would be consistent across all alternatives and would be a long-term impact because recreational use in the planning area is anticipated to steadily increase over the next 20 to 25 years.

The designation of utility corridors and authorization of ROWs may result in beneficial impacts to fire and fuels management by removing or reducing built-up fuels and by serving as fuel breaks and fire lines. Utility corridors and access roads authorized through ROW designations may also result in beneficial impacts by providing access for fire-fighting and other fire and fuels management activities. The designation of ROWs and increased incidence of human presence associated with ROW construction and use may increase the potential for unplanned ignitions in the planning area.

4.3.1.3.2.4. Special Designations

While WSA management could result in some adverse impacts to fire suppression by limiting potential suppression actions and access in these areas, this is generally not the case because fires can be contained within roads surrounding the designated areas. A notable exception may be within the Copper Mountain WSA because fuel loading outside that WSA is as heavy or heavier than fuel loading within the WSA. A restricted response to fire may cause the fire to move onto surrounding private lands.

ACEC management under Alternative A may limit fire suppression actions if roads have been reclaimed to help the resource that benefits from the ACEC designation. The reduction in roads to access wildfires may restrict suppression tactics and allow fires to grow larger and potentially cause resource damage and threaten health and human safety, especially in WUI areas.

4.3.1.3.3. Alternative B

4.3.1.3.3.1. Program Management

Under Alternative B, fire suppression is driven by threatened property or derived resource benefits. Full suppression is used when it is clearly warranted due to potential resource damage and threats to persons or property (BLM 1987a). Under Alternative B, full suppression is used in the WUI, developed recreation sites, identified cultural resources, and aboveground utility ROWs. Implementation of soil-disturbing activities (heavy equipment) to suppress fires is allowed only with the recommendation of the resource advisor and approval of the Agency Administrator in accordance with the approved FMP. Due to its emphasis on resource protection, Alternative B limits the use of a full suite of fire suppression tactics the most, when compared to other alternatives.

4.3.1.3.3.2. Resources

Management actions that restrict fire suppression, fuels management, or wildland fire planning would result in adverse impacts to wildland fire management. In general, restrictions on fire management for the protection of resource objectives are greater under Alternative B than under alternatives A and C. However, under certain scenarios, implementing actions under Alternative B could reduce the severity of landscape-level wildfires. For example, in areas where naturally caused fires were allowed to burn, fuel loads may be decreased over the long term.

Under Alternative B, restrictions on soil-disturbing activities on slopes over 15 percent may restrict fire suppression actions. The use of heavy equipment in certain strategic locations can limit the extent to which wildfires threaten critical resource values or health and human safety. Restricting the use of heavy equipment to suppress fires may result in adverse impacts to the management of wildland fires. Similarly, avoiding aerial application of fire-suppressant chemicals within 300 feet of perennial waters and restricting the use of fire-retardant chemicals as appropriate to protect rock art and water quality would result in adverse impacts to the management of wildland fires by limiting the potential to effectively control fires in these areas.

Forest and woodland management complements wildfire suppression. Forest and woodland management works to achieve a variety of seral classes across the wooded landscape, which aids in lessening fire behavior and contributing toward potential suppression strategies. Examples are found in treated juniper woodlands throughout the planning area and on Green Mountain, where a history of clear-cuts has altered the forest canopy and reduced fuel loading. Adverse impacts would result from unintended human-caused fires in cutting areas and vehicle use in these high fuel loading areas during the dry conditions of summer. Alternative B emphasizes using natural processes to manage forests and woodlands to the greatest extent possible, which may result in adverse impacts to wildland fire suppression. Fuel loading in these systems would be greater outside the WUI, areas managed for other resources (e.g., wildlife), or those areas treated to protect health and human safety, and could lead to landscape-level fire conditions. Prohibiting clear-cuts would lead to forest canopy fuel continuity in lodgepole stands, which makes fire suppression efforts challenging and extremely costly. Similar adverse impacts would result from a natural approach to management of forest stands experiencing large-scale die off of trees from insects and disease.

Prohibiting surface-disturbing activities within 1,320 feet of riparian-wetlands would adversely impact fire suppression by limiting the use of draft tanks for engines and tenders to access water sources in the event of a wildfire.

Expanded restrictions under Alternative B would potentially limit suppression actions. An example is the 1.5-mile buffer around active raptor nests where there can be no surface-disturbing or disruptive activities during the summer fire season. Closing areas with special status species plants may also similarly result in an adverse impact to fire suppression.

Greater sage-grouse management under Alternative B would result in adverse impacts to fire suppression, with restrictions on surface-disturbing and disruptive activities within 3 miles of nesting areas. Similarly, the restriction on surface-disturbing activities within 100 meters (approximately 330 feet) of suitable pygmy rabbit habitat would adversely impact potential suppression actions in these higher fuel loading shrub-steppe sites. These limitations may allow fires detrimental to landscapes to grow larger and result in a greater impact in terms of acres burned.

4.3.1.3.3.3. Resource Uses

Additional lands identified for disposal in areas of high fuel loading would result in beneficial impacts to the fire suppression program under Alternative B because responsibility for suppressing fires on those lands would not be the primary responsibility of the BLM, but will be undertaken by land managers with greater access to the property.

Impacts to fire and fuels management from the designation of utility corridors and ROW authorizations under Alternative B would be greater than under alternatives A and C because of the decreased area of designated ROW corridors and more ROW exclusion areas under Alternative B.

Under Alternative B, substantially less acreage is open to wind-energy and mineral development. Approximately 41,372 acres of BLM surface acres are open to wind energy, 954,776 acres are open to locatable mineral development, and 529,576 acres are open to mineral leasing under this alternative. The lower acreage open for development under Alternative B would result in beneficial impacts compared to alternatives A and C. Under Alternative B, there would be a lower incidence of human-caused fire across the landscape and more chance of less-complex fires because there would be less infrastructure supporting development. This would result in a lower occurrence of wildland fires and fewer wildland fire-suppression actions.

Adverse impacts to fire and fuels management from livestock grazing would be greater under Alternative B than under Alternative A or Alternative C because of a reduction in the level of grazing use and more areas being closed to livestock grazing. As a result, fine fuels buildup would increase and the size of fires would be expected to increase. A beneficial impact to fire and fuels management would result from an increase in acres treated because BLM funds would not be used to construct infrastructure but would be used for vegetation treatments.

Management for recreation would result in impacts to fire and fuels management similar to those under Alternative A, except that recreation management under Alternative B focuses on reversing the trend under Alternative A of moving toward a more urban recreation setting to moving toward a more primitive recreation setting. Because of the decreased focus on developing camping sites and other recreation sites under Alternative B, the adverse impacts may be reduced. However, the increased area managed as SRMAs may increase the potential for unplanned human-caused ignitions in these areas because of increased recreation activity, although Alternative B

emphasizes nonmotorized recreation over motorized. Under all alternatives, recreational use in the planning area is anticipated to steadily increase over the next 20 to 25 years, which would result in adverse impacts to fire and fuels management.

Trails and travel management under Alternative B allows for the use of existing roads and trails throughout most of the planning area, with the use of only designated roads in a larger percentage of the planning area than Alternative A, and with seasonal restrictions in more areas. This could result in a beneficial impact to fire and fuels management in terms of reduced potential for human-caused fires due to reduced public access to areas with high fuel loading.

4.3.1.3.3.4. Special Designations

While WSA management could result in some adverse impacts to fire suppression in terms of limiting potential suppression actions and access in these areas, this is generally not the case because fires can be contained within roads surrounding the designated areas. A notable exception may be within the Copper Mountain WSA because the fuel loading outside that WSA is as heavy or heavier than fuel loading within the WSA, and a restricted response to fire may cause the fire to move onto surrounding private lands.

ACEC management under Alternative B may limit fire suppression actions if roads have been reclaimed to help the resource that would benefit from the ACEC designation. The reduction in roads to access wildfires may restrict suppression tactics and allow fires to grow larger and potentially cause resource damage and threaten health and human safety and the WUI. The increased acreage within ACECs designated under Alternative B would lead to more complex challenges associated with suppression actions in terms of resource protection stipulations and actions that may be taken within ACECs to suppress wildland fires. This would be especially true of the expanded Green Mountain ACEC, the Government Draw/Upper Sweetwater Sage-Grouse ACEC, the South Pass Historic Mining Area ACEC, and the Lander Slope ACEC, which comprise an area with the highest proportion of fire starts in the planning area. A beneficial impact of the South Pass Historic Mining Area ACEC is the objective of reducing fuels within the WUI. This would benefit fire suppression by reducing fuel loading before wildfires and allow for greater success in effectively protecting homes and valuable cultural resources in the event of a local wildfire.

4.3.1.3.4. Alternative C

4.3.1.3.4.1. Program Management

Alternative C allows the most resource use of the three alternatives and fire suppression actions under Alternative C are the least restricted. Soil-disturbing activities, such as the use of heavy equipment for the purposes of direct fire suppression, are permitted across a greater area under this alternative. In general, restrictions on fire management for the protection of other resource objectives are the fewest under Alternative C.

4.3.1.3.4.2. Resources

Avoiding soil-disturbing activities on slopes over 25 percent and the aerial application of fire-suppressant chemicals within 300 feet of perennial waters, and restricting the use of

fire-retardant chemicals as appropriate to protect rock art and water quality would result in similar adverse impacts as those described under Alternative A.

Under Alternative C, impacts to the suppression of wildland fires in forest and woodland areas would be similar to those under Alternative A, but less than those under Alternative B. Forest and woodland management works to achieve a variety of seral classes across the wooded landscape, which aids in lessening fire behavior and helps potential suppression strategies. Alternative C allows for more aggressive forest management, which would benefit fire suppression with larger patch sizes of early seral communities. Examples are found in treated juniper woodlands throughout the planning area and on Green Mountain, where a history of clear-cuts has altered the forest canopy and reduced the fuel loading. Adverse impacts would result from human-caused fires in cutting areas and unintended ignitions and vehicle use within these cutting areas. These types of ignitions would increase under Alternative C.

Management of grassland/shrubland communities under Alternative C would benefit wildfire suppression by reducing fine-fuel loading associated with increased fire behavior. The reduction in fine fuels would result from more livestock use across the planning area.

Reviewing fire suppression impacts to special status species on a case-by-case basis would result in the same adverse impacts as described for Alternative A.

Many wildlife restrictions under Alternative C, including distance requirements for surface-disturbing activities around greater sage-grouse leks and actions in occupied pygmy rabbit habitat, are similar to those under Alternative A. These restrictions would adversely impact fire suppression activities. This would potentially limit suppression actions and allow fires detrimental to the landscape to grow larger and cause more impacts in terms of acres burned. The restriction on surface-disturbing and surface-disruptive activities within ¼ mile of active raptor nests could adversely impact wildland fire suppression.

4.3.1.3.4.3. Resource Uses

Under Alternative C, wildland fire would be used to restore fire-adapted ecosystems for commodity production and to reduce hazardous fuels. Alternative C places more emphasis on fire and fuels management for the use of resources compared to Alternative B, which uses wildland fire to restore the natural processes of ecosystems.

Under Alternative C, most of the planning area is open to wind-energy and mineral development. This development may result in adverse impacts to fire suppression in terms of increased potential for human-caused ignitions and increased infrastructure associated with this type of development, which makes fire suppression actions more challenging than when working on an undisturbed landscape. A beneficial impact may be the increased supporting road network associated with this development, which can be used strategically to suppress wildfires.

Trails and travel management under Alternative C allows use of existing roads and trails throughout most of the planning area, with seasonal restrictions in certain locations. This may result in an adverse impact to fire and fuels management in terms of increased potential for human-caused fires and increased public access to areas with high fuel loading. A beneficial impact under Alternative C would result from a higher level of access from established roads for the purposes of implementing fire suppression actions.

Livestock grazing in relation to fire suppression activities under Alternative C would result in impacts similar to those under Alternative A, but less than those under Alternative B. Livestock grazing may be beneficial to wildland fire suppression by reducing fuel loading through the use of grazing animals and consequentially, a net reduction in extreme fire behavior. However, under Alternative C, like Alternative A, approximately one-third of the amount of acres would have vegetation treatments compared to Alternative B.

Recreational activities can result in adverse impacts to wildland fire suppression with an increased likelihood for fire starts in SRMAs and ERMAs, where both concentrated and dispersed use increases the likelihood for unintended fire starts. Alternative C is more likely to increase the trend toward an urban recreation setting with increased emphasis on motorized vehicle recreation. This may increase adverse impacts to the fire and fuels management program identified under other alternatives because recreation is anticipated to consistently increase over the next 20 to 25 years. Under Alternative C, this increase would likely be in motorized recreation, not nonmotorized recreation as under Alternative B.

4.3.1.3.4.4. Special Designations

Alternative C includes no other specific restrictions on fire and fuels management related to resource objectives or special designations in addition to the restrictions and impacts described under *Impacts Common to All Alternatives*. Alternative C would allow for a greater use of all available fire suppression and management tactics when compared to Alternative A or B.

4.3.1.3.5. Alternative D

4.3.1.3.5.1. Program Management

Alternative D uses a full range of suppression tactics based on resources at risk. This would result in comparable strategies to Alternative C and less restrictions to the fire and fuels program than under Alternative B, under which full suppression of wildfires is limited to specific management and development issues close to the wildfire. Alternative D has the second fewest resource utilization management actions next to Alternative B. In general, Alternative D restrictions on wildland fire suppression specifically for the protection of other resource objectives are fewer than under Alternative B but more than under Alternative C, under which a full suite of suppression tactics would be utilized throughout the planning area.

4.3.1.3.5.2. Resources

Similar to alternatives A and C, avoidance of soil-disturbing activities on slopes over 25 percent can restrict fire suppression actions under Alternative D by limiting heavy-equipment use in certain strategic locations, potentially restricting suppression tactics that may limit the extent of wildfires threatening critical resource values or health and human safety. Similarly, avoiding aerial application of fire retardants within 300 feet of any waterbody and 500 feet of waterbodies that support certain sensitive fish species would result in a smaller adverse impact to fire suppression than Alternative B but larger than either Alternative A or Alternative C, under which 300 feet is specified for all waterbodies. However, in all cases, the Agency Administrator can waive these distance limits under appropriate circumstances and therefore reduce restrictions on fire suppression tactics where necessary to successfully slow an active wildfire.

Under Alternative D, impacts to the suppression of wildland fires in forest and woodland areas are similar to those under Alternative A, less than those under Alternative B, and more than those under Alternative C. Forest and woodland management works to achieve a variety of seral classes across the wooded landscape, which aids in lessening fire behavior and helps potential suppression strategies. Alternative D authorizes more aggressive forest management where appropriate, which would benefit fire suppression with larger patch sizes of early seral communities. Examples are found in treated juniper woodlands throughout the planning area and on Green Mountain, where a history of clear-cuts has altered the forest canopy and reduced fuel loading. Adverse impacts would result from human-caused fires in cutting areas and from unintended ignitions and increased vehicle use in these cutting areas. There would be more of these types of ignitions under Alternative D than under Alternative B, and approximately the same as under alternatives A and C.

Management of grassland/shrubland communities under Alternative D would benefit wildfire suppression by reducing fuel loading associated with fire severity and intensity. The reduction in fuel loading would be the result of using vegetation treatments to change vegetation community composition and maintenance of livestock use throughout the planning area.

Many wildlife restrictions under Alternative D, including distance requirements for surface-disturbing activities around greater sage-grouse leks in the Core Area and actions in occupied pygmy rabbit habitat, are similar to Alternative B. However, Alternative D is less restrictive outside the Core Area than Alternative B. Restrictions would result in adverse impacts to fire suppression activities. This would potentially limit suppression actions and allow fires detrimental to the landscape to grow larger and cause more impacts in terms of acres burned. The restriction on surface-disturbing and disruptive activities within ¼ mile of active raptor nests may adversely impact wildland fire suppression.

Reviewing fire suppression impacts to special status species on a case-by-case basis would result in the same adverse impacts as described for Alternative A.

4.3.1.3.5.3. Resource Uses

Under Alternative D, wildland fire would be used to restore fire-adapted ecosystems for a diversity of plant types and to reduce hazardous fuels. Alternative D places less emphasis on fire and fuels management for the use of resources than Alternative C, and is more similar to Alternative B with respect to the use of fuels and fire to restore the natural processes of ecosystems.

Under Alternative D, a smaller amount of the planning area is open to wind-energy and mineral development than under Alternative A, substantially smaller than under Alternative C, but more than Alternative B. Reduced development would beneficially impact fire suppression in terms of reduced potential for human-caused ignitions and increased infrastructure associated with this type of development, which makes fire suppression actions more challenging than when working on an undisturbed landscape. An adverse impact may result due to a reduction in the supporting road network associated with this development, which can be used strategically to suppress wildfires. However, it is anticipated that this adverse impact would be negligible.

Trails and travel management allows use of existing roads and trails throughout most of the planning area, with seasonal restrictions in certain locations. This could adversely impact wildland fire management because of the increased potential for human-caused fire starts through increased public access to areas with high fuel loading. Over time, Alternative D, like Alternative B, could

result in more adverse impacts because redundant roads could be reclaimed, thereby reducing the level of access from established roads for the purposes of implementing fire suppression actions.

Livestock grazing in relation to fire suppression activities would result in impacts similar to those under Alternative C, more beneficial than Alternative B because higher utilization levels of herbaceous forage could lead to less fuel buildup. Livestock grazing can be beneficial to wildland fire suppression by reducing fuel loading through the use of grazing animals and consequentially, a net reduction in extreme fire behavior. However, under Alternative D, like alternatives A and C, approximately 10,000 acres are likely to be treated over the life of the plan because of the emphasis on range infrastructure projects. This is opposed to Alternative B, under which vegetation communities would be more aggressively treated to reduce fuel loading on the landscape and improve overall ecological conditions, thereby eventually leading to less extreme wildfire behavior in many areas of the planning area.

Recreational activities can adversely impact wildland fire suppression with an increased likelihood for human-caused ignitions in SRMAs and ERMAs, where both concentrated and dispersed use increases the likelihood for unintended fire starts. Alternative D is more likely to trend away from an urban recreation setting to a more primitive recreation setting with an emphasis on nonmotorized vehicle recreation, similar to Alternative B. This could reduce adverse impacts to the fire management program compared to those identified under alternatives A and C.

4.3.1.3.5.4. Special Designations

While WSA management could result in some adverse impacts to fire suppression in terms of limiting potential suppression actions and access in these areas, this is generally not the case because fires can be contained within roads surrounding the designated areas. A notable exception could be in the Copper Mountain WSA, because the fuel loading outside the WSA is as heavy or heavier than fuel loading within the WSA and a restricted response to fire could cause the fire to move onto surrounding private lands. This case is a limited example because there is very little fire history for the area.

ACEC management under Alternative D could limit fire suppression actions if roads have been reclaimed to help the resource that would benefit from ACEC designation. The reduction in roads to access wildfires could restrict suppression tactics and allow fires to grow larger and potentially cause resource damage. The increased acreage designated as ACECs under Alternative D would lead to more complex challenges associated with suppression actions in terms of resource protection stipulations and actions that can be taken in ACECs to suppress wildland fires. This would be especially true of the expanded Green Mountain ACEC, the Twin Creek ACEC, the South Pass Historic Landscape ACEC, and the Lander Slope ACEC, which comprise an area with the highest proportion of fire starts in the planning area. A beneficial impact of the South Pass Historic Landscape ACEC is the objective of reducing fuels in the WUI. This would be a beneficial impact to fire suppression by reducing fuel loading before wildfires occur, and could allow for more effective protection of homes and valuable cultural resources in the event of a local wildfire.

Adverse impacts to fire and fuels management from VRM classifications would be similar to those described for Alternative A. However, because the amount of VRM Class I and II area is greater under Alternative D, fire suppression tactics would be less flexible except in cases of protecting human lives and safety.

4.3.2. Planned/Prescribed Fires and Other Fuels Treatments

4.3.2.1. Summary of Impacts

Prescribed fire management can be used to achieve measurable landscape-level or site-specific objectives, such as reducing hazardous fuel loads inside and outside the WUI, creating diversity in vegetation communities, enhancing livestock management, improving certain desirable wildlife habitats, regenerating decadent vegetation communities, and improving watershed health. Most prescribed fires in the planning area occur in mountain shrub and aspen communities. Non-fire fuels treatments will occur in all vegetation types, from Wyoming sagebrush steppe to conifer forests and aspen stands. Stipulations from other resource management that allow or prohibit prescribed fires and fuels management in certain areas or at certain times of the year are direct adverse impacts to fuels management.

4.3.2.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- The BLM fire and fuels program is guided by the principles of reducing hazardous fuels loading within the WUI as well as high fuel loading across the vegetated landscape. The program is complementary to wildlife and vegetation management by restoring fire-dependent ecosystems and enhancing vegetation communities and wildlife habitat.
- Fire and fuels management will be a priority within the WUI as well as within areas of the natural landscape that would be detrimentally impacted by wildfire.
- Air quality standards do not currently affect the ability to perform prescribed burns; however, more stringent air quality standards would likely affect prescribed burn implementation.
- Development of infrastructure such as for oil and gas or wind energy limit or close areas to the use of fire as a vegetation treatment tool.
- The Lander Field Office will continue to treat vegetation in the planning area with prescribed fire, mechanical treatments, and chemical treatments. It is expected that the average annual acres treated in the future will remain similar to average annual acres treated between 2006-2009, except for under Alternative B, under which additional fuels treatment would be undertaken.
- Landscape-level fire and non-fire fuels treatments that meet vegetation management and wildlife habitat requirements will substantially increase the amount of acres treated annually in the planning area. The use of landscape-level treatments will be enhanced or hindered depending on a number of factors, including livestock grazing management decisions that allow proper post-treatment and long-term management; increasing industrial and urban development in the WUI; future wildlife habitat considerations; and the ability to coordinate with adjacent state, federal and private landowners.

4.3.2.3. Detailed Analysis of Alternatives

4.3.2.3.1. Impacts Common to All Alternatives

Short- and long-term impacts from prescribed fire and fuels management would assist in achieving program specific management objectives as well as other resource objectives.

Air quality regulations are the most restrictive and could adversely impact fire and fuels management in federal Class I and Class II areas (e.g., the Wind River Slope on the WRIR). Regulations in these areas could restrict some prescribed burn activity, depending on the prevailing wind and disturbance to population centers. Most often, in fuels treatments using fire, the greatest concern is smoke dispersion and distance from population centers. In these cases air quality regulations are neither a beneficial or adverse impact on prescribed fire activities. While there is a marginal difference among the alternatives in the management prescriptions for air quality, it is unlikely that these management differences would have measurable differences in impacts to the fire and fuels program.

Soil resource management can limit vegetation management options through restrictions on ground-disturbing activities when the ground is frozen and, in such cases, would result in an adverse impact to fire and fuels management. Many shrub and forest/woodland treatments are ideally implemented when the ground is frozen and vegetation is lower in moisture and brittle. Additionally, restricting winter fuels treatments reduces the amount of acres potentially treated in the year. A BLM Agency Administrator may grant an exception to this standard stipulation.

Forest and woodland management complements fire and fuels management and is a beneficial impact to fuels management. Forest treatment objectives can also accomplish fuels reduction objectives, especially in the WUI. Mechanical treatments completed in forests and woodlands can also create fuels breaks that could be used to contain prescribed fire and reduce adverse impacts from fire by reducing the fire severity associated with heavy 1,000-hour fuel loading. Forest treatments also complement fire and fuels management by achieving fuels goals of restoring ecosystem health. Additionally, the use of wildland fire is a management tool in forests and woodlands and is complementary to the landscape level use of fire.

Grassland and shrubland management actions across all alternatives would result in beneficial impacts to fire and fuels management because they support the use of vegetation treatments to increase forage production and restore rangeland ecosystems. This conversion to early seral plant communities achieves fuels management objectives and is integral to cooperators buy-in to initiating prescribed burning and mechanical treatments on rangelands throughout the planning area. This impact would be similar across all alternatives with minor differences in vegetation management focus. However, to the extent that livestock grazing can adversely impact aspen from grazing/browsing or if treatments cannot be accomplished, then livestock grazing management adversely impacts the fire and fuels program.

Management actions for invasive species would benefit fuels management by reducing nonnative species, such as cheatgrass. Nonnative species such as cheatgrass adversely impacts fire and fuels management. It limits the use of prescribed fire and most mechanical treatments because of the high probability of proliferation of the annual grass in certain areas after fuels treatment.

Seasonal big game winter range and parturition areas could limit fuels management actions if roads have been reclaimed to benefit the resource associated with these areas. The reduction in roads to access potential treatment areas could restrict management strategies associated with prescribed fire or wildland fire utilized to achieve resource benefits. This would result in an adverse impact to fire and fuels management. Seasonal closures would also adversely impact fuels treatments by limiting surface-disturbing and disruptive activities in elk winter range and constraining the time available to treat vegetation, hindering the fuels management program's ability to treat areas in the planning area over the next 20 years.

Overall, wildlife habitat management is beneficial to fuels management. The wildlife program's emphasis on using a full suite of treatment tools to improve habitat types and adjustment of wildlife herd objectives may promote beneficial impacts to vegetative communities and support fuels treatment objectives.

Greater sage-grouse management is a beneficial impact to fuels management if it emphasizes a mosaic of various vegetative seral conditions across the landscape, which reduces the adverse impacts of high vegetative fuel loading and restores vegetation communities. The restriction on vegetative treatments within either ¼ mile or 0.6 mile from an active greater sage-grouse lek adversely impacts the fire and fuels program by limiting areas that would benefit from fuels treatments. Seasonal stipulations for greater sage-grouse result in a minor adverse impacts because of limits on time available to complete fuels treatments.

Limits on surface-disturbing activities in occupied pygmy rabbit habitat would adversely impact fuels management. Pygmy rabbit habitat in the planning area is often mountain shrub communities, a vegetation type that would benefit from the use of prescribed fire or potentially wildland fire that is utilized to achieve resource benefits.

Implementation of the current FMP (BLM 2004b) would be influenced by constraints to protect and conserve habitat of special status species. Conservation measures to protect and restore species listed under the ESA would potentially result in adverse long-term impacts to fuels management within listed species habitat. Following the completion of the RMP revision, the FMP would be revised or amended during the annual review process to reflect any changes in the new RMP.

Where there is livestock grazing, it is BLM policy that prescribed burn areas are generally deferred from grazing a minimum of two consecutive growing seasons post-burn, based on management objectives consistent with *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management* (Appendix J (p. 1537)) and IM No. WY-2005-018. The BLM will use resource objectives, environmental and rangeland conditions to identify appropriate recovery time and post-treatment management of prescribed burn areas. Land ownership patterns in the planning area can impede the ability to conduct prescribed burns. Prescribed burns generally are not possible where domestic livestock producers are unable to absorb the cost of the deferral period, as required by BLM policy, which could be alleviated by the development of a grass bank. The inability to adhere to this policy could adversely impact prescribed fire management by restricting the ability to use prescribed fire as a management tool. Non-fire fuels management (chemical, hand cutting, and mechanical) could have similar adverse impacts due to post-treatment grazing management and unanticipated long-term use, development on and surrounding the treatment, and overall management of the area. The use of wildland fire that is utilized to achieve resource benefits (Wildland Fire Use) would also be adversely impacted by the same grazing management constraints that will not allow sufficient post-burn rest similar to that for prescribed fire.

While WSA management could result in some adverse impacts to fuels management in terms of limiting potential fuels treatment actions and access in these areas, this is generally not the case because fuels management options in these areas can be implemented through hand cutting or the use of prescribed fire if determined to be suitable for the landscape. Wildland fire that is utilized to achieve resource benefits is ideally suited to WSAs and results in a beneficial impact to that application under the fire and fuels program.

Management of areas such as Green Mountain, Red Canyon, South Pass Historic Mining Area, and Lander Slope would also be beneficial to fire and fuels management in its support for management of healthy vegetation communities to support wildlife. This would complement fuels management objectives of managing vegetation to reduce fuels loading and restoring ecosystem health.

There is little to no difference among the alternatives with regard to land tenure decisions, which would adversely impact fuels management because some broken land status areas not identified for disposal are very difficult to access and are difficult to manage. These areas could also create large WUI areas that require substantial time and resources to treat, as opposed to treating larger blocks of BLM-administered land that dominate the planning area. Notable examples are found on the Lander Slope, the South Pass area, and on scattered BLM holdings in the Dubois area. Because there is little difference among the alternatives, this adverse impact to the fire and fuels program is not further analyzed.

The alternatives vary in their minerals and realty management. Development associated with minerals and realty actions such as wind-energy projects, could adversely impact fuels management by fracturing the landscape and making the use of prescribed fire extremely challenging and increasing the complexity of the burn. Using wildland fire to achieve resource benefits could be difficult in these situations. A beneficial impact could be the increased supporting road network that is associated with wind-energy and mineral development, which could be used strategically to break up the landscape when using prescribed fire so as to not burn too much of the vegetation community deemed critical for wildlife habitat. The areas could also warrant fuels treatments, not to restore ecological health with fire or surrogate mechanical treatments, but simply to reduce fuel loading to protect human infrastructure. This would be an adverse impact from wind and mineral development.

4.3.2.3.2. Alternative A

4.3.2.3.2.1. Program Management

Alternative A uses prescribed fire and fuels management to meet fire and fuels resource management objectives, reduce hazardous fuels, reintroduce fire in its natural role to the ecosystem, and improve plant community health. Wildland fire that is utilized to achieve resource benefits could occur throughout the planning area, but has not been attempted on any scale because of management restrictions and the general uncertainty of the approach outside wilderness areas in the region. Approximately 300 acres per year of short-term disturbance over 20 years is anticipated from prescribed fire under Alternative A. All acres of this disturbance would be reclaimed. For mechanical fuels treatments under this alternative, approximately 500 acres per year for 20 years of short-term disturbance are anticipated, and all 500 acres would be reclaimed. Under Alternative A, little to no funds would be expended on non-infrastructure types of range improvement projects such as vegetation treatments and fuels reduction because all available funds would be invested in rangeland infrastructure.

4.3.2.3.2.2. Resources

Under Alternative A, avoiding soil disturbance on slopes over 25 percent and within 500 feet of surface water could may adversely impact fuels management, although erosion from soil-disturbing activities could be mitigated with practices such as contour falling and treatments

when ground conditions are stable. Similarly, restoration of surface water systems, often directly within the riparian-wetland area, is important to achieving fuels reduction objectives (especially with the presence of riparian-wetland INNS such as Russian olive) and restoring riparian-wetland system function and ecosystem health. A beneficial impact would be the management action of achieving PFC in riparian-wetland systems, which complements fuels management in these areas.

Prohibiting surface-disturbing and disrupting activities within $\frac{3}{4}$ mile of active raptor nests is considered an adverse impact to fuels management. Similarly, protections for the benefit of greater sage-grouse would result in adverse impacts to fuels management. Alternative A has moderate greater sage-grouse protections with moderately adverse impacts to the fire programs.

4.3.2.3.2.3. Resource Uses

Lands and realty actions can adversely impact fuels management, because some areas with mixed ownership patterns not identified for disposal are very difficult to access and are difficult to manage. These areas also might create large WUI areas that require substantial time and resources to treat, as opposed to treating larger blocks of BLM-administered land that dominate the planning area. Notable examples are found on the Lander Slope and in the Dubois area.

Under Alternative A, most of the planning area is open to wind-energy and mineral development. This development could adversely impact fuels management in terms of fracturing the landscape and making the use of prescribed fire extremely challenging, and increasing the complexity of the burn. Wildland fire that is utilized to achieve resource benefits might be impossible in these situations. A beneficial impact might be the increased supporting road network associated with wind-energy and mineral development, which can be used strategically to break up the landscape when using prescribed fire so as to not burn too much of the vegetation community that might be deemed critical for wildlife habitat.

Under Alternative A, trails and travel management allows use of existing roads and trails throughout most of the planning area, with seasonal restrictions in special designations. This would be a beneficial impact in terms of allowing access to treatment areas and the use of existing roads for strategic breaks in prescribed fire and wildland fire that is utilized to achieve resource benefits.

Livestock grazing could be beneficial to fuels management objectives under Alternative A, especially in the WUI, because grazing would reduce the amount of fine fuels available in the event of a wildfire. Research has shown that certain plant communities may benefit from low-severity disturbances, such as grazing, before burning in order to increase their resilience to more severe disturbances, such as fire (Davies et al. 2009b). However, an adverse impact of grazing would be the potential proliferation of nonnative invasive species, as grazing livestock utilize desirable native grasses. Nonnative species such as cheatgrass often render an area untreatable with fire if the species dominates an area. There would be the same number of acres treated for fuels reduction as historically has been the case (500 acres per year) because range improvement projects would emphasize infrastructure and not vegetation type projects.

4.3.2.3.2.4. Special Designations

ACECs with seasonal travel management closures to protect ACEC values could adversely impact fuels management. The closures reduce the timeframes available to conduct fuels management

projects. The ACECs with seasonal closures are Green Mountain, Whiskey Mountain, Red Canyon and Lander Slope. The remainder of the ACECs would not impact fuels management.

4.3.2.3.3. Alternative B

4.3.2.3.3.1. Program Management

Similar to Alternative A, Alternative B uses prescribed fire and fuels management to achieve fire and fuels management objectives, reduce hazardous fuel loads, and reintroduce fire into its natural role in the ecosystem. This approach could result in a beneficial impact to fire management in the planning area. For mechanical fuels treatments under this alternative, approximately 1,500 acres per year for 20 years of short-term disturbance are anticipated, with all 1,500 acres (1,000 more acres than Alternative A) to be reclaimed.

4.3.2.3.3.2. Resources

Under Alternative B, protections for soil and riparian-wetland areas would limit fuels management with more adverse impacts to the fuels program than under Alternative A. Buffers around riparian-wetland areas may result in adverse impacts to fire management when they inhibit achieving fuels reduction objectives (especially with the presence of riparian-wetland invasives such as Russian olive). A beneficial impact would result from achieving PFC in riparian-wetland systems, which complements fuels management.

Prohibiting surface-disturbing and disrupting activities within 1.5 miles of active raptor nests and limiting surface disturbance in buffers around greater sage-grouse leks would have more of an adverse impact than Alternative A to fuels management, such as prescribed fire, especially in the mountain shrub-woodland interface, which demonstrates the greatest benefit from mechanical and fire treatments.

Alternative B VRM would limit more surface disturbance, which would beneficially impact fire and fuels except to the extent that additional roads improve access for the fuels program.

4.3.2.3.3.3. Resource Uses

Minerals and realty management, including wind-energy development, under Alternative B is substantially more restrictive than under Alternative A with beneficial impacts to fire and fuels management.

Under Alternative B, less land is open for wind-energy and mineral development and in lands that are open, there are more restrictions on development. While the reduced amount of development in comparison to Alternative A would reduce the associated adverse impacts, there would also be reduced roads that would facilitate access for fuels treatments and fire suppression. Overall, Alternative B has more beneficial impacts to the fuels program than Alternative A.

Trails and travel management under Alternative B is limited compared to alternatives A and C. Use of existing roads and trails would be beneficial to fuels management, while seasonal restrictions in special designations would be an adverse impact. Access to treatment areas and the use of existing roads for strategic breaks is important to achieve resource benefits from prescribed burning and, if appropriate to resource objectives, wildland fire.

Under Alternative B, livestock grazing could be beneficial to fuels management objectives, especially in the WUI, as grazing livestock would reduce fine fuels available in the event of a wildfire. The establishment of reserve common allotments would also be a beneficial impact to fuels management because it allows greater flexibility in treating areas with prescribed fire and in resting them subsequently. This could better enable the utilization of wildland fire to achieve resource benefits. In addition, Alternative B emphasizes non-infrastructure range improvement projects, which would beneficially impact the fire and fuels program. Finally, Alternative B beneficially impacts the fuels program by making INNS introduction and spread less likely. INNS, such as cheatgrass, often render an area untreatable with fire where they become dominant, as fires burn hotter and increase the likelihood that cheatgrass or other INNS will continue to revegetate and outcompete native species.

4.3.2.3.3.4. Special Designations

Special designations would beneficially impact the natural fire regime under Alternative B in the long term, with additional acreage protections and stipulations that restrict disturbances in these areas. The opportunity to manage historically natural landscapes under this alternative would allow the restoration of areas using natural processes and emphasize treatments suitable for the landscape. Alternative B allows vegetation treatments and fuels management in ACECs. Many of these ACECs contain WUI areas that would be beneficially impacted from prescribed fire and other fuels management treatments.

Adverse impacts under this alternative would be restrictions on types of treatments. (Timing limitations also limit fuels treatment in the Green Mountain area, but this is for wildlife protections and not part of the ACEC prescriptions.) This would slow the restoration process in areas such as Green Mountain, where aspen communities are in poor ecological health and mountain shrub communities are decadent and dominated by late seral vegetation assemblages.

ACEC management under Alternative B could limit fuel treatment options if roads have been reclaimed to help benefit the resource associated with the ACEC designation. A beneficial impact of the South Pass Historic Mining Area ACEC would be the objective of reducing fuels in the WUI. This would benefit fire suppression by reducing fuel loading before wildfires and could allow for more effective protection of homes and valuable cultural resources in the event of a wildfire.

4.3.2.3.4. Alternative C

4.3.2.3.4.1. Program Management

Alternative C uses prescribed fire and fuels management to meet fire and fuels resource management objectives, reduce hazardous fuels, reintroduce fire in its natural role to the ecosystem, and improve plant community health. In light of the emphasis on full suppression in this alternative, it is likely that wildland fire would not be utilized to achieve resource benefits. Similar to Alternative A, approximately 300 acres per year of short-term disturbance over 20 years is anticipated from prescribed fire under Alternative C. For mechanical fuels treatments under this alternative, approximately 500 acres per year for 20 years of short-term disturbance is anticipated. All acres of this disturbance would be reclaimed. Similar to Alternative A, little or no funds would be expended on non-infrastructure types of range improvement projects such

as vegetation treatments and fuels reduction because all available funds would be invested in rangeland infrastructure.

4.3.2.3.4.2. Resources

Under Alternative C, avoiding soil disturbance for the protection of soil, water and riparian-wetland resources would adversely impact fuels management unless these limitations were mitigated to allow fuels treatment. Alternative C is more likely to achieve improvements in riparian-wetland condition and PFC because infrastructure would be employed to fence out these areas, which complements fuels management.

Prohibiting surface-disturbing and disrupting activities within ½ mile of active raptor nests under Alternative C is less restrictive than Alternative A, but would still adversely impact fuels management. Alternative C has the same greater sage-grouse management as Alternative A with the same limited adverse impacts to the fire and fuels program, particularly in comparison to Alternative B.

Alternative C VRM is similar to Alternative A, except less restrictive, with the same moderately adverse impact to the fuels program by allowing more surface disturbance. However, as is further analyzed below under *Resource Uses*, more development would improve fire management to the extent that additional roads would be authorized improving access.

4.3.2.3.4.3. Resource Uses

Under Alternative C, most of the planning area is open to wind-energy and mineral development. This development could adversely impact fuels management in terms of fracturing the landscape and making the use of prescribed fire extremely challenging and increasing the complexity of the burn. Utilizing wildland fire to achieve resource benefits might be difficult in these situations. A beneficial impact could be the increased supporting road network associated with this wind-energy and mineral development, which could be used strategically to break up the landscape when using prescribed fire so as to not burn too much of the vegetation community that could be critical as wildlife habitat.

Trails and travel management under Alternative C allows use of existing roads and trails throughout most of the planning area, with seasonal restrictions in special designations. This would be a beneficial impact in terms of allowing access to treatment areas and the use of existing roads for strategic breaks in prescribed fire and wildland fire that is utilized to achieve resource benefits.

Livestock grazing could be beneficial to fuels management objectives, especially in the WUI, by reducing fine fuels often associated with increased fire behavior. An adverse impact would be the potential proliferation of INNS if improper livestock grazing management occurs. INNS, such as cheatgrass, often render an area untreatable with fire if the species dominates an area, leading to a higher probability of wildfire burning at a fire return interval earlier than historic occurrence. Livestock grazing management under this alternative, however, will utilize infrastructure types of range improvements with less or no vegetation treatments or aspen or riparian-wetland treatments. Alternative C, like Alternative A, would treat approximately one-third the acres as Alternative B with resulting increased adverse impacts.

4.3.2.3.4.4. Special Designations

Alternative C, like Alternative A, affords minimum protections to NHTs and no protections to the National Scenic Trails. It is likely that more surface disturbance with accompanying adverse impacts to the fire and fuels program would result in comparison to Alternative B.

Alternative C manages areas that are designated as ACECs in other alternatives with standard stipulations which will result in more surface disturbance and more development. Both of these activities would adversely impact the fire and fuels program, although improved access associated with development may, on a site-specific basis, have beneficial impacts. On a short- and long-term basis, reduced limitations on the use of prescribed fire in an ACEC or within the historical setting of an ACEC (or Congressionally Designated Trail) may beneficially impact the fire and fuels program.

4.3.2.3.5. Alternative D

4.3.2.3.5.1. Program Management

Similar to alternatives A, B, and C, Alternative D uses prescribed fire and fuels management to achieve fire and fuels resource management objectives, reduce hazardous fuel loads, and reintroduce fire in its natural role into the ecosystem. This approach could result in a beneficial impact to fire management in the planning area. Opportunities for wildland fire that are utilized to achieve resource benefits would be limited under Alternative D. Approximately 500 acres per year of short-term disturbance over 20 years is anticipated from prescribed fire treatment and 500 acres per year of short-term disturbance over 20 years is anticipated from mechanical treatments, the same as under alternatives A and C and approximately one-third that under Alternative B.

4.3.2.3.5.2. Resources

Under Alternative D, allowable emission levels are the same as alternatives A and C and potentially less restrictive than under Alternative B. Soil, water, and riparian-wetland protections are similar to those under alternatives A and C within the same moderately adverse impacts to fire and fuels, although substantially less adverse than under Alternative B.

Forest treatment objectives can also accomplish fuels reduction objectives, especially in the WUI. Mechanical treatments completed in forest and woodlands can also create fuel breaks that could be used to contain prescribed fire and reduce the adverse impacts from fire by reducing the fire severity associated with heavy 1,000-hour fuel loading. Specifically under Alternative D, forest treatments also complement prescribed fire and fuels management because they achieve fuels goals of restoring ecosystem health and, in areas where it is appropriate, allow the use of all silvicultural techniques to actively manage forests associated with 1,000-hour fuel loads. Wildland fire that is utilized to achieve resource benefits is supported by forest and woodland management under Alternative D, although not as likely a management decision as under Alternative B.

Alternatives A, C, and D could result in moderate adverse impacts to the use of wildland fire for resource benefit, the use of prescribed fire, and some mechanical treatments. Equal support for restoration of native plant communities associated with fuels management and providing for livestock forage on BLM-administered lands has historically made rangeland vegetation treatments difficult to implement to ensure the long-term reestablishment of healthy

early seral plant communities. Alternative D also could result in beneficial impacts to fuels management from the management of shrubland and grassland communities using seral-state attributes described in the NRCS ecological site descriptions, which, if properly implemented, are synonymous with the tools provided by fire and fuels management. Grassland and shrubland management actions under Alternative B would be most beneficial to fire and fuels management, with less substantial beneficial impacts under alternatives A, C, and D. Restoration of these surface water (riparian) systems, often directly within the riparian-wetland area, is important to achieving fuels reduction objectives (especially with the presence of riparian-wetland INNS such as Russian olive) and restoring riparian-wetland system function and ecosystem health. A beneficial impact would be the management action of achieving PFC in riparian-wetland systems, which complements fuels management objectives.

Cheatgrass adversely impacts fire and fuels management. It limits the use of prescribed fire and most mechanical treatments because of the high probability of proliferation of the annual grass after fuels treatment. Aggressive management of INNS, notably cheatgrass, would be a beneficial impact of invasive species management and considered to be the same under alternatives D and B.

Wildlife management actions under Alternative D are similar to Alternative B but less restrictive. These protections, such as restrictions to surface-disturbing and disruptive activities in elk winter range would adversely impact fuels management because they constrain the time available to treat vegetation and hinder the fuels program's ability to treat areas in the planning area over the next 20 years. Protections for raptors and greater sage-grouse would adversely impact the fire and fuels program but less than under Alternative B, which has more restrictive prescriptions. Wildlife protections, including limitations on surface disturbance for the benefit of wildlife under Alternative D, would have more adverse impacts than under alternatives A and C.

4.3.2.3.5.3. Resource Uses

Under Alternative D, less land is open for wind-energy and mineral development than under Alternative A or C. This limited development could still adversely impact fuels management in terms of fracturing the landscape and making the use of prescribed fire extremely challenging and increasing the complexity of the burn. Wildland fire that is utilized to achieve resource benefits might be impossible in these situations. A beneficial impact could be the increased supporting road network associated with wind-energy and mineral development, which could be used strategically to break up the landscape when using prescribed fire to meet site-specific resource objectives. Other areas might also warrant fuels treatments, not to restore ecological health with fire or surrogate mechanical treatments, but simply to reduce fuel loading to protect human infrastructure. Required Design Features would beneficially impact fuels by further limiting the size and location of surface disturbance.

Trails and travel management under Alternative D is similar to Alternative B, except that slightly fewer areas are closed to motorized travel. Use of existing roads and trails would be beneficial to fuels management, while seasonal restrictions for wildlife protection would be an adverse impact. The *Biological Resources* section addresses this in detail. Access to treatment areas and the use of existing roads for strategic breaks in prescribed fire and wildland fire that is utilized to achieve resource benefits is important to successful prescribed burning, and potentially the wildland fire that is utilized to achieve resource benefits.

Livestock grazing under Alternative D could be beneficial to fuels management objectives in the WUI because livestock grazing would reduce the fine fuels available in the event of a

wildfire. Adverse impacts to the fire and fuels program under Alternative D would be similar to those under alternatives A and C. Alternative D would not result in the beneficial impacts of Alternative B, which allows for more residual grass in grazing allotments as a result of an overall more conservative livestock grazing strategy. Alternative B could allow for more extensive use of prescribed fire and allow for more successful reestablishment of desirable native herbaceous species after burns. The establishment of reserve common allotments also would result in a beneficial impact to fuels management under Alternative D. Reserve common allotments allow greater flexibility in treating and properly resting areas with prescribed fire, and may enhance the utilization of wildland fire to achieve resource benefits. In addition, under Alternative D, infrastructure projects would be the emphasis for range improvement projects, as under alternatives A and C, with fewer beneficial impacts than would result under Alternative B. Over the long term, this difference would likely result in some 20,000 fewer acres being treated than under Alternative B, which would have the same moderate to substantial adverse impact on the fire and fuels program as alternatives A and C.

4.3.2.3.5.4. Special Designations

Special designations would beneficially impact fuels management under Alternative D. Alternative D includes more acreage protections and stipulations that restrict disturbances in these areas than Alternative A and substantially more than Alternative C. The opportunity to manage historically natural landscapes under Alternative D would allow the restoration of areas using natural processes and emphasize treatments suitable for the landscape. Alternative D allows vegetative treatment and fuels management, where feasible, in ACECs such as Lander Slope, Red Canyon, and Green Mountain, where there are interfaces between communities that would benefit from prescribed fire and other fuels management treatments and ACEC stipulations.

Adverse impacts from Alternative D would include restrictions on the types of treatments that can occur if they do not directly complement wildlife habitat protected by the ACEC, such as in Green Mountain or East Fork. This would slow the restoration process in areas such as Green Mountain, where aspen communities are in poor ecological health and mountain shrub communities are decadent and dominated by late seral vegetation communities that might have already missed an historic fire return interval.

ACEC management under Alternative D, like Alternative B, could limit fuels treatment options if roads have been reclaimed to benefit the resource associated with the ACEC designation. A beneficial impact of ACEC management, such as in the South Pass Historic Mining Area ACEC, would be the objective of reducing fuels in the WUI. This would benefit fire management by reducing fuel loading and could allow for more effective protection of homes and valuable cultural resources in the event of a wildfire.

4.3.3. Stabilization and Rehabilitation

Under all alternatives, the need for stabilization and rehabilitation following a fire event is evaluated using an interdisciplinary approach to protect natural resources and threats to human health and safety. The guidelines for development of this plan are outlined in BLM Handbook H-1742-1, *Burned Area Emergency Stabilization and Rehabilitation*. BLM management of stabilization and rehabilitation does not vary by alternative so no analysis of impacts on this program is required. Additional information regarding the stabilization and rehabilitation programs is found in the *Stabilization and Rehabilitation* section in Chapter 3.

4.4. Biological Resources

4.4.1. Vegetation – Forests, Woodlands, and Aspen Communities

Management actions restricting forest management practices or contributing to the decline in abundance, distribution, or health of forests or woodlands, and availability, quality, and quantity of forest products are considered adverse impacts. Conversely, beneficial impacts include actions that enhance management, improve health, and protect and restore forests and woodlands in the planning area.

Direct impacts to forests and woodlands (forest products are a byproduct of and part of the following analysis of impacts to forest and woodland resources) result from management actions that affect forest structure, species composition/diversity, vigor, health, vegetative community type, or other forest/woodland characteristics. Management actions that limit timber availability, restrict timber extraction methods, and restrict areas where forest and woodland treatments can occur also have direct adverse impacts to forest products. Indirect impacts to forests, woodlands, and forest products include any change in forest and woodland characteristics as a result of natural forces (e.g., insect and disease and fire and drought), management actions for other resources, or failure to implement management actions.

Natural and human activities can produce beneficial and adverse impacts to forest and woodland communities (e.g., natural regeneration). In a mature forest or woodland, natural regeneration restores genetic diversity, sustained yield, and uneven-aged stands to benefit maintenance of a forest or woodland ecological site; ensures continuous production of forest products; facilitates insect and disease control; and produces economic benefits through proper land use, soil and water conservation, and eliminating the cost of planting. Alternatively, natural regeneration can introduce conifers into aspen stands, thereby reducing the size of or out-competing the aspen stands. See Map 47 for primary forest resource areas across the planning area.

4.4.1.1. Summary of Impacts

Alternative C results in the greatest projected total surface disturbance, followed by alternatives A, D, and B. Surface disturbance could result in adverse impacts by contributing to the decline in abundance, distribution, or health of forests and woodlands and the availability, quality, and quantity of forest products. Alternative C would allow the most motorized vehicle use and would result in the most new road construction, followed by Alternative A and then Alternative B. Motorized vehicle use could degrade forest health by disturbing soil and vegetation, leading to increased erosion. Motorized vehicle use could increase the risk of unplanned ignitions and provide access for unauthorized wood cutting. Alternative C, followed by alternatives A and B, implements the most silvicultural practices to actively manage forests and woodlands. More intense forest management practices could have a beneficial impact on forest and woodland health and forest products by increasing availability and reducing the risk of landscape-level stand replacement wildfires that occur naturally in forested areas in the planning area and are generally associated with forested stands that are not managed (historic conditions). Alternative C would result in the most beneficial impacts, from a silvicultural standpoint, to forests so long as management practices to increase forest product availability also improve forest health. Alternative B provides the most forest and woodland landscape beneficial impact from a natural ecology standpoint in terms of emphasizing natural processes that dominate in these systems.

4.4.1.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- The condition, species content, and vitality of the forest and woodland ecosystem are a function of the soils, topography, slope/aspect, and microclimate and climatic forces specific to the area.
- A complete forest or woodland inventory is available for only a portion of the planning area.
- Under all alternatives, Wyoming Forestry BMPs will be incorporated and utilized to the fullest extent possible.
- Silvicultural treatments will be used to promote forest and woodland health, contribute to sustainable timber production, and enhance wildlife habitat value. Silvicultural treatments are considered long-term impacts. The use of clear-cutting varies by alternative.
- Vegetative treatments will vary in forest and woodland areas depending on the goals (e.g., fuel reduction in a WUI area) and the most appropriate treatment method.
- Aspen stands are generally in poor condition across the planning area due to limited seedling and sapling regeneration as a result of a number of factors, including ungulate browsing, conifer encroachment, and lack of recent fire disturbance.
- Stands managed for old growth will follow Healthy Forests Restoration Act of 2003 (Public Law 108-148) Section 102 for maintaining and managing these stands. There are limited areas managed for old growth features.
- Insect and disease mortality is a substantial concern in lodgepole pine and limber pine stands in the planning area. Accelerated salvage harvesting of the insect- and disease-killed trees is anticipated in the short term (years 1 through 10). Probable annual harvest levels and acreage disturbed in the years to follow (years 11 through 20) are anticipated to decrease as priority treatable areas are harvested.
- Forests and woodlands are important for watershed values, visual resources, and wildlife habitats. Some of these values are natural, some are sociological. For example, wildlife need habitats, not visual quality. Sociological, economic, and cultural influences of humans and must be considered in forest management.
- Mechanical forest treatments (soil erosion, etc.) could adversely impact water quality in the short term, but overall, the consequences of these treatments are anticipated to be negligible depending on treatment size and type.
- Management practices include removing encroaching conifers from aspen stands to release the stand and improve aspen stand health in some locations. Most woodlands (see “woodland” in the Glossary) will continue in succession until disturbed by natural causes.
- Forest health, forest restoration, and hazardous fuels reduction objectives will be the major determining factors in forest management.
- Forested areas in the planning area are in fire regime groups III, IV, or V. Fire regime group III is defined as mixed severity with a return interval of 35 to 100 years; the Douglas-fir stands are primarily in this fire regime group. The limber pine and juniper woodlands and the aspen forests/woodlands are in fire regime group III. The lodgepole pine and spruce-fir stands are in fire regime group IV, which is defined as an infrequent (return interval of 35 to 200 or more years) stand replacement fire. Therefore, clear-cut units approximating natural disturbance patterns are acceptable in established Wyoming BLM guidelines. Primary management options will emphasize thinning, removal of insects and diseases affecting trees, and partial overstory removals, where appropriate.

- Up to 700 acres of woodland (aspen, juniper, and limber pine) could be treated annually, which would assist in restoring woodlands to their historic place on the landscape and with rejuvenating aspen stands for wildlife, VRM, and the creation of natural fuel breaks.
- Public-demand sales for firewood, Christmas trees, posts and poles, and other forest products will continue. The actual number of permits issued and estimated volumes will vary annually based on public demand, although the trend is upward for over-the-counter permitted sales in the planning area based upon 2005–2009 totals and will not vary by alternative. There would be no new road construction to meet this demand. The volume of commercial forest product sales will not increase, will not vary across alternatives, and will depend on factors outside BLM management activities.

4.4.1.3. Detailed Analysis of Alternatives

Types of project impacts to forests, woodlands, and forest products under the alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts to forests, woodlands, and forest products from surface-disturbing activities and proactive management actions are described under individual alternatives. Alternative C would result in the greatest projected total surface disturbance, followed by alternatives A, D, and B. Surface disturbance could result in adverse impacts by contributing to the decline in abundance, distribution, or health of forests and woodlands and the availability, quality, and quantity of forest products. Alternative C allows the most motorized vehicle use and would likely result in the most user-created new trails, followed by alternatives A, D, and B. Motorized vehicle use could degrade forest health by disturbing soil and vegetation, leading to increased erosion, and could increase the risk of unplanned ignitions and provide access for unauthorized wood cutting.

Alternative C, followed by alternatives A, D, and B, allows the most silvicultural practices to actively manage forests and woodlands. More intense forest management practices could have a beneficial impact on forest and woodland health and forest products by increasing availability and reducing the risk of landscape-level disturbances. Alternative C would result in the most beneficial impacts to forests, so long as management practices to increase forest product availability also improve forest health. However, funding for forest management practices is not likely to be available in sufficient amounts for these differences to result in anything more than minor differences in impacts among the alternatives. See the *Vegetation – Forests, Woodlands, and Aspen Communities* section in Chapter 3 for an explanation of the impact of reduced demand for forest products on forest management.

Forest management, including timber harvest, would contribute to improving overall forest health throughout the planning area. These types of actions would reduce the potential for landscape-level wildfires, and enhance age and species diversity. These specific proactive management actions common to all alternatives would result in beneficial impacts to forest, woodlands, and forest products by restoring historic processes, composition, and structures of forests and woodlands, and thereby maintaining a harvest level of forest products that supports these objectives.

4.4.1.3.1. Impacts Common to All Alternatives

Although the types of impacts to forest and woodlands under all alternatives are similar, the intensity of these impacts is expected to vary by alternative. The following paragraphs describe potential impacts common to all alternatives.

Air quality conditions in the area at the time of proposed forest and woodland treatments could restrict treatments to maintain air quality standards. These restrictions would result in potential short-term adverse impacts to vegetative treatments, such as planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. Smoke dispersion is probably the most important concern and potential restriction of forest and woodland treatments involving fire.

Soil resource management can limit forest management options with restrictions on ground-disturbing activities when ground is frozen. In areas such as Dubois, where forested tracts are isolated and where primary forested stands are not restricted by seasonal wildlife closures, this could shorten the available time in any given year to complete forest treatments. Soil resource management can be beneficial to forest management by emphasizing protocol that reduces erosion and protects natural resources.

Fire and fuels management complements forest and woodlands management. A landscape-level approach to vegetation management and the over-the-counter sales of wood products to achieve fuels objectives would result in beneficial impacts to forest management by helping to restore these communities and reduce fuel loading and risk of long-term damage from landscape-level wildfire. The BLM does not anticipate that commercial sales would result in any more than a minor impact (adverse or beneficial) to forest health under any alternative.

INNS may adversely impact forest and woodland resources by altering fire behavior in these communities and leading to greater loss of habitat. This is notably the case in juniper and limber pine woodland areas infested with cheatgrass.

Limitations on surface disturbance such as Required Design Features that restrict road placement for the benefit of wildlife and greater sage-grouse, would adversely impact the sale of forest products, but would beneficially impact forest resources in the long term by preventing the degradation of riparian-wetland areas.

Short-term adverse impacts regarding the timing or location of vegetation treatments and the availability of forest products could result from temporary CSU restrictions and seasonal NSO restrictions in buffers for special status species and raptor nest sites in forests and woodlands.

Direct long-term adverse impacts to forest management will occur in localized areas where there are known and new significant cultural resource sites, because these sites would require protection and avoidance during forest and woodland management. The presence of cultural resource sites could restrict the location of vegetative treatments and access roads, thereby decreasing access and acreage available for forest and woodland treatments.

Oil and gas, wind-energy, and mineral development could adversely impact forest and woodland habitat by fragmenting forested stands and increasing the potential for human-caused fires and the spread of invasive species in these areas. These types of developments can also cause moderate to major disturbances and negate the beneficial impacts of some forest and woodland habitat treatments. The use of fire in these areas to restore forest and woodland habitat is more difficult than on an undeveloped landscape because of proximity to infrastructure and conflicts with resource uses. These types of resource developments can also reduce the acreage of forest and woodlands available for management.

Recreational use in forest and woodland areas could result in indirect short-term adverse impacts from unplanned ignitions and unauthorized woodcutting adjacent to permanent and dispersed camping areas. Unless properly designated and managed, development of recreation trails, both

motorized and nonmotorized, could adversely impact forests and woodlands through increased soil erosion.

Potential impacts from VRM, NHTs and other historic resources, transportation, wildlife, and special status species are anticipated to influence the location, size, and shape of forest and woodland treatments and affect the locations and construction of access roads.

Seasonal restriction for forest and woodland management could apply to existing or newly designated ACECs and WSAs. Across all alternatives, the BLM will manage WSAs as natural areas where low-impact management tools are used to improve resource conditions, with no commercial removal of timber products. These impacts would be consistent across all alternatives.

4.4.1.3.2. Alternative A

4.4.1.3.2.1. Program Management

Approximately 1,500 acres per year of short-term disturbance over 20 years are anticipated from forest and woodland management (mechanical treatments and forest product sale areas) under Alternative A. All acres of this disturbance would be reclaimed.

Under Alternative A, forest and woodland resources are managed in response to conditions on the ground and objectives such as forest health, wildlife habitat requirements, and demand for forest products using a variety of silvicultural treatment types. Overall forest health is balanced with providing commercial and over-the-counter forest products to the public in a sustainable manner.

Clear-cuts of commercial forest stands (primarily used in lodgepole pine stands) are allowed on areas up to 25 acres in size, not within 100 feet of riparian-wetlands, and on slopes only up to 45 percent for ground-based logging systems. Management is conducted in consideration of resource needs and demand for forest products, with forest product harvest objectives established for the Green Mountain and Lander Slope areas and on a case-by-case basis for the Red Canyon, South Pass, and Dubois areas. Timber and over-the-counter forest product sales would not exceed annual sustained yield capacity.

Forest replanting after timber sales or disturbance is on an as-needed basis. Similarly, management of forest insect and disease outbreaks is implemented on a case-by-case basis. Management and enhancement of aspen is emphasized in all forest management areas, while woodland species such as juniper and limber pine are not specified.

Alternative A does not apply an MLP for the Beaver Rim area and thus does not have special stipulations to protect unique plant communities in that area.

4.4.1.3.2.2. Resources

Under Alternative A, the BLM uses primarily mechanical treatments to maintain and enhance forest resources. Forest product sales are in response to local and regional market demand and on a case-by-case basis. Cut objectives are specified to allow harvest of timber on a sustained-yield basis, with the overall objective of improving forest health. As indicated in Chapter 3, sustainability could be difficult to ascertain with changing precipitation patterns and potential long-term climate change.

Management of soil resources under Alternative A could adversely impact forest management by restricting ground-disturbing activities on slopes over 25 percent, which could limit areas available for forest treatment if methods are determined to be ground disturbing. A notable example is in the Green Mountain area, where most of the forest resources are in the planning area. In the Green Mountain ACEC, more than 5,000 acres are on slopes in excess of 25 percent. Additional soil stipulations on reclamation could also adversely impact forest management by requiring soil stabilization on logging or treatment sites, which could make treatments cost more than the value of forest products harvested.

Full suppression of wildfires in forested and woodland areas is likely under Alternative A. This could be beneficial to forest resources by reducing the potential loss of timber resources and habitat from uncontrolled fire. This would result in short-term beneficial impacts to forested areas by limiting the short-term adverse impacts from high-severity fire on these areas. That could also include increased erosion and loss of residual trees to reestablish burned areas. Adverse impacts from this suppression approach would be continued loss of aspen due to lack of disturbance from fire, and long-term fuels buildup, which could lead to landscape-level and high-severity wildfires during the planning period as a result of years of full suppression of wildfires.

Under Alternative A, authorization of clear-cuts would have beneficial impacts to aspen regeneration efforts where aspen are showing signs of decline, disease, or distress from competition or otherwise are not functioning well. However, where aspen require treatment, not being able to use commercial harvesting through clear-cuts would result in the loss of a valuable tool for regeneration (Shepperd 2001). However, the success of commercial harvest depends on an available wood market and a transportation system to remove the product (Shepperd 2001). Other methods of treatment can stimulate regeneration, but with fewer beneficial impacts compared to clear-cutting.

Riparian-wetland management under Alternative A restricts surface-disturbing activities within 500 feet of surface water. This could adversely impact forest management by restricting areas, but simple mitigation measures common to Wyoming Forestry BMPs can be implemented to complete projects in these areas. Many of the projects in these areas would ultimately have beneficial impacts on riparian-wetland systems by restoring aspen communities and improving surface hydrology through the removal of younger-age-class conifers established in these areas as a result of altering the natural fire regime. The objective of progress toward PFC in riparian-wetland areas would be beneficial to forest management in many cases.

Management actions specific to wildlife and special status species could beneficially impact forests and woodlands if they restrict activities that could adversely impact forest and woodland health. An example of the beneficial impact of wildlife and special status species management to forest and woodland management is the restoration of aspen stands, which is beneficial to forest health and enhances wildlife habitat conditions.

Management actions specific to wildlife and special status species can also adversely impact forests and woodlands if they restrict forest management practices or timber product sales with seasonal closures, and individual species timing and distance stipulations that have the practical effect of limiting access to an area to a short period that makes sales impossible. Wildlife and wild/feral horse browsing in areas such as Green Mountain can adversely impact management of aspen stands.

4.4.1.3.2.3. Resource Uses

Under Alternative A, most of the planning area remains open to oil and gas and other minerals development, and the extent of RFD of minerals facilities is the second-greatest under this alternative. Where this potential development occurs in forest and woodland areas, it could adversely impact this resource by contributing to a decline in abundance, distribution, and health of forests and woodlands. The extent of most of the adverse impacts to forest and woodland resources would be greatest during the life of the development operation, with most areas of disturbance being reclaimed. Loss of forest and woodland areas as a result of oil and gas and mineral development is expected to be a long-term adverse impact; forest and woodland areas would not recover to predisturbance conditions over the next 20 to 30 years.

Most of the planning area is open to wind-energy development under Alternative A. Wind development could adversely impact forest and woodland resources by removal and fragmentation of these resources within a development site and supporting infrastructure. Similar to oil and gas and mineral development, wind-energy development in forest and woodland habitat would cause short-term and long-term adverse impacts.

Livestock grazing under Alternative A would have a continued adverse impact to aspen stands and, to a lesser degree, cottonwood galleries, due to browsing pressure on these woodlands. Intensive browsing pressure reduces the ability of these species to regenerate through suckering and contributes to the eventual die off of entire stands.

Alternative A permits the use of motorized vehicles on existing roads and trails in most of the planning area. The level of public access granted for motorized travel could adversely impact forests and woodlands by increasing the potential for unplanned ignitions and unauthorized woodcutting. However, allowing motorized vehicle use on existing roads and trails would also beneficially impact forest products by allowing access for commercial timber harvest and sales of over-the-counter wood products. Allowing motorized vehicle use in areas with limited travel designations would result in road and trail proliferation that would increase erosion, degrade vegetation, and increase the potential for unplanned ignitions in forest and woodland areas.

4.4.1.3.2.4. Special Designations

Special designations beneficially impact forests and woodlands if they place additional restrictions on activities that contribute to forest decline or degrade forest health (e.g., surface-disturbing activities and motorized vehicle use). For example, Alternative A restricts motorized vehicle use by limiting travel in some ACECs to designated roads, which would beneficially impact these areas by reducing the likelihood of unplanned ignitions and unauthorized forest and woodland product removal in these high-resource-value areas.

Special designations could adversely impact forests and woodlands and forest products with additional restrictions on forest and woodland treatments to maintain desired vegetative or habitat conditions or limit timber extraction availability or methods. ACECs with forest and woodland resources (Green Mountain, South Pass, for example) could also adversely impact forest and woodland management by limiting motorized travel to extract forest products or perform treatments, and seasonal closures that limit the time available to actively manage a forest or woodland landscape.

4.4.1.3.3. Alternative B

4.4.1.3.3.1. Program Management

Approximately 550 acres per year of short-term disturbance over 20 years are anticipated from forest and woodland management (mechanical treatments and forest product sale areas) under Alternative B. All acres of this disturbance would be reclaimed.

Under Alternative B, the BLM manages forests and woodlands for watershed stability, wildlife habitat, and forest health, with an emphasis on natural processes to achieve forest health objectives. Alternative B permits timber harvesting that mimics natural processes and addresses fuels loading in the WUI. Under this alternative, natural processes are emphasized and active management is used only where natural processes are unable to accomplish forest health goals or there is a threat to human health and safety. Alternative B allows for forest replanting after fire or treatment, but only when necessary for stabilization or to achieve desired forest habitat conditions.

Alternative B prohibits clear-cut-type forest treatments. The restriction on the use of clear-cuts under this alternative would beneficially impact forest woodlands management related to short-term maintenance of soil stability from lack of ground disturbance and maintenance of mature forest stands. The inability to use clear-cut forest management techniques could also be an adverse impact because that method of treatment can be used to mimic natural disturbance processes in lodgepole pine forests. The inability to break up forest fuel continuity could increase the threat of landscape-level disturbances, which could threaten municipal watersheds or adversely impact certain resource values.

Forest management actions under Alternative B could result in more mature stands with less diverse age structure, and could also result in an adverse impact in relation to other alternatives in terms of spread and extent of bark beetles and other forest and woodland pests, which are more prevalent in mature forest and woodland stands. Again, management under Alternative B emphasizes natural processes to achieve forest health, which raises the potential for landscape-level disturbances in forests and woodlands on BLM-administered lands in the planning area. This can result in a substantial adverse impact in terms of threatening human health and safety, the long-term removal of critical wildlife habitat types, affecting municipal watersheds, and encouraging the potential proliferation of nonnative species such as cheat grass after burns. A beneficial impact under this alternative would be the restoration of fire-dependent ecosystems.

Alternative B does not apply an MLP to the Beaver Rim area but instead closes it (and other areas of greater sage-grouse Core Area) to oil and gas leasing.

4.4.1.3.3.2. Resources

Under Alternative B, the BLM uses natural management to restore forest and woodland landscapes. Active management techniques would be used for specific concerns such as wildlife habitat and in the WUI. The use of wildland fires and prescribed burning to restore fire-adapted ecosystems would be the greatest restoration tool under Alternative B, and could substantially alter forest and woodland habitat in the planning area, because most forested areas are in fire regime IV or historically experienced stand-replacement fires. Woodland resources in the planning area are generally in fire regime III, or historically experienced mixed-severity fires. A likely result would be larger forested tracts in early seral condition as a result of fire. There would

be only minor differences between the impacts under Alternative B management the impacts under Alternative A management.

Under Alternative B, a restriction on soil-disturbing activities on slopes over 15 percent is a major limitation on the ability to treat wildlife habitat or areas in the WUI. Water resource management under Alternative B would result in beneficial impacts to forest and woodland management because it emphasizes the development of watershed management plans that would be used to identify treatments to improve the ecological health of forest and woodland habitats. A major adverse impact under Alternative B would be restrictions on surface-disturbing activity within ¼ mile of surface water/riparian-wetland areas, which would limit the ability to manage forest and woodland types in these areas, notably the restoration of aspen stands in and adjacent to riparian-wetland areas.

Under Alternative B, management of the Little Red Creek Complex as non-WSA land with wilderness characteristics would have the potential to result in adverse and beneficial impacts. The Little Red Creek Complex is closed to motorized travel under Alternative B, which would beneficially impact forest resources by avoiding the adverse impacts of motorized travel. By managing the area to maintain wilderness characteristics, forest treatments that could improve forest health could be precluded.

Fire and fuels management under Alternative B complements forest and woodland management. The limitation on the use of heavy equipment in fire suppression would limit adverse impacts to forest resources in terms of short- and long-term impacts from soil erosion. Wildfire suppression tactics are more limited under Alternative B, except in the WUI or where fire threatens infrastructure, and this would enable a natural management approach where appropriate. Restoration of aspen with prescribed fire and wildland fire is greatest under this alternative and would help to regenerate aspen stands that are generally in declining health. However, the difference in impacts between Alternative B and Alternative A would be minor.

Wildlife and special status species management under Alternative B would restrict the timing when treatments can occur in critical winter range and elk parturition areas, and prohibit forest and woodland treatments within a 1.5-mile radius of active special status raptor nests. This would result in more adverse impacts to forests, woodlands, and forest products than Alternative A. However, wildlife and special status species management under Alternative B would generally complement forest and woodland resources because protections for wildlife species and their habitat is generally compatible with natural approaches to landscape management. Limitations on surface disturbance under Alternative B for the protection of greater sage-grouse would not be likely to adversely impact forest management because there is little overlap of greater sage-grouse habitat with forest units. However, Alternative B's closure of Core Area to oil and gas leasing would beneficially impact the unique plant communities in the Beaver Rim area more so than under Alternative A which protects only those communities located on slopes of 25 percent or more steepness.

Management actions under Alternative B for cultural resources, paleontological resources, and visual resources in relation to surface-disturbing activities would generally be beneficial to forest management. Protection of resources would emphasize naturalness of the landscape and promote management activities that mimic natural processes and landscape suitability. These guidelines could limit where treatments can occur, but also help to design treatments that are more acceptable to the public. There could be some adverse impacts in terms of restrictions on where treatments may occur and appearance on the landscape. An example is treatments in proximity to the Warm

Springs Flume, where fire has not occurred for some time and the vegetation communities are in Fire Regime Condition Class II and III areas, or in areas with moderate to high departure from historic fire-return interval. In such cases, forest treatments could help to protect the cultural resource in the event of a wildfire.

4.4.1.3.3.3. Resource Uses

Alternative B restricts resource uses such as wind-energy and mineral development in the planning area far more than Alternative A. This would beneficially impact forest and woodland resources by reducing short- and long-term disturbance from such activities, moderating the amount of infrastructure and roads in these areas, which would reduce the potential for the use of fire in management, and increasing the potential for human-caused fires.

Under Alternative B, oil and gas development would result in 10,720 acres of short-term surface disturbance, a portion of which could adversely impact forests and woodlands by contributing to a decline in abundance, distribution, or health of these communities. Although most of the planning area remains open to mineral extraction under Alternative B, the RFD of minerals facilities is the smallest under Alternative B compared to the other alternatives. Most of the impacts would be temporary during the life of the operation, with most areas of disturbance being reclaimed following closure of operations; however, short-term adverse impacts from minerals development include forest health degradation and habitat fragmentation. Loss of forest and woodland areas as a result of oil and gas and mineral development would be a long-term adverse impact; forest and woodland areas would not recover to predisturbance conditions over the next 20 to 30 years.

Alternative B provides the greatest protection for aspen stands, although limited areas could still experience browsing pressure from livestock. Browsing pressure reduces the ability of these poplar species to regenerate through suckering and contributes to the eventual die-off of entire stands. Under this alternative, livestock grazing could beneficially impact aspen stands by implementing moderate grazing levels, which would allow aspen to avoid intensive browsing pressure. Alternative B would treat more acres of woodlands because little or no funding would be spent on rangeland improvement projects. Alternative B closure of the Sweetwater River pasture in the Silver Creek Allotment to livestock grazing would beneficially impact aspen and cottonwood woodland galleries in the riparian-wetland corridor.

Unlike Alternative A, Alternative B recreation management limits forest cutting in some RMZs. To the extent these restrictions preserve forest health, they could result in beneficial impacts. To the extent the prohibition limits silvicultural techniques that would improve forest health, they could result in adverse impacts.

Alternative B limits motorized vehicle use to designated roads and trails in most of the planning area, which would beneficially impact forest and woodland resources by reducing degradation of those areas from increased soil erosion. In addition, prohibiting cross-country motorized travel in areas with limited travel designations would eliminate the potential for new road and trail proliferation. Restricting motorized vehicle use to fewer travel routes could adversely impact forest products by limiting access for commercial and over-the-counter forest product harvest.

4.4.1.3.3.4. Special Designations

Special designations would beneficially impact forest and woodland management under Alternative B with additional acreage protections from surface disturbance in forested areas. The

opportunity to restore forested areas using natural processes and emphasize treatments suitable for the landscape are greatest under Alternative B. Vegetative/silvicultural treatments and fuels management, where feasible, are allowed in ACECs such as the Lander Slope, Red Canyon, and Green Mountain, where the overlay of forest and woodland and ACEC management exist, although clear-cuts are not allowed anywhere under Alternative B. Forest management, however, could increase the likelihood of landscape-level fires to the extent that treatment is limited to that which would beneficially impact ACEC values.

Adverse impacts under Alternative B would result from restrictions on the types and timing of treatments. This would slow the restoration process in areas such as Green Mountain, where aspen communities are in poor ecological health. Another potential adverse impact of ACECs such as Green Mountain would be the adverse impact to aspen from wildlife grazing.

Alternative B manages the most waterways as eligible and suitable for inclusion in the NWSRS. This management precludes surface-disturbing activities within ¼ mile of the water course, which would beneficially impact forest resources in that area. However, silvicultural activities are also limited under Alternative B, with the potential for minor adverse impacts.

4.4.1.3.4. Alternative C

4.4.1.3.4.1. Program Management

Approximately 525 acres per year of short-term disturbance over 20 years are anticipated from forest and woodland management (mechanical treatments and forest product sale areas) under Alternative C. All acres of this disturbance would be reclaimed.

Alternative C manages forests and woodlands with the allowance to use all available tools and silvicultural techniques to provide forest products to the public and to maintain forest health. Clear-cuts are allowed to be any size and can be within 100 feet of riparian-wetlands. Ground-based logging activity can be on slopes up to 45 percent or on slope in excess of 45 percent with cable or helicopter logging. As opposed to Alternative B, active management under Alternative C would address issues such as insect and disease outbreaks across the forested landscape.

Like Alternative A, Alternative C does not apply an MLP for the Beaver Rim area and thus has no special management to protect unique forest and woodland areas.

4.4.1.3.4.2. Resources

Under Alternative C, although clear-cuts are allowed on slopes up to 45 percent under some circumstances, avoidance of soil-disturbing activities on slopes over 25 percent would adversely impact the ability to treat forest and woodland areas. This management is the same as Alternative A's protection of only those unique plant communities in the Beaver Rim area that are on slopes with 25 percent or more steepness.

Full suppression of wildland fire is most likely under Alternative C, and use of heavy equipment in fire suppression activities is authorized. Impacts to forest resources would be similar to those under Alternative A. This could be beneficial to forest resources by reducing the potential loss of timber resources and forest habitat from wildfire. In the short term, this would result in beneficial impacts to forested areas by limiting the short-term adverse impacts of high-severity fire on these

areas. Adverse impacts from this suppression approach would be continued loss of aspen due to lack of disturbance from fire and long-term fuels build up, which could lead to landscape-level fire during the planning period as a result of years of full suppression tactics. The loss of soil seed bank and loss of A-horizon soils could adversely impact reestablishment of forests and woodlands after high-severity fires.

A beneficial impact under Alternative C would be the lessening of restrictions on surface-disturbing activities within 500 feet of riparian-wetlands. This could lessen restrictions on forest management activities in riparian-wetland corridors, where greater restrictions could prevent such activities. Active management in riparian-wetland areas complements forest and woodland management under Alternative C.

Forest management actions under Alternative C could result in less-dense stands with more diverse age structure, and therefore would result in the most beneficial impacts by slowing the spread of bark beetles compared to alternatives A and B. Precommercial thinning could also have a beneficial impact on forests and woodlands, if performed at the appropriate intensity, to reduce fuels and the chance of landscape-level disturbances.

Management actions under Alternative C designed to protect wildlife and special status species habitat from the adverse impacts of surface-disturbing and surface-disruptive activities would be similar to those under Alternative A. Adverse impacts to forest and woodland and forest product management would result from limits on access to forest areas due to seasonal closures and distance limitations around active raptor nests, but these impacts would be expected to be minor and not preclude treatment. Beneficial impacts would result from maintenance of the road network inside and outside big game critical winter range and parturition areas. This would allow access to forested areas and facilitate treatments and forest product sales.

Clear-cuts are allowed under Alternative C, within some parameters, which would result in greater forest product availability than Alternative B, but similar to Alternative A. The potential adverse impacts to microclimates or regeneration time and soil erosion would be greater than under Alternative B, but similar to Alternative A.

Although management under Alternative C for cultural, paleontological, and visual resources would limit surface-disturbing activities and treatment techniques to maintain viewsheds, prescriptions under Alternative C are generally the least restrictive of all the alternatives and allow for the greatest flexibility in forest and woodland management. Under this alternative, there would be some adverse impacts from cultural, paleontological, and visual resources management, with beneficial impacts from VRM in terms of helping to design the treatments to be most acceptable to the public.

4.4.1.3.4.3. Resource Uses

Under Alternative C, most of the planning area is open to oil and gas and other minerals development, and the extent of the RFD of minerals facilities is the greatest under this alternative. A minor portion of this potential development could adversely impact forests and woodlands by contributing to a decline in abundance, distribution, or health of forests and woodlands. The extent of some of the impacts would be temporary during the life of the operation, with most areas of disturbance being reclaimed following closure of operations; however, short-term adverse impacts from oil and gas and mineral development include forest health degradation and habitat fragmentation. Loss of forest and woodland areas as a result of oil and gas and mineral

development would be a long-term adverse impact because forest and woodland areas would not recover to predisturbance conditions over the next 20 to 30 years.

Most of the planning area is open to wind-energy development under Alternative C. Wind-energy development could adversely impact forest and woodland resources by removal and fragmentation of these resources within a development site and supporting infrastructure. Wind-energy development in forest and woodland habitat would result in both short-term and long-term adverse impacts.

Livestock grazing under Alternative C would result in a continued adverse impact to aspen stands and, to a lesser degree, cottonwood galleries, due to browsing pressure on these woodlands. Browsing pressure reduces the ability of these poplar species to regenerate through suckering, and contributes to the eventual die off of entire stands. Adverse impacts to forest resources from livestock grazing would be minor compared to Alternative A and moderate compared to Alternative B, depending on grazing strategies implemented in forest resources. Like Alternative A, Alternative C does not close the Sweetwater Canyon pasture to livestock grazing, so adverse impacts to woodland vegetation in the canyon would be the same.

Alternative C permits the use of motorized vehicles on existing roads and trails in most of the planning area. The level of public access granted for motorized travel could adversely impact forests, woodlands, and forest products by increasing the potential for unplanned ignitions, unauthorized woodcutting, and INNS spread. However, allowing motorized vehicle use on existing roads and trails would also beneficially impact forest products by allowing access for commercial and over-the-counter forest product harvest. Allowing cross-country motorized travel in areas with limited travel designations would result in road and trail proliferation that would increase erosion, degrade vegetation, and increase the potential for unplanned ignitions, which would adversely impact forests, woodlands, and forest products.

4.4.1.3.4.4. Special Designations

Alternative C does not designate any ACECs and manages Congressionally Designated Trails with a ¼-mile buffer. Areas specially designated under alternatives A and B are managed under Alternative C with standard stipulations. Accordingly, to the extent that special designations could beneficially impact forests and woodlands by placing additional restrictions on activities that contribute to forest decline or degrade forest health (e.g., surface-disturbing activities and motorized vehicle use), Alternative C would result in more adverse impacts than alternatives A and B. To the extent that management of special designations limits forestry activity, Alternative C would result in beneficial impacts because it includes no such special management.

Under Alternative C, there would be some adverse impacts to forest resources from applying standard stipulations. For example, no part of Green Mountain is designated an ACEC, but seasonal restrictions are still applied. Seasonal restrictions would result in adverse impacts from restricting access to forest areas for management if the season in which to undertake forest management is too restricted to be able to complete needed work.

Under this alternative, the lack of management protections associated with special designations could also adversely impact forest and woodland resources and lead to increased adverse disturbances from recreational use and resource development in these habitat types and cause degradation of forest and woodland resources.

4.4.1.3.5. Alternative D

4.4.1.3.5.1. Program Management

Approximately 600 acres per year of short-term disturbance over 20 years are anticipated from forest and woodland management (mechanical treatments and forest product sale areas) under Alternative D. All acres of this disturbance would be reclaimed within a short time. These approximate annual acres treated over 20 years are greater than under alternatives A and B, but less than anticipated under Alternative C. Required Design Features for the benefit of greater sage-grouse habitat would adversely impact access to forests, but only to a moderate degree because the 1 percent of the planning area that is not greater sage-grouse habitat is the location of most of the forested vegetation. To the extent that greater sage-grouse and mule deer management treat juniper encroachment, woodland health, including aspen, would benefit.

Alternative D manages forests and woodlands using all available tools and silvicultural techniques to provide forest products to the public and to maintain forest health. Clear-cuts are allowed to be any size and in any location, depending on resource conflicts. This management would result in more beneficial impacts to forest and woodlands management; it does not impose artificial limits on forest management but acknowledges the potential for resource conflicts such as the potentially adverse impact of clear-cuts to soil and riparian-wetland areas.

Alternative D applies an MLP for the Beaver Rim area which would provide beneficial impacts to forests and woodlands.

4.4.1.3.5.2. Resources

Under Alternative D, slope avoidance would result in slightly more adverse impacts to the ability to treat forest and woodland areas than under Alternative A or Alternative C, but less than under Alternative B.

Full suppression of wildland fire is more likely under Alternative D than Alternative B, and more similar to alternatives A and C for the benefit of greater sage-grouse. The use of heavy equipment in fire suppression activities is authorized after considering impacts to other resources. Beneficial impacts to forest resources would be similar to those under alternatives A and C by reducing the potential loss of timber resources and forest habitat from wildfire. In the short term this would have a beneficial impact on forested areas by limiting the short-term adverse impacts from high-severity fire in these areas. Adverse impacts from this suppression approach would continued loss of aspen due to lack of disturbance from fire and long-term fuels build up, which could lead to landscape-level fire during the planning period as a result of years of full suppression tactics. The loss of soil seed bank and loss of A-horizon soils could adversely impact reestablishment of forests and woodlands after high-severity fires. The differences in impacts among the alternatives with regard to fire suppression activities would be very minor.

Alternative D, like Alternative A, restricts surface-disturbing activities within 500 feet of riparian-wetlands. This would result in more adverse impacts to forest and woodlands management than Alternative C, which could allow logging in riparian-wetland corridors where greater restrictions would prohibit such activities. Alternatives A and D would result in fewer adverse impacts than Alternative B.

Forest management actions under Alternative D are comparable to alternatives A and C in allowing the use of silvicultural techniques to address beetle outbreaks in manageable areas and create diverse age structure by allowing precommercial thinning and other forest treatment methods. Under Alternative D, funding to implement effective landscape-level treatments to address loss of dominant forest and woodland species such as lodgepole pine and limber pine could continue to be limited and substantially limit the beneficial impact of such treatments. However, aspen would benefit from the emphasis on addressing juniper encroachment rather than the use of prescribed fire where it could harm greater sage-grouse habitat. Management actions under Alternative D designed to protect wildlife and special status species habitat from the adverse impacts of surface-disturbing and surface-disruptive activities would be similar to those under Alternative B, but to a lesser extent. Adverse impacts to forest and woodland and forest product management would be limits on access to forest areas due to distance limitations around active raptor nests. Seasonal closures due to wildlife and travel management concerns could also adversely impact forest management in areas that have inclement weather by limiting the season of treatment to too short a time before inclement weather makes access impossible. Beneficial impacts would be maintenance of road networks inside and outside big game critical winter range and parturition areas. This would allow access to forested areas and facilitate treatments and forest product sales.

Clear-cuts are allowed under Alternative D, with consideration of other resources, which would provide greater forest product availability than Alternative B, but similar to alternatives A and C, and potentially more beneficial impact because Alternative D does not impose artificial constraints such as slope or size. Potential adverse impacts to microclimates or regeneration time and soil erosion would be greater than under Alternative B, but similar to alternatives A and C.

Management of the Little Red Creek Complex for wilderness characteristics would result in generally the same impacts under Alternative D as Alternative B – in some ways beneficial and in some ways adverse.

Management under Alternative D for cultural, paleontological, and visual resources limits ground-disturbing activities and treatment techniques to maintain viewsheds. This management is the second most restrictive of all the alternatives and allows the least flexibility in forest and woodland management. Under this alternative, there would be some adverse impacts from cultural, paleontological, and visual resources management, although fewer impacts than under Alternative B. Forest treatments can be designed to reduce contrast by feathering and avoiding straight lines, which would limit adverse impacts to forest, and particularly woodlands, management (where feathering has been very effective).

4.4.1.3.5.3. Resource Uses

After Alternative B, Alternative D management of oil and gas and other minerals development would result in the next most beneficial impacts to forest and woodlands management by closing the most areas to leasing (and withdrawals from locatable minerals) and managing the most areas as NSO. In the Dubois and South Pass Primary Forest Resource areas, this management would be substantially more beneficial than that under alternatives A and C, and comparable to Alternative B because of locatable mineral withdrawals. Although the Green Mountain ACEC is open to mineral location under Alternative D, a Plan of Operations is required for disturbances under 5 acres, which would assist the BLM in preventing undue or unnecessary degradation to forest resources (see *Special Designations*). Alternative D has almost as beneficial impacts to the forest resources in the proposed expanded ACEC as Alternative B because oil and gas leases

in the expanded Green Mountain ACEC would be NSO. Required Design Features for mineral development under Alternative D would have beneficial impacts in the limited forested areas in which they would be utilized.

Alternative D's MLP for the Beaver Rim area would have a beneficial impact on the area's unique plant communities that is similar to Alternative B's protections by making oil and gas in those areas subject to an NSO stipulation. This is more beneficial than under alternatives A and C where only the standard steepness stipulation protects the plant communities.

Except for Alternative B, Alternative D allows the least wind-energy development, followed by alternatives A and C, and closes most forested areas to wind-energy development. Where allowed, wind-energy development could adversely impact forest and woodland resources by removal and fragmentation of these resources within a development site and supporting infrastructure. Alternative D wind-energy development in forest and woodland habitat would result in short- and long-term adverse impacts. However, wind energy closures for the benefit of other resources such as on Green and Crooks Mountain and in the South Pass and Dubois areas, limit the extent of this adverse impact.

Livestock grazing under Alternative D would result in a continued adverse impact to aspen stands and, to a lesser degree, cottonwood galleries, due to browsing pressure on these woodlands, but the impact would be less than under Alternative C because livestock grazing intensity is likely to be less. Browsing pressure reduces the ability of these poplar species to regenerate through suckering and contributes to the eventual die-off of entire stands. In terms of areas closed to livestock grazing, Alternative D closes slightly more acres to livestock grazing, but none containing aspen or cottonwood galleries; therefore, this impact would be the same as under Alternative A and less beneficial than under Alternative B, which includes management that would beneficially impact the woodlands in the Sweetwater Canyon pasture. Alternative C has more potential for adverse impacts to woodlands because of the potential for adverse impacts from intensive grazing strategies. These would be similar to the adverse impacts described for grassland and shrubland communities.

Alternative D closes almost the same number of acres to motorized vehicle use as Alternative B, including some in Primary Forest Management Areas, and manages to reduce duplicative roads. The level of public access granted for motorized travel could adversely impact forests, woodlands, and forest products by increasing the potential for unplanned ignitions, unauthorized woodcutting, and invasive species spread. However, allowing motorized vehicle use on existing roads and trails could also beneficially impact forest products by allowing access for commercial and over-the-counter forest product harvest.

4.4.1.3.5.4. Special Designations

Special designations under Alternative D would be beneficial impacts to forests and woodlands if they place additional restrictions on activities that contribute to forest decline or degrade forest health (e.g., surface-disturbing activities and motorized vehicle use). Alternative D manages 51,196 acres of forest and woodlands (Primary Forest Resource Areas) in the Lander Slope, Red Canyon, Whiskey Mountain, Beaver Rim, East Fork and Green Mountain areas as ACECs and other areas with forest and woodland ecological sites as special management areas. Limits on surface disturbance and other management in these areas would be a beneficial impact by reducing the likelihood of unplanned ignitions and unauthorized forest and woodland product removal in these high resource value areas. In addition, the areas outside of ACECs that are withdrawn from

locatable mineral entry, although less than under Alternative B, would limit adverse impacts to forests and woodlands from mining. These areas include the forested areas in the Lander Slope, Red Canyon, Beaver Rim, Whiskey Mountain, East Fork, and South Pass areas. In the ACECs that are not withdrawn, such as the Green Mountain ACEC, the designation requires a Plan of Operations for exploration-size disturbances, which gives the BLM an opportunity to ensure that no undue or unnecessary degradation would result. While a Plan of Amendment would not preclude mining development, it could avoid exploratory activities that would result in long-term adverse impacts to forest and woodlands management. Potential adverse impacts under Alternative D would be restrictions on forest and woodland treatments in maintenance of special designation objectives and restrictions on season when treatments may be implemented.

Management of Congressionally Designated Trails under Alternative D in the NTMC, would result in more beneficial impacts to forest and woodlands management than under any alternative other than Alternative B by limiting the amount of surface disturbance and applying stricter VRM in areas within view of the trails. This could be an adverse impact to forest and woodland management by restricting treatment methods and project design. However, due to the limited overlap of forest resources with the trails management area, this adverse impact could be minor and would likely not preclude treatments that could meet VRM objectives for the area.

Under Alternative D, somewhat fewer waterways are managed as eligible and suitable for inclusion in the NWSRS than under Alternative B, so there would be fewer beneficial impacts, but most of the suitable segments in forested areas are protected, so the difference is relatively small. Alternative D management would result in far fewer adverse impacts than Alternative C, and somewhat fewer adverse impacts than Alternative A.

Alternative D's management of the parturition areas that are part of the expanded ACEC in Alternative B is open to oil and gas leasing but subject to an NSO. This would beneficially impact forest resources that would otherwise be adversely impacted through oil and gas surface disturbance. This management would avoid most of the adverse impacts identified under alternatives A and C but would not achieve the beneficial impacts from better management using oil and gas created roads. It is unlikely that road development for forest management would not occur on its own to reach moderate- to low-value timber stands.

4.4.2. Vegetation – Grassland and Shrubland Communities

Most biological resources in the planning area are dependent on the quality and quantity of vegetation. This section describes potential impacts to grassland and shrubland communities from resource management actions and resource use programs.

Adverse impacts to grassland and shrubland communities result from surface-disturbing activities and other activities that cause vegetation to be removed or that mechanically impact plants. Livestock grazing, wildlife use, wildfire, and vegetative treatments result in direct adverse impacts to these plant communities. Impacts to grassland and shrubland communities result from activities that alter the health of the communities. Erosion and a change in hydrology, or encroachment of invasive species, are indirect impacts. Changes beneficially impact some vegetation species and adversely impact others. Plant succession is the product of opening and filling niches on the landscape. Beneficial impacts to grasslands and shrubland communities are measured against objectives for the ecological site. It is desirable that grassland and shrubland communities are maintained with a mix of species composition, cover, and age classes.

Beneficial changes could be a reduction in the spread of invasive species or the implementation of vegetative treatments that improve these communities. Adverse changes would include shifts to less desirable native species or increases in bare ground. The primary objective in sagebrush grassland vegetation communities is a vigorous stand of sagebrush with an understory containing cool-season bunchgrasses such as needle and thread, Indian ricegrass, bluebunch wheatgrass, green needlegrass, and bottlebrush squirreltail. These large cool-season bunchgrasses are replaced by smaller, more grazing-resistant species such as threadleaf sedge, Sandberg bluegrass, and rhizomatous wheatgrasses when subjected to heavy or repeated use during the critical growing season.

FLPMA and the Wyoming Standards for Healthy Rangelands direct the BLM to manage vegetation resources toward the maintenance and/or restoration of the physical function and biological health of these communities. The objectives are to maintain and improve the condition and trend of these plant communities within their respective ecological site. This would provide benefits to the many consumptive and non-consumptive uses within these sites. Examples include beneficial impacts to livestock grazing, wildlife habitat, recreation, and soil and water.

4.4.2.1. Summary of Impacts

Adverse impacts to grassland and shrubland communities accrue in two fundamental ways. Vegetation can be lost, or plant communities composition can shift. All alternatives entail surface-disturbing activities that remove vegetation. Alternative C entails the most surface disturbance, followed by alternatives A, D and B. All alternatives provide for reclamation activities which are projected to be successful, except in isolated circumstances. However, while reclamation activities normally replace vegetation cover, reclaimed areas are commonly dominated by herbaceous plant communities, especially in the near and mid-term. Consequently shrub communities, notably sagebrush, would decline at volumes commensurate with the amount of surface-disturbing activity each alternative allows. In the long term shrubs will eventually colonize these sites.

Herbivory by livestock, wildlife and wild horses can change the vegetation community composition to species that are more adapted to utilization pressure. Communities in the planning area can remain stable for extended periods, but can also undergo transition to when conditions alter the niches occupied by the vegetation. The primary issue relates to vegetation community transition when grazing or browsing is heavy, or occurs repeatedly during rapid growth periods. Generally, plants are more vulnerable to damage from herbivory during this period. It is not anticipated that any of the alternatives will materially affect the way wildlife and wild horses utilize the range. Consequently no large scale changes in vegetation are expected to occur from these uses. All alternatives address the need to protect the vegetation resource from issues associated with livestock grazing. Alternative B provides for plant health primarily by limiting the levels of use. Alternative C relies on strategies that control the timing of grazing use. Alternative D provides a hybrid of the approaches from alternatives B and C. Alternative A, allows for any strategy, but provides little direction regarding preferred approaches. All alternatives offer the potential to promote healthy plant communities, but the more aggressive strategies associated with Alternative C offer the most risk of resource damage.

Some disturbances and vegetation treatments can alter niches in a manner that promotes vegetation health and moves plant succession toward desired plant communities. All alternatives provide the opportunity for treatments that augment natural disturbance, such as drought and insect infestations, that can influence plant succession.

Successful reclamation and grazing management provides a deterrent to INNS because healthy plant communities successfully compete with INNS for space in the landscape. This is the most important component of a comprehensive INNS strategy, and all alternatives provide for this need. However the more aggressive nature of Alternative C again provides the most risk. In some situations INNS invade native range even though the native plant community is healthy. In this situation, physical treatment of infestations is required, and all alternatives provide for this activity. Control of INNS is not assured under any alternative.

Wind-energy development disturbs large areas of surface, and much of the disturbance would be permanent. Therefore, the more acres open to wind-energy development and related transmission lines, and the more area open to all ROWs, the more adverse the impacts to vegetation.

4.4.2.2. Methods and Assumptions

The Wyoming Standards for Healthy Rangelands are designed to maintain or improve rangeland health and are applied under all alternatives. Theoretically, all lands in the planning area are required to meet the Standards for Healthy Rangelands. However, cause-and-effect relationships associated with vegetation are complex. It is much easier to identify areas not meeting the Wyoming Standards for Healthy Rangelands than to identify causal factors and site-specific solutions, which are often the subject of dispute. Consequently, assessments of rangeland health require detailed analysis, and decisions often require monitoring data that is time consuming and expensive to obtain. In many cases, implementation of BMPs that are generally successful would leave some problem areas unaddressed. Consequently, achieving the Wyoming Standards for Healthy Rangelands is an ongoing process. The BLM would pursue rangeland health objectives throughout the planning period under all alternatives.

Methods and assumptions used in this impact analysis include the following:

- Energy development is identified as the primary source of surface disturbance in the planning area. This includes not only the development at the well pad, but in the network of roads, powerlines, and pipelines to support development. New technologies such as enhanced recovery increase the need for surface disturbance. The greater the energy development likely under an alternative, the greater the adverse impacts to vegetation.
- Grazing and browsing, whether by livestock or wildlife, must be properly managed to maintain the health of grassland and shrubland communities and to improve the communities' capacity to sequester carbon. Improper livestock grazing management can decrease plant vigor and ground cover, lead to increased erosion, degrade soil nutrients and water retention, and adversely impact rangeland health. As rangeland health degrades, its ability to hold carbon is reduced.
- As rangelands are evaluated through assessments, guidelines are implemented to improve undesirable conditions regardless of allotment category. Over time, implementing guidelines is expected to continue to improve and maintain the health of these communities.
- Fire plays an intricate role in these communities, particularly shrubland communities. Prescribed fire is a tool used to manage vegetative communities and can result in short-term adverse impacts, but long-term beneficial impacts to wildlife and wildlife habitats.
- Both wildland and prescribed fire result in adverse and beneficial impacts to grassland and shrubland plant communities. In the short term, fires result in the direct loss of vegetation, habitat, and forage, an increase in soil erosion, and reduced water penetration, and create a seedbed for invasive species. However, the long-term result can be beneficial. Fire has played a historic role on the landscape. On a landscape level, fire can rejuvenate plants,

increase density and cover of vegetation, increase diversity, change plant composition to more desirable states, and enhance the overall health of vegetative resources. In shrublands, fire can have the long-term impact of reducing shrubs from the population for up to 30 years. This might or might not be beneficial, depending on the desired use of the area, which is determined by other management decisions such as in the livestock grazing or special status species programs. Limiting the effects or spread of fire prevents direct loss of vegetation that can be used by livestock, wild horses, and wildlife. Extinguishing fires immediately also reduces the invasion of invasive species by not offering a seedbed to easily germinate in without competition. Given fire's historic role on the landscape, the lack of fire plays a direct role in the health of grassland and shrubland communities. The alternatives vary in the extent to which wildland fire would be suppressed. It is not possible to quantify these impacts.

- Increased prescribed fire would result in a short-term adverse impact to vegetation, but a long-term beneficial impact. The duration of the impact (both adverse and beneficial) would depend on the type of vegetation community. Beneficial impacts in shrubland communities might not be observed during the planning period. Thus, the extent to which prescribed fire is used, which varies by alternative, determines the degree of adverse and beneficial impacts.
- Surface disturbance adversely impacts grassland and shrubland communities by contributing to a decline in abundance, distribution, or health of the vegetation. In addition, surface disturbance contributes to fugitive dust. Dust from increased road construction, well pads, and ROWs that accumulates on the surface of plant leaves would adversely impact the plants. Photosynthesis and the plant's ability to function are greatly reduced in areas adjacent to these projects. As acres of disturbance increase, the chances of successful reclamation in these areas decreases. Thus, the surface disturbance the more adverse impacts to grassland and shrubland communities.
- Adverse impacts to vegetative communities from INNS management would relate directly to the amount of surface disturbance. The more authorized surface disturbance, the more adverse impacts to vegetative communities.
- Short-term impacts to plant communities result from activities that contribute to the decline in the distribution or abundance of the plant communities within 5 years of the activity. Short-term impacts to vegetation can also depend on the time it takes for a disturbed area to become revegetated, generally 1 to 5 years.
- Long-term impacts are those that require more than 5 years to manifest or that persist for more than 5 years. Some existing plant communities likely would not be reestablished to predisturbance structure and density for more than 20 years, regardless of the cause of the disturbance.
- Plant communities are managed for plant diversity and viability, and to provide the forage, cover, and habitat needs of livestock, wild horses, and wildlife.

4.4.2.3. Detailed Analysis of Alternatives

4.4.2.3.1. Impacts Common to All Alternatives

Potential impacts to grassland and shrubland plant communities would be similar under all alternatives, but the extent and intensity of impacts would vary by alternative. Impacts to grassland and shrubland communities from livestock and wildlife grazing and browsing, recreation use, fuels management, prescribed fire and wildfire, and proactive management actions are described under the each alternative. The following paragraphs described potential impacts common to all alternatives.

Vegetation and soils have a symbiotic relationship: any adverse impacts to the soil resource can directly impact the health and functionality of the vegetation. Impacts from water and wind erosion and other forms of surface disturbance can reduce the soil's capability to provide an environment that supports vegetation. A healthy soil resource will promote healthy vegetative attributes.

Activities that disturb the surface occur under all alternatives. Under all alternatives, programs apply BMPs for surface-disturbing activities. These disturbances can impact grasslands and shrublands by contributing to the transport of invasive species along the network of roads and watersheds. Plant communities can be degraded, lost, and fragmented by such activities as fire and fuels management, livestock, wild horse, and wildlife herbivory, recreation use, road and ROW construction, and minerals development.

Livestock, wild horse, and wildlife herbivory produces both adverse and beneficial impacts to grasslands and shrublands, depending on the intensity, timing and season of use, condition of the range, and precipitation patterns. Herbivory can result in direct mortality to native plants of grasslands and shrublands through trampling and direct consumption of the plants. There could be indirect impacts due to soil compaction and erosion, and changes in plant community composition that cause plant communities to change to different transitional states.

Sagebrush communities in the planning area contain a shrub and herbaceous component. Impacts associated with grazing refer to herbivory on the herbaceous component, whereas browsing refers to herbivory on the shrub component. Cattle, wild horses, elk, and bighorn sheep are primarily grazers. Pronghorn and mule deer are grazers in some seasons, especially spring, and browsers in others, especially winter. Moose utilize sagebrush and grassland habitat periodically but not in sufficient numbers to be an important driver affecting plant succession.

Livestock grazing is permitted on more acreage in the planning area than any other resource use with the potential to impact grasslands and shrublands. Grasslands and shrublands evolved with grazing, but in historic distributions and uses different than today's commercial grazing operations. Historically, grazing has resulted in adverse impacts. Over the last 50 years, rangeland conditions in the planning area have improved with the application of better grazing management practices. With proper grazing management, many plant species will have increased plant vigor or increased seed production – but improperly managed grazing could result in reduced root growth, which is where long-term carbon sequestration can be maximized.

However, areas where rangeland health is most likely to experience adverse impacts are areas where livestock congregate. These include areas with water, shade, aspect, and/or more palatable forage. Rangeland improvement projects can adversely impact grasslands and shrublands by concentrating livestock along fence lines, water developments, and salt and mineral supplementation. Fencing to protect riparian-wetland areas can disperse livestock to upland range that has historically not been heavily grazed, with the potential for adverse impacts to grasslands and shrubland communities. The numbers of range improvement projects vary by alternative; therefore, potential adverse and beneficial impacts to grassland shrubland communities from range improvement projects vary by alternative.

Rangeland management often is geared toward improving the overall distribution of livestock within an allotment. This is accomplished through implementing BMPs, such as managing utilization levels and the timing of utilization. In the absence of BMPs, livestock use increases bare ground and promotes shifts in plant communities that are adverse. Grazing-resistant species such as blue grama, threadleaf sedge, and western wheatgrass tend to reproduce through rhizomes

rather than seeds, and exhibit low profiles that limit the level of use by livestock, which produces long-term adverse impacts to the site.

Improper livestock grazing management can transport and cause the propagation of INNS.

Through proper and sound grazing management, livestock grazing can beneficially impact rangeland health by improving plant vigor, increasing vegetative cover, reducing competition among plant communities, and reducing INNS infestations.

One tool used to decrease the spread of invasive species in an area is to have livestock graze an invasive species at a crucial point in its life-cycle. For example, sheep can graze leafy spurge before seed distribution and cattle can graze areas infested with the annual grass cheatgrass in early spring before boot formation, thereby limiting seed production. However, the use of livestock for this purpose is expensive and requires a long-term commitment. It also has the potential to adversely impact vegetative resources by reducing ground cover and making the area vulnerable to new INNS infestation. In the planning area, only oil and gas operators have implemented this potentially beneficial practice on state and private lands; there has been no application of this practice on public lands.

Long-term over utilization or repeated grazing in the critical growing season reduces abundance of certain native plants, allows less desirable forage species to increase, and allows INNS to enter and, in some cases, dominate communities. An indirect impact of improper livestock grazing management is a decrease in ground cover, which results in an increase in runoff and soil erosion, which can impact the health of the grassland and shrubland plant community. These adverse impacts can be both short and long term and can move a plant community to a new ecological state that cannot be reversed.

The presence of riparian-wetlands can adversely impact grassland and shrublands because they attract high levels of grazing use. Sagebrush grasslands in the immediate vicinity of riparian-wetlands tend to be heavily used. Trampling of, use of, and mechanical damage to plant species impact grasslands and shrublands.

Wildlife grazing and browsing can result in both adverse and beneficial impacts to the health and productivity of grassland and shrubland communities. During severe winters, wildlife can congregate on winter ranges and over use grasses and shrubs. This over use typically occurs after livestock have grazed the area during their grazing season. In addition to areas of congregation, wildlife movement can transport and propagate invasive seeds and plant parts, thereby expanding infestations. Impacts to vegetation by these means of transport have contributed to the challenge of managing rangeland health and productivity in the planning area. Impacts from wildlife exceeding objective levels can result in an adverse impact to grassland and shrubland communities in terms of use.

Wild-horse numbers are managed according to the established appropriate management level for a herd area. When horse populations increase, plants can be over used, which adversely impacts the vegetative health of the plant community. Unregulated wild-horse numbers can adversely impact plant vigor and health by year-round consumption in grassland and shrubland communities. A beneficial impact from wild-horse grazing is that within proper appropriate management level levels, wild horses tend to use higher-elevation areas and graze farther from water. This type of grazing achieves reduced pressure on grasslands and shrublands.

Continued proper management of programs that impact grassland and shrubland communities would maintain the species attributes using ecologically sustainable practices that would enhance or maintain these communities in accordance with each site's ecological site description.

ROW corridors adversely impact grasslands and shrublands. These corridors are typically a linear disturbance that bisects an area. Vegetation is removed for project installation. This immediate loss of plants is a short-term adverse impact. However, the long-term adverse impact of linear disturbances is that these areas are difficult to reclaim. The linear nature of the disturbance does not readily allow for fencing and protection of the site.

Under all alternatives, no surface disturbances, permanent new development, or ROWs are allowed in WSAs. Therefore, impacts to grasslands in WSAs do not vary by alternative and are not be further analyzed.

All alternatives limit motorized vehicle use to existing and/or designated roads and trails with seasonal travel limitations in certain areas; the locations vary by alternative. Adopted for the benefit of wildlife, these limitations also beneficially impact plant communities because they limit the likelihood of people driving cross-country because of weather and/or road condition. Where present, seasonal limitations beneficially impact grassland and shrubland communities.

Alternatives B and D have protective management for the unique plant communities in the Beaver Rim area while alternatives A and C have only the standard steepness slope limitations, which is less beneficial. However, the unique plant communities are primarily forest and woodland types which are analyzed in that section. The Beaver Rim area management has such slight differences in impacts that no additional analysis is required.

4.4.2.3.2. Alternative A

4.4.2.3.2.1. Program Management

Under Alternative A, there are no requirements for the use of weed-free seed and no restrictions on the use of mulch and hay that could introduce invasive species. Alternative A manages grasslands and shrublands to the ecological site and the transitional state they are in. Beneficial impacts to grassland and shrubland health occur under Alternative A to varying degrees through managing for objectives based on ecological site descriptions. Vegetative treatments such as prescribed fire and mechanical, chemical, and biological treatments are used to improve plant community health, diversity, cover, and other attributes to meet resource objectives.

4.4.2.3.2.2. Resources

Alternative A management of air resources places moderate limitations on surface disturbance; therefore, it would neither beneficially nor adversely impact grasslands and shrubland plants. Alternative A management of soil and water resources would beneficially impact grassland and shrubland plants by limiting surface disturbance. Lands with wilderness characteristics are not specially managed under Alternative A, so there are no limits on surface disturbance. In general, wildfires are suppressed, although on a case-by-case basis. Therefore, the beneficial and adverse impacts from fire management are site-specific.

The BLM currently manages activities to reduce the invasion of INNS. Under Alternative A, appropriate methods, herbicide types, and applications are used in grasslands and shrublands to control INNS, with beneficial impacts to vegetation.

Alternative A places moderate limitations on surface disturbance for the benefit of wildlife. This alternative closes ¼ mile around greater sage-grouse leks to surface disturbance. This would beneficially impact grasslands and shrubland resources, except to the extent that it would preclude vegetation treatment that would otherwise benefit the vegetative community, especially shrublands.

In areas protected for cultural, paleontological, and visual resources, grassland and shrubland plants tend to achieve full growth and maximize their vigor. This allows plants to always remain in a healthy state in their area of protection. However, the acreage of these sites is small and mostly less than 100 acres (exclusive of VRM management). The exception is the Warm Springs Canyon Flume, which under this alternative is open to grazing and construction of range improvement projects.

Under Alternative A, VRM that limits surface disturbance would beneficially impact grassland and shrubland communities.

4.4.2.3.2.3. Resource Uses

Wind-energy development, ROWs, and locatable, leasable, and mineral materials management reduce the acreage of available grasslands and shrublands from both short- and long-term surface disturbance. In the short term as these areas are developed, acres would be removed from the plant community. It is estimated that 52,591 acres would be developed under Alternative A, including ROWs corridors and pads for energy development activities. Furthermore, gravel or dirt roads add to dust particulates that settle on adjacent vegetation in proximity to development areas, resulting in adverse impacts. ROWs corridors remove vegetation and can be difficult to reclaim. Subsequent livestock use can preclude successful reclamation even if initial procedures were well implemented. It is estimated that approximately 9,000 acres of proposed pipelines and utility lines would be installed over the next 20 years under Alternative A.

Alternative A authorizes wind-energy development on 283,647 acres with commercial potential for wind energy, and opens 2,188,294 acres for ROWs.

Alternative A has only one designated corridor. To the extent that a designated corridor serves to group disturbances, it can have a beneficial impact to vegetation by limiting disturbance. In addition, grouping disturbances limits the areas of travel which could reduce the spread of INNS, which secondarily benefits vegetation.

Under Alternative A, trails and travel management limits motorized travel to existing roads and trails except in some ACECs, where travel is limited to designated roads. Routes and travel can be managed, but unless enforced, there could be long-term adverse impacts to how the vegetation restores itself on the landscape. Travel management has had little on-the-ground implementation; therefore, management limited to designated roads has produced few beneficial impacts to grasslands and shrublands.

Under Alternative A, almost the entire planning area currently is available for livestock grazing. Grazing system and range improvements are implemented to achieve management objectives for livestock and serve as a primary means of improving range conditions on category I allotments

and maintaining category M and C grazing allotments. The trend of continued slow improvement in rangeland productivity in the planning area is expected to continue under Alternative A. Short- and long-term adverse impacts to grassland and shrubland communities are anticipated under Alternative A based on continued development of rangeland improvement projects would continue, but riparian-wetland conditions should improve.

There is no recreation management under Alternative A that would beneficially impact grassland and shrubland communities. It is likely that long-term adverse impacts to vegetation would continue as more roads and impacts associated with continued recreational use would continue to grow.

4.4.2.3.2.4. Special Designations

Alternative A designates the same number of ACECs with the same acreage as the 1987 RMP; therefore, there would be continued beneficial impacts to grassland and shrubland communities in the existing ACECs. Under Alternative A, the BLM would apply interim management to the nine waterways eligible for inclusion in the NWSRS to protect their free-flowing characteristics which would provide a beneficial impact to grassland and shrubland communities near these waterways.

Currently, for Congressionally Designated Trails under Alternative A, surface disturbance such as ROW crossings are allowed only where the trail ruts have been modified by modern uses; otherwise, no new disturbances are allowed unless established outside the minimum distance identified under Alternative A for historic trails actions. This management is beneficial to the vegetation protected from disturbance.

4.4.2.3.3. Alternative B

4.4.2.3.3.1. Program Management

Alternative B manages grasslands and shrublands to achieve or make progress toward achieving biological diversity in the plant communities. Alternative B manages and implements soil and vegetative treatments to restore the diversity of grassland and shrubland ecological sites and their transitional states to beneficially impact all resources. This would result in more beneficial impact to vegetative resources than Alternative A, because range improvement projects are focused on rangeland health rather than cattle distribution or increasing animal unit months (AUMs). Alternative B emphasizes wildlife, recreation, and aesthetics, with resulting adverse impacts to resource uses.

4.4.2.3.3.2. Resources

Impacts to soils under Alternative B would be similar to those under Alternative A, except that mineral and reactivity actions on slopes more than 15 percent, rather than 25 percent, would be managed with Category 6 restrictions. This would reduce adverse impacts to grassland and shrubland communities. Alternative B manages lands with wilderness characteristics in the Little Red Creek Complex as non-WSA land with wilderness characteristics to preserve their wilderness characteristics, which limits surface disturbance that would adversely impact grasslands and shrublands. Water quality protections for sole-source aquifers and discharge areas would beneficially impact vegetation in the areas. The limited amount of identified areas protected by this management would result in minor beneficial impacts to grasslands and shrublands.

Fire and fuels management under Alternative B is similar to under Alternative A, except that suppression efforts would only occur in the WUI, developed recreation sites, identified cultural areas, and aboveground-utility ROWs. There would be no use of heavy equipment during fire suppression unless recommended by the resource advisor and approved by the Agency Administrator. This would beneficially impact grasslands and shrublands in the short term, but could result in long-term adverse impacts as the risk of landscape-level fire increases.

The Alternative B prohibition on clear-cuts might conflict with proposed management regarding aspen regeneration and would have fewer beneficial impacts to aspen regeneration efforts compared to Alternative A. While other treatments, such as partial or selective cutting, would be authorized, these approaches have a lower likelihood of success than clear-cutting (Shepperd 2001). The use of fire in areas outside of Core Area would result in many of the beneficial impacts associated with clear-cutting, but could result in unintended consequences if not successful (Shepperd 2001). Within the WUI and in Core Area, prescribed fire is not likely to result in beneficial impacts. In addition, under Alternative B, emphasizing vegetation treatment projects rather than range infrastructure would result in more acres of treatment than under Alternative A, including both fire and mechanized treatment, that would beneficially impact aspen regeneration.

Compared to Alternative A, Alternative B riparian-wetlands management would result in many of the same adverse impacts to grassland and shrubland surrounding riparian-wetland areas, except on a larger area because the riparian-wetland avoidance zone is more than three times as large under Alternative B. Additional impacts to riparian-wetland areas are identified in the *Livestock Grazing Management* section in this chapter.

Beneficial impacts to grasslands and shrublands from INNS management under Alternative B would be similar to Alternative A. However, there would be more beneficial impacts under Alternative B because the Authorized Officer could implement a livestock flushing program. A flushing program could provide a minimum of 72 hours for livestock known to have been using forage that includes INNS seeds to pass any ingested seeds through the rumination process to properly dispose of seeds before livestock enter public lands. This would reduce the spread of invasive species into native grasslands and shrublands in the planning area. Furthermore, because range improvement projects would be restricted under Alternative B, more financial resources would be available to INNS abatement programs. Alternative B would result in the fewest acres of surface disturbance to control or eradicate invasive species; however, because of the projected overall surface disturbance, reclamation practices, and restrictions on motorized vehicle use, Alternative B also would result in the smallest area vulnerable to invasive species establishment. Alternative B would result in the fewest adverse impacts to grassland and shrubland communities from INNS management. In addition, the terms of all authorized activities would be adjusted to reduce the spread of invasive species in the planning area.

Wildlife management actions under Alternative B would result in more indirect beneficial impacts to grassland and shrubland communities than any other alternative. Alternative B applies the most surface disturbance restrictions around greater sage-grouse leks and in nesting and early brood-rearing habitats, which would result in short-term beneficial impacts by preventing vegetation removal or degradation. However, Alternative B could also result in the least long-term beneficial impact in these areas by restricting vegetation treatments in areas where the vegetation community is extremely degraded, especially by occurrence of INNS, or by the increase in certain conifer species (e.g., juniper). The short-term beneficial impacts of preventing vegetation loss from surface disturbance could outweigh potential loss of long-term beneficial impacts from vegetation treatments where they are necessary to restore degraded vegetation

communities. Impacts from wild horses grazing grasslands and shrublands would be similar to those under Alternative A.

Impacts from cultural and paleontological resource management under Alternative B would be similar to those under Alternative A, except that no new range improvement projects would be constructed on 834 acres of Warm Springs Canyon in Dubois, which would have a beneficial impact on grassland and shrubland plant communities in that allotment. Alternative B VRM limits surface disturbance more than Alternative A, with increased beneficial impacts to grasslands and shrublands.

4.4.2.3.3. Resource Uses

Under Alternative B, oil and gas, wind-energy, and minerals development would result in 16,549 acres of short-term surface disturbance, a portion of which would adversely impact grassland and shrubland communities by contributing to a decline in abundance, distribution, or health. This would be substantially less adverse to vegetative health than Alternative A. Alternative B allows the fewest new oil and gas wells and a limited number of acres open to mineral extraction. Alternative B makes available a limited number of acres for locatable mineral entry (approximately 1.2 million acres), which results in the least amount of long-term surface disturbance compared to the other alternatives. Some of the impacts would be temporary during the life of the operation, with areas of disturbance being reclaimed following closure of operations.

Alternative B would result in the least acreage of disturbance from pipeline and road development, and the greatest chance of successful reestablishment of grasses and shrubs following construction. Alternative B is also projected to result in the least new ROW construction because of limits to protect greater sage-grouse habitat and reduced disturbance associated with oil and gas and other mineral development. The projected new ROWs for mineral development under Alternative B and management designed to encourage large contiguous blocks of important plant communities would result in the least potential for fragmentation of grasslands and shrublands and associated loss of diversity, compared to the other alternatives.

Motorized vehicle use under Alternative B would result in impacts to grasslands and shrublands similar to those under Alternative A, but to a lesser degree. Motorized vehicle use in most of the planning area is limited to designated roads and trails under Alternative B. Alternative B protects winter wildlife habitats, sensitive soils, watersheds, and visual resources, and because motorized and mechanized travel is limited to designated roads and trails subject to seasonal travel limitations in areas where there are limitations, this would have a beneficial impact on grassland and shrubland habitats. Overall, Alternative B would result in the fewest adverse impacts to grassland and shrubland communities from motorized vehicle use, compared to the other alternatives.

Under Alternative B, on an allotment-by-allotment basis, stocking rates would be established to achieve an adequate residual cover for wildlife and wild horses with a likelihood that utilization would not exceed 21 to 40 percent, or light use. Managing to a use level of 21 to 40 percent would result in long-term beneficial impacts to grasslands and shrublands. An increase in vigor, seed production, root reserves, and leaf growth would be most noticeable over the long term, but managing to a use level of 21 to 40 percent also would be expected to result in short-term beneficial impacts. Compared to Alternative A, under Alternative B, the placement of salt and mineral supplements no closer to water than ½ mile would decrease livestock impacts to vegetation adjacent to water. Placing salt and mineral supplements this distance away would improve livestock distribution, thus minimizing impacts to vegetation in grassland and

shrubland communities. Alternative B would result in the least acreage disturbed from rangeland improvements such as reservoirs, pits, pipelines, and wells and fences, and pose the least threat to grasslands and shrublands from invasive species spread and livestock concentration. Conversely, decreasing surface-disturbing rangeland improvement activities could adversely impact some grassland and shrubland communities where problems with livestock distribution cannot be addressed without these projects. Reductions in livestock numbers over time are expected to decrease adverse impacts to grasslands and shrubland. However, this reduction is expected to be gradual and in response to monitoring. These areas should show slow improvement from the grazing management implemented.

4.4.2.3.3.4. Special Designations

Alternative B designates the most acres of any alternative as ACECs and other special designations with management prescriptions that limit surface disturbance. This management would beneficially impact grassland and shrubland communities. In all ACECs, identified roads would be reclaimed to reduce erosion. This includes additional acreage reclaimed and brought back into grassland and shrubland community production. Although small in acreage, this would add plants to the existing community. ACEC expansions under Alternative B therefore would extend the beneficial impacts to grassland and shrubland communities to a larger area. Beaver Rim ACEC management would have direct beneficial impacts on sensitive plant species and unique plant communities in the ACEC. The Government Draw/Upper Sweetwater Grouse ACEC has limited vegetation treatments to those lands within the proposed ACEC to enhance and improve grassland and shrublands habitats of the ACEC. This is a major beneficial impact when compared with Alternative A. Under Alternative B, rangeland improvements and mineral supplementation are not allowed within 3 miles of Congressionally Designated Trails unless those activities would not be visible from the trails. Although it is possible individual projects would be allowed on a site-specific basis, because of topography it is likely that this management would close 305,422 acres to rangeland developments. This would provide immediate relief to vegetation adjacent to the trail corridors, where livestock congregate and trample and over use vegetation. Beneficial impacts of implementing this restriction over a greater distance would improve livestock distribution and improve the plant health and vigor of grassland and shrubland communities.

4.4.2.3.4. Alternative C

4.4.2.3.4.1. Program Management

Alternative C manages to achieve or make progress toward achieving Wyoming Standards for Healthy Rangeland for grasslands and shrublands. The Alternative C approach involves more livestock-dependent economic uses of vegetation, but these uses would be supported with increased use of BMPs designed to mitigate adverse impacts. However, the projected reduced vegetative treatments under Alternative C as funds are used to build range infrastructure would result in adverse impacts. Those adverse impacts could be offset by using the range improvements across the greatest area to achieve rangeland health standards in areas requiring rehabilitation.

4.4.2.3.4.2. Resources

Impacts would be more adverse under Alternative C than under Alternative B, and similar to those under Alternative A, by allowing surface disturbances on slopes of up to 25 percent, which would increase the chances of soil erosion through wind and water. This would directly impact

vegetation in grassland and shrubland communities, which would be at higher risk to loss as construction activities increase on steeper slopes. Alternative C does not specially manage any lands with wilderness characteristics, so there would be no beneficial impacts to the grasslands and shrublands in this area.

Alternative C utilizes wildland fires and other vegetation treatments to restore fire-adapted ecosystems, reduce hazardous fuels, and enhance forage for commodity production. Alternative C includes the same acreage of fuels treatments as Alternative A, and therefore the same probability of adequate fuel reductions to substantially reduce the risk of landscape-level fire. This is less treatment than under Alternative B. In addition, Alternative C requires full suppression in all cases. Compared to the other alternatives, this alternative would result in the short-term beneficial impact of preventing fire that could destroy or permanently alter grassland and shrubland communities. Full suppression, however, risks a landscape-level fire with long-term adverse impacts to grassland and shrubland communities.

Under Alternative C, impacts to aspen regeneration would be the same as under Alternative A, with potentially more beneficial impacts than under Alternative B, where there is a demand for clear-cutting. Without such a demand (through either commercial or stewardship sales), Alternative B's emphasis on vegetation treatments rather than infrastructure range improvement projects would likely result in more beneficial impacts than Alternative A or C.

Impacts to grasslands shrublands in the vicinity of riparian-wetlands would be similar to Alternative A. Under Alternative C, however, range improvement projects, travel management, and road construction activities are fully utilized to make progress toward achieving Wyoming Standards for Healthy Rangelands. The advantages to vegetation associated with project infrastructure for grazing management would be offset by increased stocking rates over time. Grazing strategies that entail high stocking and intensive management for a short period have been proven effective, and they are particularly useful when applied to areas where livestock show high preference for some areas of a grazing allotment. However, these systems need to be implemented with precision and they constitute a higher-risk strategy for adverse impacts to grasslands and shrublands than the prescriptions associated with Alternative B.

Under Alternative C, the impacts to vegetative communities from INNS management would be similar to impacts under Alternative A. Impacts associated with INNS management would be the greatest under Alternative C because it involves the most surface disturbance, which makes the most acres vulnerable to new INNS. INNS would establish new surface disturbance and less restrictive management of motorized vehicle use. Alternative C relies on the extensive use of BMPs to contain INNS infestations.

Wildlife management actions under Alternative C would result in the least beneficial impacts to grassland and shrubland communities, compared to the other alternatives. Compared to the other alternatives, Alternative C applies the same surface disturbance restrictions around greater sage-grouse leks and in nesting and early brood-rearing habitats as Alternative A, and many fewer than Alternative B. These management actions would result in the least short-term beneficial impacts by preventing vegetation removal or degradation in these areas. Alternative C gives livestock forage requirements priority when allocating grassland and shrubland forage. In areas identified as crucial winter range and parturition areas, Alternative C would manage vegetation to benefit all grazing and browsing animals (livestock and wildlife). Alternative C allows vegetation treatments over a larger area than the other alternatives. This would result in long-term beneficial impacts to grasslands and shrublands by reducing fuel loads; however,

Alternative C provides substantially less funding for vegetation treatments than Alternative B, because it allocates funds for range development.

Impacts to grasslands and shrublands from cultural, paleontological, and VRM under Alternative C would be similar to impacts under Alternative A, except that VRM for areas designated as ACECs (see below) includes fewer limitations on surface disturbance and therefore results in more adverse impacts to grasslands and shrublands.

4.4.2.3.4.3. Resource Uses

Under Alternative C, oil and gas and other minerals development would result in more short-term surface disturbance, a preponderance of which would adversely impact grassland and shrubland communities by contributing to a decline in abundance, distribution, or health of the vegetation. Alternative C would result in the most new oil and gas wells and the most area to remain open to mineral extraction. Leasable minerals development would result in the greatest amount of long-term surface disturbance, and potential development would be more likely under Alternative C than the other alternatives. Some impacts would be temporary during the life of operations, with areas of disturbance being reclaimed following closure of operations. Overall, minerals development under Alternative C would result in the greatest adverse impact to grassland and shrubland communities. Alternative C makes available the most area for wind-energy development, which would result in adverse impacts to vegetation.

Surface disturbance under Alternative C would result in the largest number of acres to reclaim. As acres of disturbance increase, the chances of successful reclamation in these areas would decrease compared to the other alternatives. Alternative C allows the greatest acreage of disturbance from pipeline and road development and more chance reestablishment of grasses and shrubs would not be successful following construction. In DDAs, reclamation standards address soil stabilization in the interim with a higher percentage of grasses, rather than restoring predisturbance plant communities (see Appendix D (p. 1477)). Alternative C includes the most new road construction associated with mineral and realty development, with the greatest potential for fragmentation of grasslands and shrublands. Fragmentation of lands associated with loss of species diversity would be an adverse impact to grasslands and shrublands under Alternative C, unlike Alternative B, which manages for large contiguous blocks of important plant communities.

Alternative C also limits motorized vehicle use to existing or designated roads and trails with seasonal travel limitations on the Lander Slope and in the Red Canyon, Whiskey Mountain, Green Mountain, and East Fork areas. Alternative C also limits motorized travel in the WSA portion of the Dubois Badlands and the Castle Gardens ACEC to designated roads and trails. In addition, WSAs retains limits on motorized travel to designated roads and trails as described for Alternative A. These limitations would beneficially impact plant communities, but Alternative C protects fewer communities than alternatives A and B. Alternative C would result in the most long-term surface disturbance from motorized vehicle use as a result of BLM actions, which would directly impact grasslands and shrublands by removing vegetation. Alternative C allows cross-country motorized travel for carcass retrieval and dispersed campsites so long as there would be no resource damage, which would result in more adverse impacts than alternatives A and B. However it is difficult to detect and contain subtle impacts such as transportation of INNS, so grassland and shrubland communities at greater risk of adverse impacts under Alternative C than under Alternative B. Overall, Alternative C would result in the most adverse impacts to grassland and shrubland communities from motorized vehicle use compared to the other alternatives.

Alternative C maintains use levels in all grazing allotments on an allotment-by-allotment basis that will result in less residual forage for wildlife consumption and residual cover. This is likely to be at a use level of 41 to 60 percent (moderate use) but that will be determined on a site-specific basis. Placement of salt and mineral supplements is similar to Alternative A, and placed to maximize forage utilization, which would put more use on individual plants in grassland and shrubland communities. Placing salt and mineral supplements ¼ mile from water would increase grazing in the surrounding riparian-wetland vegetation. A secondary impact would be more use in the riparian-wetland communities. Alternative C includes an increase in range improvement projects to make more acres available for grazing, thus adversely impacting traditionally non-grazed grassland and shrubland areas. Over the next 20 years, the BLM estimates that 220 miles of new pasture-division fence will be constructed and 150 new water sources will be developed (34 springs, 48 reservoirs/pits, and 68 new wells). The increase in projects would make approximately 283,000 new acres available for livestock grazing. Increases in stocking must be offset by intensive management enabled by project infrastructure. Intensive management approaches can fail unless they are implemented with precision. Grazing strategies that do not meet objectives would need to be identified and revised, which would require intensive monitoring and management. Some plant communities would change because communities subject to adverse impacts from failed grazing management could cross the “threshold” beyond which the changes would not be readily reversible.

Under Alternative C, forage reserve allotments are not established and flexibility for permittees with alternative areas to graze would not be available if there were a an event such as a landscape-level wildfire. This would result in the same impact as under Alternative A, and would be more adverse to vegetation than under Alternative B. Not allowing an area to rest and recover from a catastrophic event would reduce desirable vegetation in the area, thus allowing the potential for invasive species to establish. Conversely, having a forage reserve allotment would provide flexibility and relief from grazing in areas that have a catastrophic event.

4.4.2.3.4.4. Special Designations

Alternative C would result in the least beneficial impacts to grassland and shrubland communities than the other alternatives because Alternative C designates no ACECs, and does not recommend any NWSRS-eligible segments as suitable for inclusion in the NWSRS. Congressionally Designated Trails management would have the same reduced beneficial impacts as Alternative A.

4.4.2.3.5. Alternative D

4.4.2.3.5.1. Program Management

Under all alternatives, the BLM manages to achieve or make progress toward achieving Wyoming Standards for Healthy Rangeland for grasslands and shrublands. The approach associated with Alternative D entails more economic uses of vegetation than Alternative B and approximately the same as Alternative A, but these uses are supported with increased use of BMPs and Required Design Features to mitigate adverse impacts. Compared to Alternative B, Alternative D includes fewer acres of vegetation treatments to improve vegetation conditions and manages to achieve diversity of site composition, approximately the same as Alternative A.

4.4.2.3.5.2. Resources

Alternative D would result in slightly fewer adverse impacts than alternatives A and C in its slope management, but moderately more than Alternative B because there is more surface disturbance in general under Alternative D. In addition, like alternatives A and C, Alternative D allows surface disturbances on slopes of up to 25 percent, which increases the chances of soil erosion through wind and water in grassland and shrubland communities at higher risk for loss when construction activities increase on steeper slopes. Required Design Features limit adverse impacts to soil and therefore soil erosion in greater sage-grouse habitat.

Alternative D utilizes wildland fires and other vegetation treatments to restore fire-adapted ecosystems, reduce hazardous fuels, and enhance forage for healthy rangelands and commodity production; however, the use of fire as a tool in sagebrush is limited. Alternative D includes fewer acres of prescribed fire and fuels treatments than Alternative B, and more acres than alternatives A and C. Alternative D is similar to Alternative A in its fire suppression activities, except that more of an emphasis on fire suppression is required in sagebrush, so its adverse or beneficial impacts to vegetation would be the same, which would be more beneficial in the short term and less beneficial in the long term than Alternative B. The reverse is true compared to Alternative C, as Alternative D would result in more adverse short-term and less adverse long-term impacts. Therefore, Alternative D involves a lower risk of landscape-level fire than alternatives A and C, but less than Alternative B. It is not possible to determine the significance of this difference.

Adverse impacts to sagebrush grasslands within ¼ mile of riparian-wetlands under Alternative D would be similar to and somewhat more adverse than under Alternative B and less adverse than under alternatives A and C. Alternative D uses rangeland developments (fences and water developments) to improve riparian-wetlands if they are part of a Comprehensive Grazing Strategy. This management would shift some livestock grazing out of riparian-wetland areas and into uplands that have historically experienced lower utilization levels (see *Resource Uses*). Other strategies may be developed across the planning area with the increased flexibility provided.

Under Alternative D, impacts to aspen regeneration are similar to those under alternatives A and C. Alternative D would likely result in more vegetation treatment than those two alternatives, but less than Alternative B. The demand for commercial cutting would likely limit the beneficial impacts identified under Alternative A, but noncommercial treatment would result in beneficial impacts under Alternative D. However, it is likely that most vegetation treatments would prioritize sagebrush treatments in Core Area with a lesser emphasis on aspen regeneration which would limit the beneficial impacts under Alternative D.

INNS management under Alternative D is similar to alternatives A and C in allowing chemical treatment as one of the tools to eliminate INNS where necessary, although management must evaluate the potential adverse impacts to greater sage-grouse.

Wildlife management actions under Alternative D would beneficially impact grassland and shrubland communities more than under alternatives A and C, but less than under Alternative B because of limitations on surface disturbance and Required Design Features. In the greater sage-grouse Core Area, alternatives D and B would beneficially impact grasslands and shrubland communities by prohibiting surface disturbance within 0.6 miles of greater sage-grouse leks. However, Alternative B is more beneficial to grasslands because Core Area is closed to new oil and gas leasing for the benefit of greater sage-grouse. The difference in benefit is limited, however, by the relatively limited amount of oil and gas potential inside Core Area. Outside the

Core Area, Alternative D applies a ¼-mile buffer around leks, which would be moderately more adverse than the Alternative B 0.6-mile buffer, which would preclude development in areas with oil and gas potential that is likely to be developed. (However, many of the lands within the 0.6-mile buffer outside of Core Area with oil and gas potential are already leased, and the new restrictions of Alternative B are further limited.) Limits on surface disturbance would result in beneficial impacts by preventing vegetation removal or degradation and long-term beneficial impacts where reclamation or reestablishment of predisturbance conditions is not likely or the vegetation is permanently removed.

Alternative D focuses on vegetation for all foraging animals, unlike Alternative C, which prioritizes livestock forage requirements. In this regard, Alternative D would result in fewer beneficial impacts than Alternative B and more than alternatives A and C.

Under Alternative D, impacts to grasslands and shrublands from cultural, paleontological, and VRM would be similar to Alternative B, but less beneficial. Alternatives B and D would result in more beneficial impacts to vegetation from heritage and VRM than alternatives A and C as a result of limits on surface disturbance to protect these resources.

4.4.2.3.5.3. Resource Uses

Under Alternative D, leasable minerals and other minerals development result in more short-term surface disturbance than Alternative B, but less than alternatives A and C. The Required Design Features and the areas NSO to oil and gas leasing for the protection of many resources would be less adverse than under alternatives A and C, but more than under Alternative B. However, oil and gas minerals in the areas not subject to NSO management are relatively limited and would still receive the benefits of the Required Design Features and selected BMPs made COAs in Core Area. Alternative D includes considerably more areas proposed for withdrawal from locatable mineral entry and therefore more beneficial impacts to grasslands and shrublands than alternatives A and B, but less than Alternative B. Alternative D closes more areas to mineral materials disposal than alternatives A and C. Alternative D would result in more beneficial impacts to grasslands and shrublands than alternatives A and C, but less than Alternative B. Some of the adverse impacts would be temporary during the life of the operation, with areas of disturbance reclaimed following closure of operations; however, long-term adverse impacts from mineral developments could result from unsuccessful reclamation to predisturbance conditions. Overall, minerals development under Alternative D would result in the second least adverse impacts to grassland and shrubland communities, although considerably more than would occur under Alternative B.

Alternative D has approximately the same amount of lands with wind-energy potential for industrial wind-energy development as Alternative B, and therefore would result in the same adverse impacts to grasslands and shrublands. See Chapter 2 for a comparison of these acres and management.

Surface disturbance under Alternative D would result in more acres to reclaim than under Alternative B, moderately fewer than under Alternative A, and moderately to substantially fewer than Alternative C, thus decreasing the likelihood of both short and long-term adverse impacts to grassland and shrubland communities. The Alternative D reduced area of disturbance from pipeline and road development would result in a better chance of successful reestablishment of grasses and shrubs following construction. In energy development areas, reclamation standards address soil stabilization in the interim with a higher percentage of grasses, rather than restoring predisturbance plant communities (see Appendix I (p. 1535)).

Alternative D includes the second lowest new ROW construction associated with mineral and realty development, with substantially less potential for fragmentation of grasslands and shrublands than alternatives A and C. Fragmentation of lands associated with loss of species diversity, an adverse impact to grasslands and shrublands; therefore, Alternative D, like Alternative B but to a lesser degree, would beneficially impact grasslands and shrublands by managing for large contiguous blocks of important plant communities.

Alternative D closes fewer areas to motorized vehicle use than Alternative B, but more than alternatives A and C; Chapter 2 identifies the respective acreage under each alternative. Alternative D also imposes restrictions on new road development similar to those under Alternative B, but to a lesser extent. Limitations on roads and motorized vehicle travel would beneficially impact grasslands and shrublands by limiting the removal of vegetation and deterring user-created roads. This would be substantially more beneficial than alternatives A and C, which do not include this management.

Under Alternative D, livestock grazing management overall would be more beneficial to shrubland and grassland communities than alternatives A and C, but less Alternative B. Although the livestock grazing program might use rangeland improvements such as fences and water (see Chapter 2), they are authorized only when the benefits associated with the improvement in rangeland health exceed the adverse impacts associated with the project. As implemented on an allotment basis, with proper stocking levels and implementation of range improvements, this would avoid adverse impacts to grassland and shrubland communities. Alternative D would result in somewhat fewer adverse impacts to upland communities than Alternative A and moderately fewer than Alternative C, but more than Alternative B. This requires that identified rangeland health issues be addressed through lowered stocking rates or other non-infrastructure-related management.

Range improvement projects under Alternative D would develop water in upland acres to increase their suitability for livestock grazing. Other strategies may be developed across the planning area with the increased flexibility provided. This would have the potential to adversely impact grasslands and shrublands that have not historically been grazed by domestic animals.

Alternative D fully utilizes range improvement projects, travel management, and road construction activities to make progress toward achieving the Wyoming Standards for Healthy Rangelands. The decreased stocking rates would result in moderate beneficial impacts to grasslands and shrublands when associated with project infrastructure for grazing management. Grazing strategies that entail high-stocking levels and intensive management for a short period have been proven effective, and they are particularly useful when applied to areas where livestock show high preference for some areas of a grazing allotment. However, these systems need to be implemented with precision and they constitute a higher risk strategy for adverse impacts to grassland and shrublands than the prescriptions associated with Alternative B. Grazing strategies that are not meeting objectives would need to be identified and revised requiring intensive monitoring and management. Some plant communities would undergo change, in that plant communities considered to have adverse impacts from grazing management failure may cross the “threshold” beyond which these changes are not readily reversible.

Alternative D livestock grazing management regarding the placement of salt and mineral supplements would result in beneficial impacts to uplands similar to Alternative B and moderately more beneficial impacts than alternatives A and C because Alternative D identifies larger avoidance zones.

Alternative D would result in moderately more adverse impacts to grassland and shrubland communities than Alternative B by establishing stocking rates on an allotment-by-allotment basis that would result in residual forage for wildlife similar to alternatives A and C and would likely result in utilization not exceeding 41 to 60 percent (moderate use). As use levels approached 60 percent, this would result in some areas experiencing more adverse impacts than for the light use under Alternative B.

As under Alternative B, forage reserve allotments under Alternative D would be established when opportunities allow, which would provide flexibility for permittees if an event such as a landscape-level wildfire occurred, and would be a beneficial impact to grassland and shrubland communities. Alternatives A and C do not manage with forage reserves, which would result in a greater adverse impact to vegetation than Alternative D.

4.4.2.3.5.4. Special Designations

Alternative D management of Congressionally Designated Trails in the NTMC precludes the use of livestock supplements within ½ mile of NHTs and other important areas. (The NTMC NSO management is identified above as part of the large resource protection area.) This would result in the same beneficial impacts to the grassland and shrubland communities as Alternative B. Alternatives A and C would result in more adverse impacts because the buffer is smaller under those alternatives. Alternative D is less restrictive with VRM and would include more range improvement projects than Alternative B in areas near the NTMC, as long as the viewshed and setting of the Congressionally Designated Trails was not impacted. This is less beneficial than Alternative B to grasslands and shrublands, but far less adverse than alternatives A and C.

Alternative D limits additional range improvements acres in areas where money generated through leasing fees may be spent (Taylor Grazing Act Section 15 allotments) unless the purpose of the project is to enhance certain ACEC resource values. This is less than Alternative B and therefore less beneficial to grassland and shrubland communities. Alternatives A and C do not include limits on rangeland improvements for any ACEC.

Alternative D recommends the Warm Springs Creek Segment 1, Baldwin Creek and Sweetwater River units as suitable for inclusion in the NWSRS and would manage these waterways to protect their free-flowing values, providing a beneficial impact to grassland and shrubland communities near these waterways. Theoretically, Alternative D would result in fewer beneficial impacts to grassland and shrubland communities than Alternative B because Alternative D protects fewer waterways. However, this difference can only be quantified on a site-specific basis because vegetation mapping is not fine enough to distinguish grassland and shrubland plant communities at a planning area-wide scale.

4.4.3. Invasive Species and Pest Management

This section describes the impacts to the INNS program under each alternative in terms of direct, indirect, short-term, and long-term impacts.

The presence of INNS in the planning area is considered an adverse impact. Actions that contribute to the introduction of INNS, the spread of existing INNS populations, or that avoid, reduce, or prohibit INNS control activities in the planning area also are considered adverse impacts. Actions that reduce opportunities for INNS spread are considered beneficial impacts.

Direct impacts to INNS management typically result from actions that disturb the soil or that otherwise create habitats (seedbed) for the establishment of INNS. Indirect impacts result from activities that avoid, reduce, or prohibit INNS control activities in the planning area. The transport to other locations of INNS seed or propagules by wildlife, livestock, vehicles, wind, or water, thereby expanding the distribution of INNS or increasing the rate of INNS spread, is also considered an indirect impact.

4.4.3.1. Summary of Impacts

INNS would be expected to spread under all alternatives. Alternatives that involve the most projected surface disturbance would have the potential to result in the greatest spread of INNS. Stringent reclamation requirements, especially reclamation plans before surface disturbance, would decrease long-term disturbance and the likelihood of INNS establishment. Based on projected surface disturbance, Alternative C would result in the greatest spread of INNS, followed by alternatives A, D, and B, having the least potential surface disturbance.

4.4.3.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Roadways, trails, and ROW and other corridors are the most likely routes for the spread of INNS through transport on motorized vehicles, including OHVs. INNS also can spread through watercourses, by wind, and by wildlife and livestock movement.
- Although there are exceptions, most INNS are less likely to invade relatively undisturbed and healthy natural vegetative communities.
- The amount of new surface disturbance associated with an alternative is a good index for measuring potential impacts of INNS. The larger the acreage of surface disturbance, the greater the potential adverse impacts of INNS, although it is not necessarily a linear relationship. Mineral exploration and development, including oil and gas leasable minerals, non-oil and gas leasable minerals, locatable minerals, and salable minerals often result in high levels of surface-disturbing activity and human presence, which leads to the introduction and establishment of INNS. The more mineral development, the more adverse impact to the INNS, although reclamation efforts can help reduce this trend.
- Partners Against Weeds – An Action Plan for the BLM (BLM 1996) establishes a strategy to prevent invasive plant species through cooperation with all partners. It outlines goals and specific actions to help prevent and control the spread of invasive plant species. This action plan, along with any future updates and guidance, will be followed to control and prevent invasive plant species problems under all alternatives.
- Seeds from some INNS can remain dormant and viable in the soil for periods that exceed the 5-year division between short- and long-term impacts. Therefore, favorable site conditions could serve to reintroduce INNS in the short term without additional surface disturbance.
- INNS will continue to be introduced and spread as a result of ongoing traffic in and out of the planning area by recreational activities, wildlife and livestock movements and grazing, and surface-disturbing activities.
- The BLM will continue to treat INNS and pests on public land. Livestock permit holders, ROW holders, and mineral lease, claim, and permit holders will continue to treat invasive plant species and pests on public land as stipulated in their permits and authorizations. This does not vary by alternative.
- Weed and pest control, inventory, monitoring, and research will be performed in coordination with the appropriate federal and state agencies and authorized users of BLM-administered

public lands, with the appropriate county weed and pest control districts acting as the primary points of contact among all involved parties.

- The introduction of invasive invertebrates, vertebrates, microorganisms, and pathogens can threaten the stability of ecosystems, create serious human health consequences, and cause substantial economic burdens. Most INNS do not pose a threat to natural or human systems. However, pests are defined as any organism that causes economic or aesthetic damage to humans or their property, and species defined as pests change frequently. As species become of greater concern, the Lander Field Office will cooperate and coordinate with appropriate government agencies, private industry, and other interested parties involved in public education efforts and control, management, and research of INNS.
- BLM Washington Office IM 2006-073, Weed-Free Seed Use On Lands Administered by the Bureau of Land Management, establishes policy and guidance for use of certified weed-free seed and BLM Washington Office IM 1999-076, BLM Policy on the Use of Certified Weed-free Hay, Straw, and Mulch on BLM Land, establishes policy for the use of certified weed-free hay, forage, straw, and mulch to prevent the establishment of new INNS in restoration projects on public lands.

4.4.3.3. Detailed Analysis of Alternatives

4.4.3.3.1. Impacts Common to All Alternatives

The types of impacts of INNS and pest control would be common to all alternatives. The BLM will coordinate with individuals, groups, and other agencies to utilize Integrated Pest Management (IPM) using chemical, biological, and cultural methods for the control of INNS and pests as needed. The types of impacts under the alternatives would be similar; however, the intensity of impacts would vary by alternative. Impacts resulting from surface-disturbing activities (e.g., fire management, minerals and realty actions, recreation, dispersed travel, and the management of special designations) and surface-disruptive activities (e.g., livestock grazing and OHV use) are described under each alternative.

INNS on BLM-administered surface lands and federal mineral estate could spread under each alternative through activities proposed across a variety of resource programs. While the types of impacts from INNS as a result of surface-disturbing activities would not vary by alternative, the intensity would. Appendix T (p. 1641) lists projected surface disturbance by alternative during the planning period. The acres of surface disturbance in the analysis that follows are from this appendix. INNS create adverse impacts because of the lack of natural predators capable of keeping the system in balance. INNS can lead to unstable soils, changes in soil chemistry, losses in land productivity, loss of wildlife habitat, and loss of available forage for wildlife and livestock. Species such as cheatgrass have a profound influence on the fire regime; they impact fire frequency, which leads to additional direct and indirect adverse impacts. Pollen from invasive plant species can adversely impact human health by causing hay fever and other allergic reactions.

Adverse impacts from surface disturbance are different depending upon type of disturbance. The more dispersed the disturbance and the less concentrated the disturbance, the greater the adverse impact to INNS because of the greater likelihood of spread.

Healthy herbaceous communities that meet the Wyoming Standards for Healthy Rangelands are more resistant to INNS invasion than vegetation communities in an earlier seral stage or showing signs of degradation. Outbreaks of insects such as grasshoppers and Mormon crickets can result

in severe forage losses and can lead to adverse impacts to the health of the herbaceous community. Some pathogens, such as WNV, or other mosquito-transmitted diseases rely on the availability of stagnant water typically found in playas, ponds, reservoirs, and drilling reserve pits. As mosquito populations increase, so does the potential for exposure to pathogens such as the WNV; Fremont County commonly leads the state in reported cases of WNV. Rodents such as mice can increase the potential for exposure to viral pathogens such as hantavirus. However, these types of exposures are generally confined to very small sites that provide the habitat needs of the animals.

All alternatives use various methods to minimize impacts from INNS. BMPs, watershed enhancement projects, conservation practices, Storm Water Discharge Plans, project-specific soil investigations, and reclamation plans are designed to reduce adverse impacts to soil, resulting in greater reclamation success and limiting opportunities for INNS establishment. The BLM participates in the Fremont County Weed and Pest Control District to coordinate efforts in three Weed Management Areas, where there is a unified effort between agencies and landowners in each Weed Management Area. The three Weed Management Areas cover all of the BLM-administered lands in Fremont County.

Although the alternatives vary in the amount of federal mineral estate open to locatable mineral development and mineral material disposals, a much smaller area has commercial potential. All alternatives foresee that approximately 95 acres a year will be disturbed for locatable mineral entry and 183 acres will be disturbed for mineral material disposals, although this could change with market changes and activities. Accordingly, the alternatives do not vary in the INNS impacts.

INNS often have a strong correlation to sources of readily available water such as reservoirs. Under all alternatives, the Lander Field Office will inventory reservoirs on BLM-administered lands and prioritize the rehabilitation or reclamation of the ones functionally compromised. This would help disturbed sites resist INNS and, with successful rehabilitation or reclamation, be a long-term beneficial impact.

Wind-energy development has adverse impacts to the INNS program. Industrial-scale development requires a wide spacing – 5 to 6 turbines per 640 acres (one section) or 128 to 107 acres spacing. This will require more roads and more underground utilities over a far broader area than any other type of resource use. Oil and gas wells, in contrast, are generally on 40 acre spacing and ISR uranium wells can be as concentrated as 100-foot spacing. Thus, the degree of adverse impact to the INNS program is disproportionately greater than the acres disturbed. Only portions of the long-term disturbance would result in adverse impacts to the INNS program because buildings and other permanent structures themselves do not contribute to INNS although roads and human activities do.

Concentrated livestock use has resulted in adverse impacts when the removal of herbaceous vegetation is excessive and adequate vegetation does not remain to protect the soils. Loss of native vegetation provides opportunities for INNS to establish, but each alternative contains BMPs designed to limit this impact. The acres closed to livestock grazing would not have any potential for these adverse impacts from livestock grazing although other forms of concentrated herbivory could have similar impacts.

All alternatives assume that existing range infrastructure will remain although some alternatives provide for removal or moderate fences as opportunities occur. The difference among the alternatives on a planning area wide basis would be minimal. The alternatives vary substantially in whether new range infrastructure will be utilized or whether vegetation treatment types of range improvement projects will be implemented.

All alternatives prohibit cross-country motorized travel, which would prevent the proliferation of unauthorized routes and vegetation removal that could increase suitable habitat for invasive plant species infestations or spread invasive plant species seeds and propagules to uncontaminated locations. In addition, management actions that restore plant communities, enhance native plant communities, and make them better able to resist invasive plant species invasion. Impacts from surface-disturbing and disruptive activities are mitigated through the application of the Wyoming BLM Standard Mitigation Guidelines for Surface-Disturbing and Disruptive Activities (Appendix M (p. 1595)).

The wildland fire program will consider the presence and potential for INNS when designing wildland fire response and fuels treatments. All equipment and vehicles used for BLM-authorized activities, including the fire program, will be cleaned of INNS seeds and propagules before entering BLM-administered lands. Typically, this provision applies to out-of-county fire vehicles and equipment.

The presence of invasive plant species can alter natural fire regimes to the point where increased fire frequency leads to adverse short- and/or long-term impacts that degrade other resources, such as accelerated soil erosion and fertility losses, water quality degradation, loss of wildlife habitat and species diversity, loss of livestock forage, and in some cases, risks to property and human health and safety. Under all alternatives, the Lander Field Office will coordinate with other agencies to develop a plan for the management of cheatgrass in an effort to minimize the impacts of cheatgrass to the natural fire frequency cycle, and impacts to soil stability and forage production. Prescribed fire in the planning area can impact soils in the short term by removing vegetation and exposing soils to water and wind erosion. Following a fire, early seral-stage species and INNS can become established and can provide some stabilization of soils. However, the level of soil stability provided by these early seral-stage species is limited. In the long term, fire can beneficially impact soil resources and, secondarily INNS management, by improving land health and reducing erosion and the risk of landscape-level fire. Following successful reclamation, the BLM does not anticipate long-term surface disturbance or associated erosion from prescribed fire or chemical or mechanical fuels treatments. Fuels management could result in a short-term adverse impact and a long-term beneficial to soil resources. The amount of fuels treatment varies by alternative.

INNS are managed to meet the Wyoming Standards for Healthy Rangelands (Appendix J (p. 1537)) to protect and improve rangeland health. Of priority concern are Wyoming Declared Weeds; their presence is considered a threat, regardless of their influence on rangeland health (BLM 2009h).

All alternatives manage grassland and shrubland communities to meet Wyoming Standards for Healthy Rangelands. The differences between favoring production more oriented toward wildlife, wild horses, or livestock does not lead to different impacts as a result of management emphasis, because all of these animals will contribute to the spread of invasive plant species via their movement across the landscape.

All alternatives implement a program to promote public awareness of INNS and emphasize the Wyoming Declared Weeds and INNS most likely to invade from other states. Early detection is critical to the control of invasive plant species; therefore, public awareness provides a benefit to IPM management.

Requiring BLM-authorized activities and programs to use certified weed-free forage, mulch, and other land-applied products (BLM 1999) would result in beneficial impacts by limiting a possible

vector for infesting BLM-administered lands and other adjacent land. The county weed and pest control districts certify these products locally and maintain lists of local providers. All alternatives require weed-free feed; therefore the beneficial impacts of this management would not vary by alternative.

INNS program management actions common to all alternatives require that all equipment and vehicles used to perform BLM program work or authorized activities be cleaned of INNS seeds and propagules before they enter BLM-administered lands. Also, equipment and vehicles that perform BLM program work or authorized activities in areas of known INNS/Wyoming Declared Weeds will be required to be cleaned of INNS seeds and propagules before leaving worksites; containment of sediment and wash water is required. These requirements for cleaning equipment and vehicles to prevent the spread of INNS beneficially impact other resources that rely on healthy vegetative communities.

WSAs will remain unchanged under any alternative with a total of 55,338 acres. Surface-disturbing activities are highly restricted in WSAs, thus providing a collateral beneficial impact for management of INNS.

All alternatives include actions that restrict surface disturbance in the planning area; these actions are generally considered to result in a beneficial impact by stopping the spread of INNS. For example, withdrawals that close areas to surface-disturbing activities, or requirements for construction, operation, monitoring, and rehabilitation planning before surface-disturbing activities are initiated would, at a minimum, reduce the potential for impacts that could contribute to the spread of INNS.

All alternatives will require mineral and realty applicants to prevent introduction and spread of INNS. This management historically did not prevent introduction of INNS along new roads and other surface disturbance. In all alternatives INNS management efficacy is dependent upon enforcement.

The management of the Beaver Rim area varies by alternative. The impacts to the INNS program are the same as the impacts to the oil and gas program but in reverse. Alternatives B and D limits surface disturbance either by closing the area to leasing or making a portion of the area subject to an NSO stipulation. By limiting surface disturbance, the INNS program is beneficially impacted. Similarly, alternatives A and C only utilize standard steepness of slope stipulations and therefore allow more surface disturbance which increases the potentially adverse impacts to the INNS program in the Beaver Rim area.

4.4.3.3.2. Alternative A

4.4.3.3.2.1. Program Management

Alternative A manages authorized activities likely to spread INNS on a case-by-case basis. This includes cleaning work equipment to remove INNS seeds and propagules; the use of certified weed-free materials; site-specific INNS inventories; avoidance; eradication/treatment; enhanced weed-free seed requirements for reclamation work; monitoring; and coordination with the appropriate county weed and pest control district. These methods have worked well to limit the introduction of declared (Wyoming) weeds to surface disturbances authorized by the BLM.

Range improvement projects almost always involve the construction of infrastructure such as fences and water developments rather than vegetation and weed treatments. Under present management, livestock flushing has not been required for livestock that move from private lands infested with Wyoming Declared Weeds to BLM-administered lands, which puts BLM-administered lands at risk of infestation from this vector.

Under Alternative A, the Lander Field Office will monitor and determine if authorized activities are contributing to the spread of INNS. In the event authorized activities are creating an adverse impact due to the spread of INNS, the Lander Field Office will adjust the terms of the authorization to aid in the control of INNS on a case-by-case basis. This provides a beneficial impact to INNS management in the areas where adjustments are made.

4.4.3.3.2.2. Resources

Alternative A management imposes standard measures to mitigate for impacts to soils, which would beneficially impact INNS management by restricting development in the areas with LRP soils. The water resources program under Alternative A prohibits or avoids surface-disturbing activities in groundwater recharge areas on a case-by-case basis, which would beneficially impact the INNS program to a moderate degree. Alternative A does not restrict the use of pesticides for INNS control. The restrictions on the pesticide label are considered adequate to protect groundwater resources when applied correctly.

Alternative A includes full suppression of fire and authorizes soil disturbance associated with suppression activities on a case-by-case basis. Fire suppression and rehabilitation activities also have the potential to spread INNS, an adverse impact in both the short and long term. Activities such as firebreak construction, vegetation clearing, and use of heavy equipment would disturb the soil surface and increase the risk of INNS introduction and infestation in the short term. In the long term, however, successful stabilization efforts can increase cover, with a subsequent reduction in erosion and sediment production to natural rates.

Forest and woodland management for the promotion of timber production under Alternative A restricts certain forest product sales in areas where soil erosion is likely, which would beneficially impact INNS management. These restrictions would reduce short-term adverse impacts from exposing disturbed soils to INNS infestation. In the long term, these restrictions would help return the forest community to natural levels of appropriate vegetative species and ground cover. However, this beneficial impact would likely be minimal because of the limited demand for forest products. Alternative A avoids surface-disturbing activities within 500 feet of surface water and riparian-wetland areas, which creates a buffer that will afford native plant communities moderate short- and long-term protection from potential INNS introduction and infestation.

Management actions under Alternative A designed to protect wildlife and special status species habitat from the impacts of surface-disturbing and surface-disruptive activities would also protect the planning area from adverse impacts associated with the presence of INNS. Restrictions such as NSO and CSU in crucial wildlife habitat would limit development in these areas and provide a mutual beneficial impact for INNS management. This alternative closes and reclaims unnecessary roads and old mineral exploration trails to improve habitat on a case-by-case basis. The degree of this less protective management depends on whether disturbance would be likely for development.

Management for the benefit of greater sage-grouse minimally limits surface disturbance and thus provides only a small protection from INNS. It is likely that the ¼-mile buffer will only relocate disturbance and will not serve to cap it.

Management prescriptions under Alternative A designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and surface-disruptive activities would also protect against adverse impacts associated with INNS introduction and infestation. Disturbed soil is highly susceptible to INNS infestation. Therefore, limits on surface disturbance would help the land resist weed seed germination, and limiting motorized vehicle use would eliminate that vector for weed seed and propagule introduction.

4.4.3.3.2.3. Resource Uses

As indicated in *Impacts Common to All Alternatives*, mineral development generally results in an increase in the introduction and spread of INNS. Alternative A is expected to result in approximately 21,234 acres of initial disturbance and approximately 9,895 acres of long-term disturbance related to mineral development. Alternative A opens a substantial amount of the planning area to non-oil and gas leasing but only small areas have mineral development potential (primarily phosphate). If these resources were developed it is likely that INNS management would be adversely impacted. Analysis of phosphate development is found in the discussion of Lander Slope, Red Canyon, and Beaver Rim ACECs in the *Areas of Critical Environmental Concern* section in this chapter. No acres of surface disturbance are projected.

Alternative A withdraws approximately 23,114 acres from locatable mineral entry, which would beneficially impact INNS management because it would restrict surface disturbance in those areas. Almost all of the mineral estate is available for mineral material disposal under Alternative A (although not the 23,114 acres withdrawn). Alternative A imposes moderate limits on surface disturbance in soils with LRP, which could beneficially impact the INNS program by directing mineral materials disposals to soils with better reclamation potential, therefore making it less likely that the area of disturbance would become infested with INNS.

Alternative A opens almost all of the planning area to wind-energy development; however, it opens only 283,647 acres with high potential for commercial development. Based upon other resource conflicts, it is estimated that 2,250 acres of short-term disturbance and 1,250 acres of long-term disturbance would be developed under this alternative, with 50 turbines located on 10–8 sections. Such a development will adversely impact the INNS program by facilitating the introduction and spread of INNS.

Alternative A manages new ROWs (not associated with wind or on-lease oil and gas operations) by co-locating them with existing ROWs where possible. However, ROWs could be authorized in other locations, which would increase surface disturbance and result in potential adverse impacts to the INNS program. ROW development under Alternative A would result in 11,872 acres of short-term disturbance and 684 acres of long-term disturbance. Approximately 232 acres would be roads, with an increased risk of INNS spread. Alternative A has 66,099 acres of ROW avoidance areas and 205,916 acres of ROW exclusion areas, which would be beneficial impacts to the INNS program.

Alternative A allows livestock grazing on 2,324,934 acres of the planning area. and does not closes any acres to livestock grazing. The potential adverse impacts to the INNS program are described under *Impacts Common to All Alternatives*. Alternative A would authorize range

improvement projects with approximately 860 acres of surface disturbance with increased risk of INNS spread. Alternative A also prohibits the placement of salt and mineral supplements within ¼ mile of water, wetlands, riparian areas, and reclaimed or reforested areas, which would reduce vegetation removal, soil compaction and sediment production from concentrated livestock grazing and traffic. This would beneficially impact the INNS program by preventing adverse impacts to vegetation and soil resources in those areas and limiting the introduction of INNS by grazing animals.

Alternative A does not provide for a forage reserve for livestock grazing so reclamation of surface disturbance would be more difficult if grazed by livestock which increases the risk of INNS spread.

Recreation-related adverse impacts can contribute to the introduction and spread of INNS. INNS seed and propagules can be introduced from authorized group activities, such as the repeated use of undeveloped campsites near waterbodies and cross-country mechanized travel. Alternative A closes 5,923 acres to motorized vehicle use. Seasonal restrictions on 111,002 acres would be likely to beneficially impact the INNS program, because soils will be protected during times of the year when damage to vegetation could make the area more vulnerable to INNS spread. Alternative A closes 14,729 acres to over-snow vehicle use. However, the remaining lands (virtually all of the planning area) are open without any minimum snow-depth requirements, resulting in the potential for adverse impacts to vegetation and secondary adverse impacts to the INNS program.

4.4.3.3.2.4. Special Designations

Alternative A also manages waterways identified in an inventory as eligible for inclusion in the NWSRS, which limits surface disturbance within ¼ mile of those waterways. Like any avoidance of surface disturbance, this would result in direct beneficial impacts to the INNS program, although the limited number of acres associated with this management would result in only moderate beneficial impacts.

Alternative A manages 119,622 acres of ACECs as ROW avoidance areas. This management has historically precluded major ROWs and thus avoided the adverse impacts to the INNS program associated with surface disturbance. While ACEC management also introduces the requirement for a Plan of Operations for locatable mineral actions, which would help prevent undue or unnecessary degradation, it will not stop mineral-related surface disturbance, a vector for INNS introduction and spread.

4.4.3.3.3. Alternative B

4.4.3.3.3.1. Program Management

Under Alternative B, the Authorized Officer may require that livestock be flushed for weeds (fed certified weed-free forage) for 72 hours before livestock is allowed to move onto BLM-administered lands. The intent of this short-term quarantine measure is to keep livestock from moving off private lands infested with Wyoming Declared Weeds onto BLM-administered lands. This alternative would put BLM-administered lands at lower risk of infestation from this vector. This would require that livestock operators obtain certified weed-free forage, or have their own forage crops certified by the appropriate county weed and pest control district. This alternative will help coordination between the Lander Field Office and the Casper Field Office, because the Casper Field Office adopted this specific management action in its RMP and EIS.

There is no similar requirement under Alternative A, so management under Alternative B is more beneficial to the INNS program.

Under Alternative B, the Lander Field Office will monitor and determine if authorized activities are contributing to the spread of INNS. If authorized activities are creating an adverse impact due to the spread of INNS, the Lander Field Office will adjust the terms of the authorization to aid in the control of INNS. This would provide a greater beneficial impact to INNS management than Alternative A, because all activities identified as contributing to the spread of INNS would require adjustments to authorized terms, rather than making adjustments on a case-by-case basis.

4.4.3.3.2. Resources

Management actions under Alternative B prohibit soil-disturbing activities in areas with LRP soils, which would result in more beneficial impacts to the INNS program than Alternative A. The risk of reclamation failure and INNS invasion is greatest on LRP soils, and Alternative B restrictions would provide the greatest protection and help ensure that erosion would be kept to natural rates. This alternative eliminates the risk of land reclamation failure associated with mineral and realty actions by prohibiting these activities on LRP soils. There would still be a potential for INNS to become established on LRP soils from other activities, such as range improvement projects and livestock grazing. However, soils would remain more resistant to INNS infestation than under Alternative A in the absence of development related to mineral and realty actions.

Slopes in excess of 15 percent are closed to surface-disturbing activities under Alternative B, an increase of 231,325 acres over Alternative A. The potential for erosion becomes greater on slopes in excess of 15 percent than on less steep slopes. Steeper slopes undergo accelerated erosion and are more difficult to stabilize and reclaim, becoming suitable sites for weed infestations. Therefore, additional limitations under Alternative B would result in moderately more beneficial impacts than Alternative A.

Management actions for water resources under Alternative B limit surface disturbance on more acres than Alternative A. This would beneficially impact the INNS program, but cannot be quantified because not all of the areas have been mapped and would have to be considered on a case-by-case basis.

While Alternative A relies on label precautions and INNS treatment application restrictions near water to protect surface water and groundwater from contamination, Alternative B prohibits pesticide use in identified aquifer recharge areas and any areas underlain by a sole source aquifer or wellhead protection area. Alternative B water management would adversely impact INNS management in areas of infestation, like the Lander Slope, by placing restrictions on pesticide use beyond those specified by the EPA. Not treating new, small infestations of deep-rooted perennials on the Wyoming Declared Weed list for eradication risks permanently losing acreage of livestock forage and wildlife habitat and increasing the fire hazard from heavy weed infestations. The U.S. EPA regulates the conditions of safe use for all pesticides by specific statutory authority using the best available science to protect human health and the environment. The risk of damage to the environment from INNS is greater than the risk from properly applied pesticides.

Alternative B manages 5,490 acres of lands with wilderness characteristics as non-WSA land with wilderness characteristics to protect their wilderness character, which includes prohibiting motorized and mechanized travel. This would help to protect these lands from weed infestations. Alternative A does not designate special management for these lands, but because of the

limited number of acres involved, Alternative B would be only moderately more beneficial than Alternative A.

Alternative B includes full suppression of fire and authorizes soil disturbance associated with suppression activities within limited areas, in accordance with an approved FMP. This would create surface disturbance in the areas of full suppression, providing suitable conditions for INNS invasion. However, this management approach would reduce the risk of INNS invasion in small, non-landscape-level wildfire situations by reducing impacts from heavy fire-fighting equipment. As vegetation communities return to a more natural fire frequency cycle, the risk of INNS establishment following wildfire would decrease, resulting in healthier herbaceous communities. While there is not enough information to quantify the difference, Alternative B would result in more beneficial impacts than Alternative A because of the reduced surface disturbance associated with full suppression.

Under Alternative B, short-term adverse impacts from INNS due to timber harvesting activities, similar to those described under Alternative A, would accrue as forest areas are managed according to prescriptions that will be developed in forest management plans for the Green Mountain, South Pass, Lander Slope, and Dubois Primary Forest Resource areas (Map 47). Alternative B prohibits clear-cutting. Natural forest processes would be relied on to achieve suitable forest health, with traditional silviculture techniques applied when natural forest processes fail. This would be more beneficial to the INNS program than Alternative A because it would be less likely to result in surface disturbance, although the low demand for forest products makes this only a minor beneficial impact to the INNS program under either alternative. The Alternative B prohibition on clear-cuts increases the potential for large, landscape-level wildfire. Under Alternative B, the result of landscape-level wildfire could increase erosion and the potential for INNS infestation compared to Alternative A, where small clear-cuts could be strategically located to act as fire breaks against landscape-level wildfires. Under either alternative, there would be limited demand for forest products, so the difference in impacts between the two alternatives would likely to be minor.

Riparian-wetland resources management under Alternative B closes additional acres to surface disturbance through a larger active buffer. This wide buffer and moderate restrictions on surface use would help reduce the risk of INNS invasion due to surface disturbance. Reductions in surface-disturbing activities would have an indirect beneficial impact on the control of INNS. Alternative B prohibits surface disturbance near riparian-wetland areas on approximately two and one-half times the acres than Alternative A.

Alternative B implements a passive-management-oriented, non-project approach for correcting identified PFC and/or Wyoming Standards for Healthy Rangeland deficiencies (see the *Livestock Grazing Management* section). This more passive management can work well on low slopes without compacted soils in moist locations; recovery of these areas can be realized in the short to long term. However, simply closing an eroding road without alleviating soil compaction and reseeding can be successful in some cases and very unsuccessful in others, leading to more adverse impacts from INNS invasion. The success of this approach depends on the slope, runoff, and soil material present. This is unlike Alternative A, which on a case-by-case basis uses management and projects to rehabilitate or enhance riparian zones and wetland resources that can yield desirable results sooner, depending on the level of degradation at the site.

Management actions under Alternative B designed to protect wildlife and special status species habitat from the impacts of surface-disturbing and surface-disruptive activities also serve

to protect against INNS invasion. This alternative restricts and prohibits surface-disturbing activities to a much greater degree than Alternative A. In greater sage-grouse nesting areas, surface-disturbing activities are highly restricted on 1,339,609 acres, somewhat more than Alternative A. While this is only a timing restriction it does limit surface disturbance during a time that is ideal for the introduction of INNS in soils that are wet in the spring. Buffers around occupied greater sage-grouse leks prohibit surface-disturbing activities on 93,410 acres of BLM surface acres, substantially more than Alternative A.

Alternative B would systematically inventory and close unnecessary roads and trails and prescribe rehabilitation for them to benefit wildlife habitat. Comparatively, Alternative A closes and reclaims unnecessary roads and old mineral exploration trails on a case-by-case basis. Alternative B prohibits new water development projects in big game crucial winter range and parturition areas. In general, limitations on surface disturbance under Alternative B to improve wildlife and special status wildlife habitat would result in major beneficial impacts to the INNS program compared to Alternative A.

Special status species management provisions for this alternative prohibit chemical treatments within ¼ mile of BLM sensitive plant species habitat, unless the purpose is to protect the special status plant species. Also, buffers can be increased to protect plant populations on a case-by-case basis. This management could result in an increase of INNS that could ultimately out perform special status plants or adversely alter habitat for special status species. In comparison, Alternative A allows chemical treatment of vegetation in sensitive species habitat on a case-by-case basis, which could be a more effective way to remove weed threats to special status species, depending on the specific weed species involved.

Alternative B proposes the construction/upgrade of up to three wild-horse viewing loop roads. These roads would be built in accordance with BLM Manual 9113 design specifications and surfaced with crushed rock or asphalt. Short- and long-term adverse impacts would include increased risk of INNS invasion in the road ditches due to construction and increases in traffic. Increased monitoring would be necessary for these routes.

Management prescriptions under Alternative B designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and surface-disruptive activities would also protect against INNS invasion. Generally, the management of heritage and visual resources under Alternative B would provide more secondary protections for resisting INNS invasion than Alternative A.

4.4.3.3.3. Resource Uses

Surface-disturbing activities associated with mineral development expose soils to increased risk of INNS invasion in both the short term and long term. For projected figures of disturbance under Alternative B, see Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45). Alternative B decreases the amount and severity of surface disturbance related to mineral development (salable, leasable, and locatable minerals; and geothermal leasing) compared to Alternative A, which would be expected to result in a corresponding decrease in risk of INNS invasion.

Alternative B opens 41,372 acres for wind-energy development; this is approximately only a of the acreage Alternative A offers on a case-by-case basis. Of these areas, only 867 acres have wind-energy potential. Accordingly, Alternative B would be unlikely to have any industrial scale

wind-energy development. This would be a major beneficial impact to INNS in comparison to Alternative A. Alternative B's wind-energy development restrictions would beneficially the INNS program in comparison to Alternative A.

ROW development under Alternative B would result in approximately 7,590 acres of short-term surface disturbance and 125 acres of long-term surface disturbance. This is much less adverse than Alternative A, although some of the long-term disturbance in Alternative B would not necessarily lead to INNS because it is associated with paving roads or constructing facilities. Under Alternative B, there are 315,219 acres of ROW avoidance areas (approximately five times more than Alternative A) and 1,919,029 acres (approximately 9.3 times more than Alternative A) of ROW exclusion areas. The far more limited ROW program under Alternative B would result in major beneficial impacts to the INNS program compared to Alternative A.

Alternative B manages 12,839 more acres as closed to livestock grazing in comparison to Alternative A. The impacts of concentrated herbivory are identified in *Impacts Common to All Alternatives*. These adverse impacts would be reduced in the areas that are closed to livestock grazing in Alternative B. Alternative B prohibits the placement of salt and mineral supplements in far more areas than Alternative A with beneficial impacts to INNS by limiting vegetation loss. Furthermore, Alternative B emphasizes the use of non-structural grazing management to achieve or maintain Wyoming Standards for Healthy Rangelands. New range improvements would not be allowed that would result in adverse impacts to other resources. This approach would likely require a reduction in stocking rates and the use of alternative grazing strategies, such as herding, to prevent livestock concentrations from creating suitable conditions for INNS invasion. In addition, not only would there be no new surface disturbance, range improvement projects would emphasize vegetation treatments, increasing the acres treated from 10,000 acres over the life of the plan to 30,000. If a forage reserve were established, as authorized under Alternative B, reclamation success could be improved with beneficial impacts to the INNS program. The beneficial impacts to INNS management from livestock grazing management under Alternative B would be major compared to Alternative A.

The adverse impacts of recreation-related travel are described under Alternative A. Alternative B closes 71,761 acres to motorized vehicle travel, approximately 12 times more acres than Alternative A. Under Alternative B, approximately 116,805 acres are seasonally closed to motorized vehicle travel, somewhat more than under Alternative A. To the extent that seasonal closures protect vegetation during muddy seasons, there would be less vegetation disturbed, a beneficial impact to the INNS program. Alternative B closes approximately 181,173 acres to over-snow vehicle use, approximately 12 times more than Alternative A, and limits travel when there are less than 12 inches of snow, which would limit adverse impacts to vegetation and, indirectly, result in beneficial impacts to the INNS program. With more restrictions on travel, there would be fewer chances for INNS seed and propagule introduction and less surface disturbance to create favorable conditions for INNS germination.

4.4.3.3.4. Special Designations

Alternative B management associated with Congressionally Designated Trails would result in major beneficial impacts to INNS management compared to Alternative A because Alternative B places far more restrictions on surface-disturbing activities. It is not possible to quantify the acres that would not be disturbed under Alternative B because trails management is based on the trail's visual and historical setting. However, the restrictions are extensive under Alternative B

and would limit the kinds of disturbances (surface disturbance and new roads) that are the major vectors for INNS spread.

Alternative B manages all NWSRS-eligible waterways as suitable for inclusion in the NWSRS, while Alternative A recommends that interim management continue for the nine NWSRS-eligible waterways. Managing the Sweetwater River Unit to maintain its NWSRS suitability would not provide additional beneficial impacts because it is part of a WSA with more restrictive management. In the other waterways, while theoretically there would be a beneficial impact to the INNS program from WSR suitability management under Alternative B, there is little demand for surface-disturbing activities in these areas, so there would be no real difference in impacts to the INNS program between alternatives A and B.

Alternative B designates 1,492,990 acres as ACECs and prohibits or minimizes surface disturbance in these areas. This is approximately 12.5 times the acreage protected under Alternative A. However, a large portion of these acres overlap with other restrictions so the acres of protection analyzed here are not additive.

4.4.3.3.4. Alternative C

4.4.3.3.4.1. Program Management

INNS program management under Alternative C is the same as under Alternative A. As described above, Alternative B includes more proactive management, such as cattle flushing and adjusting terms and conditions of authorized activities, to help control INNS. Therefore, alternatives A and C would result in less beneficial impact to INNS management than Alternative B.

4.4.3.3.4.2. Resources

Alternative C soils, water, and fire program management are similar to that under Alternative A. Like Alternative A, Alternative C avoids surface-disturbing activities on slopes more than 25 percent with the same beneficial impacts to the INNS program. This is much less restrictive than Alternative B, which avoids surface-disturbing activities on slopes more than 15 percent, the avoidance requirement with the highest level of restrictions. Impacts to the INNS program from soils management under Alternative C would be very similar to impacts under Alternative A, and more than moderately less beneficial than under Alternative B.

Alternative C management of forest product sales is generally the same as Alternative A, but less restrictive and with more potential for adverse impacts to the INNS program than Alternative B. Alternative C prescriptions that allow for large clear-cuts would result in more short-term adverse impacts from the risk of INNS invasion until logged sites could grow native vegetative cover that can resist INNS invasion. Alternative C would result in the greatest long-term adverse impacts of INNS invasion in any portions of large clear-cuts that lose soil fertility and do not rehabilitate in the short term. However, because of the lower demand for forest products, differences in impacts among the alternatives would be minor.

Alternative C riparian-wetland management actions are very similar to Alternative A, with similar moderate beneficial impacts.

Alternative C places the fewest restrictions on surface-disturbing activities based on wildlife and special status species concerns. Therefore, Alternative C would be expected to result in a greater

degree of development in critical wildlife habitats, and in turn result in the highest potential for INNS introduction and establishment compared to the other alternatives. In greater sage-grouse nesting areas, Alternative C prohibits surface-disturbing activities the same as Alternative A. Alternative C has the same nesting stipulations as Alternative A, which is less beneficial to soils and thus INNS management during a vulnerable season. Alternative C management of wildlife resources does not close and reclaim unnecessary roads and old mineral exploration trails, unlike Alternative A, which does on a case-by-case basis, and Alternative B, which requires more active identification and rehabilitation of redundant and hazardous roads. Addressing these road-related erosion problems through rehabilitation denies INNS preferred germination sites.

Alternatives A and C provide for greater control of INNS species compared to Alternative B because chemical (pesticide) use is not limited. The impact of this different management would be minor because of the limited mapped acres of special status plant species.

Management prescriptions under Alternative C designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and surface-disruptive activities also protect against adverse impacts associated with INNS introduction and infestation. Generally, Alternative C would provide the least secondary protections for resisting INNS invasion compared to alternatives A and B, which would provide the most protection for resisting INNS invasion. Alternative C includes very limited restrictions on surface disturbance to protect these resources (particularly visual resources), so more surface disturbance would be likely under Alternative C, with major adverse impacts to the INNS program.

4.4.3.3.4.3. Resource Uses

Surface-disturbing activities associated with mineral development expose areas to increased risk of INNS introduction and infestation. For potential short- and long-term acres affected and acres of disturbance under Alternative C, see Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45). Alternative C increases the amount and severity of surface disturbance related to all mineral development (locatable, leasable and mineral material disposals) compared to alternatives A and B, which would be expected to result in an increase in risk of INNS invasion, a major adverse impact.

Alternative C opens more acres with wind-energy potential to wind-energy development and has fewer acres of avoidance or exclusion. It is assumed that there would be 108,000 acres of short-term disturbance and 48,000 acres of long-term disturbance, the most of any alternative. This alternative would have adverse impacts as the development would be spread across 400 or more sections.

Alternative C designates future major ROWs in a 3 mile-wide corridor that follows existing ROWs totaling approximately 660,908 acres in designated corridors. Surface disturbance for ROWs (other than on-lease oil and gas and wind-energy development) would be 12,216 acres of short-term disturbance and 703 acres of long-term disturbance or slightly more than Alternative A. Alternative C excludes ROWs on 147,053 acres thus protecting far fewer acres from INNS disturbances in comparison to Alternative B. Alternative C manages 11,714 acres as ROW avoidance areas. INNS can still become established in ROW exclusion and avoidance areas by means of livestock, wildlife, and range improvement projects, among others. Alternative C ROW management is likely to have at least moderately more adverse impacts than either Alternative A or B.

Like Alternative A, Alternative C opens the planning area to livestock grazing with very similar management. Alternative C calls for moderate grazing (41 to 60 percent) rather than setting utilization levels on a case-by-case basis, as does Alternative A, or by prescribing light (20 to 40 percent) utilization levels as does Alternative B. Moderate utilization would necessarily require more monitoring and leave less room for error than light utilization, and would present a risk of more adverse impacts to plant communities, which can favor INNS invasion. The acres open to grazing under this alternative and its utilization levels (moderate) are the same as Alternative A. Alternative C would have 1,996 acres of long-term surface disturbance associated with range development projects. Alternative C management of the placement of salt and mineral supplements is the same as Alternative A; however, unlike Alternative A, Alternative C uses salt and mineral supplements as a tool to maximize forage use. Like Alternative A, the development of range infrastructure would limit vegetation treatments to approximately 10,000 acres over twenty years or 1/3 the acres of treatment under Alternative B. Alternative C would result in the greatest adverse impacts to vegetation from livestock grazing compared to the other alternatives, and consequently would result in the greatest adverse impacts from INNS invasion.

Alternative C closes 5,472 acres to motorized vehicle travel, more closely resembling Alternative A than Alternative B in the beneficial impacts to the INNS program. Alternative D includes seasonal closures similar to Alternative A, but less than Alternative B. Seasonal closures designed to benefit wildlife can also benefit vegetation by reducing the likelihood of INNS spread. Alternative C is similar to Alternative B in its management of over-the-snow vehicles by requiring motorized vehicles to stay on roads unless there are at least 12 inches of snow, which would beneficially impact vegetation and, therefore, beneficially impact INNS management.

4.4.3.3.4.4. Special Designations

Alternative C management of Congressionally Designated Trails restricts surface disturbance on the fewest acres of any alternative. Compared to Alternative B, Alternative C allows greater development outside ¼ mile of trails and would have the potential to result in major adverse impacts to the INNS program.

Alternative C does not recommend any NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS. This would result in fewer protections against surface-disturbing activities and INNS invasion than alternatives A and B.

Alternative C does not designate any ACECs. The alternative manages surface-disturbing activities with standard stipulations, which is the least restrictive to surface-disturbing activities of all the alternatives and provides the least protection against the risk of INNS introduction. Standard stipulations would provide some level of protection against the potential infestation of INNS; however, Alternative C standard stipulations would do little to hinder the spread of INNS compared to Alternative B, with resulting major adverse impacts. Alternative C would also result in fewer beneficial impacts to INNS management than Alternative A.

4.4.3.3.5. Alternative D

4.4.3.3.5.1. Program Management

INNS program management under Alternative D is generally the same as under Alternative B, with Required Design Features and selected BMPs applied as COAs. However, Alternative

D includes fewer restrictions on surface disturbance than Alternative B, which would make the beneficial impacts under Alternative D moderately to substantially less than Alternative B. Alternative D better prevents the introduction and spread of INNS than alternatives A and C.

4.4.3.3.5.2. Resources

Soils and water program management under Alternative D is similar to that under Alternative A in terms of slope and LRP. Impacts under this alternative would be expected to be very similar to those described for Alternative A and less than those under Alternative C.

Alternative D includes full suppression of fire based on a consideration of other resources, especially in sagebrush areas. This management would be more likely to lead to INNS spread than Alternative B, where soil disturbance associated with suppression activities occurs. Alternative D would result in more acres of disturbance from fire suppression activities than Alternative B.

Alternative D management of forest product sales allows all silvicultural management techniques wherever they are deemed suitable. This would be a more beneficial approach to INNS management than any of the other alternatives because it accounts for site-specific considerations and does not impose artificial limits. This alternative avoids the potential for INNS expansion into clear-cut areas that occurs under alternatives A and C, but would provide more management flexibility than Alternative B. Alternative D also allows management flexibility to address beetle-killed trees in parts of the planning area and allows the BLM to partner with other land managers, such as the U.S. Forest Service (USFS) in the Shoshone National Forest. This management can also be used strategically, as funds permit, to perform fuels treatments that would help prevent landscape-level fires. However, the low demand for forest products would make the importance of differences in impacts among the alternatives minor to moderate. The application of Required Design Features, including silviculture BMPs as COAs, would help to prevent INNS spread.

Riparian-wetland management actions under Alternative D are the same as those under Alternative A, which would afford native plant communities some short- and long-term protection from potential INNS introduction and infestation, but not as much protection as Alternative B, which closes a much larger buffer (125,403 more acres). Alternative D allows the use of infrastructure projects to make progress toward PFC and Wyoming Standards for Healthy Rangelands, but balances adverse impacts to resources. Additional information regarding livestock grazing management impacts to INNS is provided below under that section.

Alternative D places more restrictions on surface-disturbing activities for the protection of wildlife and special status species than alternatives A and C, but not as many as Alternative B. Accordingly, adverse impacts under Alternative D from INNS establishment and spread would be less than those under alternatives A and C, but more than those under Alternative B although limits on surface disturbance through the use of Required Design Features would reduce the adverse impacts. Restrictions on surface disturbance due to special status species would limit the amount of bare ground allowed, particularly in the greater sage-grouse Core Area, and therefore would decrease potential locations for INNS establishment. The Alternative D closure of the Dubois area to surface-disturbing activities (e.g., oil and gas development, phosphate leasing, mineral materials disposals, and major ROWs to protect wildlife) would reduce the potential for INNS spread in the area by reducing surface disturbance. However, the Dubois area has not historically been an area of intensive mineral development, so beneficial impacts to the INNS program could be minor.

Like Alternative B, Alternative D closes and reclaims redundant and hazardous roads and old mineral exploration trails and has greater sage-grouse objectives for road reclamation. Addressing these road-related erosion problems through rehabilitation would deny INNS preferred germination sites and therefore would result in more beneficial impacts to INNS management than Alternative A, which closes and reclaims redundant and hazardous roads and old mineral exploration trails on a case-by-case basis. Alternative C provides the least protection for special status species, alternatives A and D provide a mid-level of protection, and Alternative B provides the most protection to special status species and by imposing the most restrictive limits for surface-disturbing impacts.

Alternative D authorizes chemical (pesticide) treatments within identified sensitive species plant habitat if it would benefit the special status plants. This is unlike Alternative B, which prohibits chemical treatments within ¼ mile of BLM sensitive plant species habitat, unless the purpose is to protect the special status plant species. Alternative D management could reduce the likelihood of INNS, which could ultimately out perform special status plants or adversely alter habitat for special status species. Alternative A allows chemical treatment of vegetation within sensitive species habitat on a case-by-case basis. Alternatives A, B, and C are very similar, because all weed control is reviewed on a case-by-case basis. To safeguard sensitive species populations against accidental pesticide treatment, the Fremont County Weed & Pest Control District has information about sensitive plant populations and boundaries in the planning area in their Geographic Information System (GIS), which is readily available to field work crews. Alternative D provides for the greatest control of INNS followed by alternatives A and C and finally Alternative B which has the least flexibility for treatment of INNS.

Management prescriptions under Alternative D designed to protect cultural, paleontological, and visual resources from the impacts of surface-disturbing and surface-disruptive activities also protect against adverse impacts associated with INNS introduction and infestation. Generally, this alternative provides the second best management (limiting surface-disturbing activities) for resisting INNS invasion compared to Alternative B, but more than Alternative A or C.

4.4.3.3.5.3. Resource Uses

Surface-disturbing activities associated with mineral development expose areas to increased risk of INNS introduction and infestation. For potential short-term and long-term acres affected and acres of disturbance under Alternative D, see Table 2.4, “Comparative Summary of Proposed Land Use Decisions in the Lander Planning Area” (p. 45). Alternative D would decrease the amount and severity of surface disturbance related to mineral development (locatables, leasables, and mineral material disposals) compared to Alternative A, and would decrease them substantially compared to Alternative C but less than Alternative B. The NSO stipulations applied to the high-resource value areas in Dubois and the Lander Front-Hudson-Atlantic City areas and the Required Design Features would beneficially impact the INNS program.

Management under Alternative D of industrial wind-energy development is similar to that under Alternative B, and the impacts to the INNS program are likely to be the same.

Alternative D assumes that 9,894 acres would have short-term disturbance associated with ROW (other than oil and gas on-lease and wind-energy development). Alternative D confines major ROWs to designated corridors and designates more corridors than Alternative B; most other areas are avoided with avoidance criteria. These designated corridors are fewer and narrower under Alternative D than under Alternative C but only somewhat. This would limit surface

disturbance through many areas of resource concern and limit this potential vector for INNS spread, but less than under Alternative B. However, with more designated corridors available, it is possible that any one corridor will be used less frequently, with a longer period of rest for reclamation objectives to be met.

Alternative D manages 7,566 acres as closed to livestock grazing, slightly less than Alternative B and slightly more than alternatives A and C. Alternative D livestock grazing management is less restrictive than Alternative B because Alternative D allows moderate utilization levels. Limiting range infrastructure projects to when part of a Comprehensive Grazing Strategy would result in fewer adverse impacts to the INNS program than alternatives A and C. Alternative D would likely make more rapid progress towards rangeland health than Alternative B but this could be offset by the additional surface disturbance associated with the infrastructure. Alternative D will disturb 847 new acres whereas Alternative B will likely disturb little to none. Like alternatives A and C, Alternative D would treat 10,000 acres or 1/3 that of Alternative B. However, in cases where livestock use would be continuous or occur annually during the critical growing season for uplands or during the riparian-wetland hot seasons, light utilization levels could be necessary. Utilization levels would be based on the results of monitoring data. Under Alternative D, forage requirements for big game herd objectives are considered when determining stocking rates for livestock and wild horses. Because healthy herbaceous communities are more resistant to INNS infestation, moderate livestock grazing in uplands and riparian-wetland systems would result in beneficial impacts by reducing over utilization and the potential for INNS establishment as herbaceous communities return to a stable state. Alternative D restricts the placement of salt and mineral supplements similar to Alternative B, which would result in beneficial impacts to INNS management similar to those under Alternative B. While these beneficial impacts would be more pronounced under Alternative D than under Alternative A, and exceed those under Alternative C, they would not be as widespread or effective as beneficial impacts under Alternative B. Required Design Features would reduce the adverse impacts associated with livestock grazing and range infrastructure.

Roads and trails are prime vectors for INNS invasion and the less acreage open to motorized vehicle travel the less chance there would be for the introduction of INNS. Alternative D closes 26,357 acres to motorized vehicle travel, far less than Alternative B but similar to Alternative A. Alternative D includes seasonal closures similar to Alternative A but less than Alternative B. Seasonal closures for wildlife management would also have beneficial impacts on vegetation and, therefore, reduce the likelihood of INNS spread. Alternative D is similar to Alternative B in its management of over-snow vehicle travel, as it requires motorized vehicles to stay on roads unless there are at least 12 inches of snow; this would beneficially impact vegetation and, therefore, have a beneficial impact INNS management. The Required Design Features for surface disturbance, which limits the footprint and extent of vegetation removal, would reduce the adverse impacts associated with development. Mandated impoundment pond designs, where authorized, would limit the spread of WNV, although not to the extent that would occur under Alternative B.

4.4.3.3.5.4. Special Designations

Alternative D management of Congressionally Designated Trails in the NTMC would result in more beneficial impacts to INNS management than alternatives A and C, because Alternative D includes more restrictions on surface disturbance over a larger area. However, Alternative D would result in substantially fewer beneficial impacts than Alternative B, because Alternative D closes less area to surface-disturbing activities.

Alternative D protects fewer NWSRS-eligible waterway segments by managing them as suitable for inclusion in the NWSRS than Alternative B, but this would result in only a marginally less beneficial impact to INNS management because many of the segments are protected by other management (e.g., ACEC or WSA designation). Moreover, it is not clear that there would be any real demand for surface-disturbing activities in these areas, so there might be only minor differences in impacts among alternatives A, B, and D. The Alternative C approach of not recommending any NWSRS-eligible waterway segments as suitable could result in more adverse impacts because of the lack of restrictions associated with special designations realized under the other alternatives. Two of these units are contained in areas that are withdrawn from locatable mineral entry and NSO for oil and gas for the benefit of other resources.

Alternative D designates 243,838 acres of ACECs, which in turn have limits on surface disturbance. As discussed above, ACEC designation requires a Plan of Operations for locatable mineral activities regardless of disturbance acreage, which includes a weed management plan. This would beneficially impact INNS management, although not to the extent of the withdrawals proposed under Alternative B. More of the ACECs in Alternative D are withdrawn from locatable mineral entry than under Alternative A.

4.4.4. Riparian-Wetland Resources

Impacts to riparian-wetland resources occur when something alters the physical, chemical, or biological components of the ecosystem. Actions that contribute to the decline in abundance, distribution, or functionality of riparian-wetland resources are considered adverse impacts. Conversely, beneficial impacts result from management actions that protect or restore riparian-wetland resources in the planning area.

Direct impacts to riparian-wetland resources result from disturbing vegetation or the ground surface in these communities. Indirect impacts result from actions in a watershed that cause a change in riparian-wetland functionality (e.g., increased rates of sediment loading or changes in hydrology), a change in water chemistry, or spread of INNS.

4.4.4.1. Summary of Impacts

Major adverse impacts to riparian-wetland resources arise from surface disturbance associated with mineral resources development, motorized vehicle use, road construction, and livestock grazing. Impacts from wildlife and wild horses are more localized and site specific than the broad impacts from livestock grazing. Alternative C would result in the greatest projected total surface disturbance, followed by Alternative D, Alternative A and then Alternative B. Alternative B would result in the greatest beneficial impact to riparian-wetland resources by imposing more restrictions on surface-disturbing activities close to riparian-wetlands resources and by instituting more beneficial proactive management actions, such as watershed improvement projects. Overall, Alternative B would result in the fewest adverse impacts to riparian-wetland resources and Alternative C would result in the most. Alternative D has moderate beneficial impacts to riparian-wetland resources over alternatives A and C, but less than Alternative B.

4.4.4.2. Methods and Assumptions

Evaluating potential impacts to riparian-wetland areas caused by changes in functionality or INNS establishment focuses on resource management actions that (1) cause surface disturbances

or limit impacts from surface disturbances and (2) are substantially different among the proposed alternatives. Estimates of projected surface disturbances are used as the primary metric for determining the relative level of potential indirect impact to riparian-wetland areas.

Methods and assumptions used in this impact analysis include the following:

- Where appropriate actions have been applied following rangeland health assessments, riparian-wetland plant communities are functioning properly or are in the process of achieving PFC.
- Surface disturbances generally increase the potential for accelerated sediment loading to streams.
- Surface disturbances generally increase surface runoff to streams due to an increase in impervious surface, changes in water routing, and loss of vegetation.
- Surface disturbance, transportation networks, ungulate use, and recreation increase the likelihood of INNS introduction and spread in an area.
- The greater the amount of surface disturbance in a watershed, the greater the probability that excess surface runoff and sediment will enter the stream and contribute to the loss of riparian-wetland functionality.
- Placing salt and mineral supplements outside riparian-wetland communities is a tool that can reduce livestock use of riparian-wetland areas.
- Surface runoff to streams generally increases as livestock stocking rates increase. This is not a linear relationship. For example, low stocking rates typically result in no measurable impact to surface runoff, moderate stocking rates typically result in a negligible impact to surface runoff, high stocking rates result in a measurable impact to surface runoff, and consecutive years of high stocking rates have the highest potential for increasing surface runoff to streams.
- Livestock use is typically disproportionately higher in riparian-wetland communities than in upland communities. Improper livestock grazing management can adversely impact riparian-wetland communities throughout the year, but generally there are more impacts in spring and early summer when soils are wet and, therefore, more vulnerable to compaction, and stream banks are more vulnerable to sloughing. Livestock, especially cattle, tend to congregate in these communities during the hot season (mid through late summer). While stocking rates for an allotment or pasture might be low to moderate, the utilization levels in riparian-wetland areas can be high.
- Riparian-wetland areas are managed to meet PFC and Wyoming Standards for Healthy Rangelands. Meeting these standards depends primarily on management of grazing practices and ground-disturbing activities. Riparian-wetland areas are evaluated during Wyoming Standards for Healthy Rangeland assessments. Approximately 5 percent of the public land in the planning area is evaluated annually for rangeland health. The BLM assesses riparian-wetland sites on BLM-administered land using the PFC method. The BLM manages livestock and implements rangeland improvement projects to endeavor to bring locations not in PFC into PFC, where conditions allow.
- Livestock numbers are managed on an annual basis based on livestock permittees operations, available forage, and permitted seasons of use.
- Wildlife can adversely impact riparian-wetland areas, depending on the numbers and types of wildlife and when the use occurs; however, impacts from wildlife are more localized and site specific and are not widespread in the planning area.
- All riparian-wetland areas are managed toward PFC. Management toward desired plant community is assumed to exceed the requirements of managing toward PFC.
- Management actions for soil resources will help minimize soil erosion, and sediment, salt, and nutrient loading in waterbodies.

- Stream channel and land health conditions can degrade quite rapidly. Recovery is often a much slower process. It is generally more efficient to prevent degradation than to recover a degraded system.

4.4.4.3. Detailed Analysis of Alternatives

4.4.4.3.1. Impacts Common to All Alternatives

Impacts to riparian-wetland resources would be similar, but the intensity of impacts would vary by alternative.

Implementing any of the alternatives could result in direct and indirect impacts. Because riparian-wetland areas are limited in the planning area and often the most productive lands, humans, livestock, wild horses, and wildlife disproportionately impact these resources compared to the same types and extent of actions in upland areas. Whenever possible, the alternatives generally avoid or minimize direct adverse impacts to riparian-wetland. Impacts from projects or uses that involve riparian-wetland areas are minimized through the application of BMPs. In addition, the BLM manages lotic (running water) and lentic (standing water) riparian-wetland areas to meet PFC and Wyoming Standards for Healthy Rangelands.

Under all the alternatives the BLM uses wildland fires to restore fire-adapted ecosystems and to reduce hazardous fuels. However, it is likely that several resource objectives throughout the planning area will require the use of full suppression tactics in most cases. The loss of vegetative cover from both wildland fires and prescribed fires increases runoff and sediment to streams and other waterbodies in the short term. Storm events following a fire can overwhelm downstream waterbodies by contributing excessive amounts of sediment, large woody debris, and water to the system in a short period. Fires that burn more intensely result in a greater adverse impact to the watershed. Fires of the appropriate intensity generate a vegetation response that could result in beneficial impacts to a watershed by helping to recharge water tables and increasing the amount of herbaceous cover, thereby improving livestock, wild-horse, and wildlife distribution and decreasing erosion. As described in the fire and fuels analysis, greater sage-grouse management in Core Area with less than 12 inches of annual precipitation (a category that includes 70 percent of the planning area) does not utilize prescribed fire absent very limited exceptions. Full suppression of wildfire will occur in Core Area in all alternatives.

Direct adverse impacts to riparian-wetland resources can result from wildlife, livestock, wild-horse grazing, and linear disturbances such as roads and pipelines. The alternatives stipulate BMPs to address these impacts. These BMPs are particularly important for livestock management. All alternatives stipulate varying riparian buffers to reduce impacts to riparian-wetlands. Locatable mineral activities are not subject to riparian buffer stipulations. Produced water discharge is permitted under all alternatives by the Wyoming Pollutant Discharge Elimination System (WYPDES). Impacts caused by wildlife and wild horses are not specifically managed but are generally minor.

Riparian-wetlands typically experience the highest adverse impacts during the hot summer seasons (June 15 through September 15, historically) when livestock tend to loiter and select these areas for the higher-quality forage, open water, and thermal cover they provide. If improperly managed, livestock can directly impact bank stability in lotic systems, affect water quality, limit the growth and vigor of riparian-wetland herbaceous communities, and create hummocking leading to soil compaction. Riparian-wetland soils are sensitive to hummocking

and compaction, which decreases water infiltration rates and water-holding capacity. Properly functioning riparian-wetland zones are often comprised of a diverse mix of woody and herbaceous riparian-wetland species. These communities are highly dependent on slope, aspect, soil type, and ecological site and can be dominated by either herbaceous species, woody species, or both. Woody species often encountered in riparian-wetland areas include cottonwood, willow, waterbirch, and alder.

In some parts of the planning area, aspen is also a component of riparian-wetland areas. The herbaceous component associated with properly functioning riparian-wetland areas is often comprised of sedges, tufted hairgrass, rushes, and bulrushes. Heavy use of these systems suppresses the reproduction of these riparian-wetland-obligate species and can lead to a shift to a more grazing-resistant plant community such as bluegrass, mat muhly, dandelions, and pussytoes. These annual species lack the root mass capable of withstanding large flow events, leading to bank shearing, and either widening of the channel or headcutting. As these alterations to channel morphology occur, riparian-wetland areas lose their ability to hold moisture, leading to encroachment by upland vegetation species. Over use of upland forage can lead to increases in overland flow, contributing to excessive sedimentation in riparian-wetland areas. Grazing management strategies, such as rotation, deferment, seasonal rest, and the manipulation of season of use and grazing intensity, are implemented to manage vegetation composition, cover, and vigor to maintain or achieve Wyoming Standards for Healthy Rangelands and PFC in riparian-wetland areas.

Wild horses are managed to maintain appropriate management levels in balance with forage resources and herd objectives. Uncontrolled herd populations adversely impact riparian-wetland areas in the form of decreased bank stability, decreased water quality, and hummocking resulting from congregation in these areas and improper livestock grazing management in riparian-wetland areas. Management of wild horses to maintain appropriate management levels would prevent over use of riparian-wetland areas. An additional long-term impact to riparian-wetland systems in HMAs is the “mudding up” that wild horses practice in wild-horse congregation areas. Wild horses create a “wallow” in some areas to cover themselves with mud to protect them from flies. Impacts in wallow areas would be minor, but would occur and would denude the sites of vegetation. Wild horses congregating in riparian-wetland areas tend to chase cattle away, which has a beneficial impact on riparian-wetland areas by reducing forage use by grazing livestock; however, these occurrences are localized and not widespread. As horse populations increase, wallows increase in number and impacts to riparian-wetland areas in HMAs increase.

Linear features such as pipelines, roads, and fences also result in direct adverse impacts to riparian-wetland areas; they impact bank stability and contribute to a high degree of sedimentation and water flow routed directly to the riparian-wetland areas. The loss of vegetation capable of dissipating water energy, compounded with soil compaction related to energy development, would lead to increased runoff and sedimentation in riparian-wetland areas. Increases in direct water flow can result in headcutting and excessive erosion in some portions of the riparian-wetland area. Conversely, additional sedimentation in the riparian-wetland area can lead to more deposition and braiding of the stream system. INNS are often introduced to riparian-wetland areas via these linear actions and they take advantage of new surface disturbance, with the potential to outcompete native riparian-wetland vegetation for soil and water resources. Species such as tamarisk, Russian olive, leafy spurge, Russian knapweed, and hoary cress have the potential to dominate riparian-wetland areas and take the place of native sedges, cottonwoods, and willows. INNS species generally lack the necessary root mass to bind the soil that is typically associated with riparian-wetland-obligate species, which can lead to headcutting and excessive erosion.

Designated ROW corridors would concentrate new disturbance in areas of existing disturbance, preventing new unmitigated impacts to riparian-wetland areas.

Indirect impacts to riparian-wetland resources would result primarily from sedimentation flow into the riparian-wetland zone. While most surface-disturbing activity would not occur near riparian-wetland areas, these areas could experience indirect impacts due to soil compaction, loss of vegetative cover, and erosion in the uplands, causing increases in sediment released into streams. Higher sediment loading entering a stream could alter its form and, consequently, the performance of adjacent riparian-wetland resources. The impact of increased sediment loading depends on the stream's ability to pass the sediment through the system and largely depends on the size (discharge volume) of the stream and the channel slope gradient. In segments of a stream with lower gradients, deposition occurs and the stream channel aggrades (builds), possibly becoming braided and shallow. In some cases, aggradations of the streambed at one location can cause the stream to down cut or degrade (become more incised) in upstream reaches as the stream seeks to restore its equilibrium. The additional material eroded from the upstream channel is transported down to the a depositional area and the cycle continues. In such cases, the functionality of the riparian-wetland areas in both the aggraded stream reach and the incised stream reach change.

The BLM manages riparian-wetland habitat for several special status species, including a variety of different raptors, plants, amphibian, and fish species. Management of habitats critical for these special status species generally involves restricting activities in the vicinity of riparian-wetland areas or, in the case of wildlife, year-round or seasonal restrictions. As a result, the extra protections associated with these species can result in beneficial impacts to riparian-wetland areas in the vicinity of buffer zones for special status species.

Similar to wildlife and fisheries, management actions designed to protect cultural resources from the impacts of surface-disturbing activities would also protect riparian-wetland resources from these activities.

Impacts to riparian-wetlands as a result of surface disturbance associated with locatable mineral development would be the same under all alternatives, notwithstanding the difference in acres withdrawn from mineral entry under each alternative. Withdrawals would not impact existing claims and it is assumed that the most viable or likely areas for mineral development have already been claimed. While it is possible that changing markets could change what is determined by industry to be economically viable, for analysis purposes each alternative assumes 109 acres per year of short-term (3 to 5 years) disturbance and 95 acres per year of long-term disturbance. These numbers are based on actual data from the last 2 decades.

Locatable minerals are not subject to established or proposed buffers for riparian-wetland areas. Consequently, there would be a potential for adverse impacts to riparian-wetland areas in the form of altered stream channels, degraded bank stability, and the removal of hydric soils and riparian-wetland vegetation. Surface-disturbing activities in riparian-wetland areas are generally mitigated on or off the sites. Net acres of riparian-wetland areas lost or mitigated are not available at this time; however, impacts related to lost and mitigated riparian-wetland areas are best analyzed on a site-specific basis.

4.4.4.3.2. Alternative A

4.4.4.3.2.1. Program Management

Program management under Alternative A consists of managing riparian-wetland areas to meet PFC and prohibiting surface-disturbing activities within 500 feet of surface water and riparian-wetland areas. Management actions designed to improve streams and conserve riparian-wetland areas generally result in long-term beneficial impacts to riparian-wetland resources. Site-specific management actions such as fencing, deferred use, resting, and road closures are implemented to maintain and meet PFC for riparian-wetland systems. Man-made barriers such as fences generally result in the greatest immediate impact to riparian-wetland areas that do not meet PFC by minimizing livestock and wildlife grazing, and thus eliminating the greatest adverse impact to riparian-wetland areas. However, fencing all riparian-wetland areas would not be a practical management strategy, and fences result in a number of adverse impacts to wildlife (see the *Fish and Wildlife Resources – Wildlife* section). On a case-by-case basis, the BLM will give management priority to actions that would benefit riparian-wetland areas in the Sweetwater watershed that do not meet PFC. The riparian-wetland resources in the Beaver Rim area would be managed with standard riparian setbacks and no watershed monitoring would be required. Alternative A range improvement projects would be anticipated to disturb more acres than Alternative B, but fewer than Alternative C. While these treatments could result in short-term impacts in terms of surface disturbance, they would be expected to result in long-term beneficial impacts to these areas.

4.4.4.3.2.2. Resources

Alternative A does not specifically manage lands with wilderness characteristics to maintain their wilderness character.

Alternative A manages grasslands and shrublands to meet Wyoming Standards for Healthy Rangelands. Grasslands and shrublands that meet Standards for Healthy Rangelands promote healthy herbaceous communities capable of stabilizing upland soils, dissipating water-flow energy, and increasing water infiltration rates and water holding capacity. Healthy grasslands and shrublands minimize sedimentation and excessive water flow into riparian-wetland areas, promoting PFC. Conversely, degraded grasslands and shrublands allow for increased overland flow and sediment movement. Degraded grasslands and shrublands contribute to increased erosion and sedimentation in riparian-wetland areas until they are improved to meet Wyoming Standards for Healthy Rangelands.

Alternative A management of forest and woodlands for the promotion of timber products would have the potential to result in increased surface disturbance associated with access roads and timber removal operations. This activity could result in a return to an early seral-stage plant community comprised primarily of annual species. As discussed under *Impacts Common to All Alternatives*, annual species lack the root mass necessary for proper soil stabilization, leading to the potential of increased erosion rates and contributions of excess sediments to the riparian-wetland areas. Alternative A allows clear-cut operations within 100 feet of riparian-wetland areas and on slopes of as much as 45 percent, further resulting in the potential for excessive erosion and sediment movement into riparian-wetland areas. Appropriate management of forest products to maintain and improve forest and woodland health would promote watershed health by providing adequate vegetation to dissipate water energy and minimize sediment

movement. Market conditions suggest that there would be negligible to minor impacts to riparian-wetlands because of a lack of demand for products.

INNS are particularly undesirable in riparian-wetland areas because they do not have the same high level of soil-binding properties of many native riparian-wetland species (e.g., willows and sedges). The proximity of surface disturbances to riparian-wetland areas is one of the primary ways in which INNS can spread to these areas. Prohibiting surface disturbance within 500 feet of riparian-wetland areas would help reduce the opportunity to spread INNS to these areas. INNS management under Alternative A does not restrict any kind of chemical application near riparian-wetland areas. Application of chemicals near water could reduce water quality, which would adversely impact the health of riparian-wetland resources.

Management actions under Alternative A designed to protect wildlife and special status species habitat from the impacts of surface-disturbing and surface-disruptive activities would also protect riparian-wetland resources from the impacts of these activities. For example, applying NSO and CSU restrictions in crucial wildlife habitat would reduce the chance of sediment loading into streams in these areas. Other beneficial impacts would include restoring streams and fisheries habitat on a case-by-case basis, which would result in a direct beneficial impact to riparian-wetland areas. Alternative A limits surface disturbance within ¼ mile of greater sage-grouse leks, but the degree of beneficial impact of this management would depend on the amount of riparian-wetland areas within ¼ mile of leks.

4.4.4.3.2.3. Resource Uses

The projected number of wells and associated surface disturbance under Alternative A is the second highest of the alternatives, resulting in an estimated disturbance over the planning period of approximately 22,475 acres of initial disturbance and approximately 11,706 acres of long-term disturbance from oil and gas development. Of this projected disturbance, 15,405 acres of initial disturbance and approximately 7,995 acres of long-term disturbance would be from federal wells; the remainder of the disturbance would be associated with wells on state and private lands. It is possible that riparian-wetland resources would be adversely impacted in the Beaver Rim area by the 500 foot exclusion zone and lack of watershed monitoring.

While Alternative A prohibits surface-disturbing activities associated with mineral development within 500 feet of riparian-wetlands, these activities, including well pad construction, pipeline development, road construction, and gravel pit development and use, in upland areas could increase sediment loading in streams.

Wells, pipelines, and facilities situated close to riparian-wetland resources would have the potential to contribute produced water of varying quality and hydrocarbons directly to the riparian-wetland areas in the event of a spill, contaminating riparian-wetland soils and resulting in adverse impacts to vegetation and water quality. Alternative A allows the surface discharge of produced water if it meets State of Wyoming water quality standards and is permitted by the state. Produced water from oil and gas development would represent a new water source in a watershed that augments existing water flows.

If produced water from CBNG or conventional gas development was disposed of on the surface, there could be impacts to riparian-wetland vegetation. These impacts could be beneficial due to increased water quantity that could have a beneficial impact on riparian-wetland vegetation or create new riparian-wetland areas. Any new riparian-wetland areas resulting from the discharge

of produced water would depend entirely on continued discharge of produced water. It is possible that the reduction or termination of produced-water flow would adversely impact riparian-wetlands in the long term; that is, riparian-wetlands might not return to predisturbance conditions, which could lead to the introduction of INNS.

The chemistry of produced water would have the potential to change not only the vegetative community, but also soil chemistry. Upon ultimate recovery of the mineral resource and the end of production operations, these newly created riparian-wetlands would no longer have the steady source of water necessary to maintain the riparian-wetland-obligate vegetation species. The loss of hydrology, compounded by modifications to the soil chemistry, would create ecological conditions that are often difficult to reclaim to an upland herbaceous community or the ecological plant community present before the discharge of produced water. Newly created riparian-wetlands would ultimately provide only a temporary potential beneficial impact. Conversely, increasing water quantities into existing riparian-wetland systems could result in an adverse impact through increased erosion, loss of bank stability, downcutting of stream channels on steeper gradients, and increased sedimentation and deposition, leading to widening of the stream channel and braiding on lower gradients. Impacts from the discharge of produced water are most often adverse to riparian-wetland areas due to increased sedimentation, increased salinity, dissolved compounds, and water temperature that could adversely impact riparian-wetland systems, as discussed in more detail in the *Water* section.

Mineral materials disposals have averaged approximately 183 acres of surface disturbance per year over the past 20 years. It is not anticipated that this development would change over the next 20 years, and could be reduced because it includes years of AML work that required extensive aggregate for reclamation. While this amount of use is assumed to be constant for the over the planning period under all alternatives, the 500-foot setback protection for riparian-wetlands is applied to mineral materials disposals.

Alternative A opens 2,240,104 acres to non-oil and gas mineral leasing. The most likely development would be of phosphate resources, but these have surface restrictions on development (see the discussions for the Lander Slope and Red Canyon ACECs in the *Areas of Critical Environmental Concern* section). Solid minerals development is a surface-disturbing activity that results in long-term adverse impacts to riparian-wetlands, because all vegetation and overburden is stripped to access the minerals.

Of the alternatives, Alternative A allows motorized vehicle use on existing and designated roads and trails across the second largest area. There would be more surface disturbance associated with trail creation under Alternative A than under Alternative B, but less than under Alternative C. Motorized vehicle use and the associated increased access it provides to recreationists could adversely impact riparian-wetland resources by introducing INNS near streams or wetlands and increasing erosion and sediment loading in streams. Recreational activities such as camping often occur near riparian-wetland areas and could result in adverse impacts through soil compaction and trash accumulation in or near these areas. More developed recreation areas would increase this potential, although most impacts would be expected to be mitigated by managing recreational use to maintain or improve riparian-wetland habitat conditions along intensively used streams and reservoirs. Recreation management areas such as SRMAs and ERMAs that implement more intensive management of recreation activities in these areas would beneficially impact riparian-wetlands by restricting surface disturbance in these areas. Alternative A designates three SRMAs and 11 distinct ERMAs. These designations would result in a beneficial impact

to riparian-wetland resources by focusing recreation management and could adversely impact riparian-wetland resources if recreation management concentrates usage in riparian-wetlands.

Most of the planning area is open to livestock grazing under Alternative A. Concentrated livestock grazing and over use of forage resources would increase runoff in a watershed due to soil compaction and loss of vegetative cover, with the amount of bare ground being the primary factor. As the weather dries and air temperatures increase, upland vegetation begins to dry and go dormant, but riparian-wetland areas remain lush and green. These lush green areas attract livestock to loiter and congregate. Alternative A prohibits the placement of salt and mineral supplements within ¼ mile of water, wetlands, and riparian areas, drawing livestock away from riparian-wetland areas and decreasing the direct impacts from livestock congregation in riparian-wetland areas compared to Alternative C. Livestock range improvement projects and supplements would distribute livestock over a large area, but would also create concentrated use in local areas. Over the long term, these improvements potentially improve the stability and resiliency of riparian-wetland resources.

4.4.4.3.2.4. Special Designations

Special designations beneficially impact riparian-wetlands when they place additional restrictions on activities that degrade watershed health (e.g., surface-disturbing activities and motorized vehicle use). These restrictions would result in indirect beneficial impacts to riparian-wetland areas because the areas would not be subject to large-scale surface-disturbing activities. Overall, special designations under Alternative A would result in beneficial impacts to approximately 4,340 acres of riparian-wetland resources and 17,629 acres of protections in and adjacent to riparian-wetland resources.

4.4.4.3.3. Alternative B

4.4.4.3.3.1. Program Management

Program management under Alternative B would result in more beneficial impacts to riparian-wetland resources than Alternative A. Alternative B prohibits surface-disturbing activities within 1,320 feet of surface water, riparian-wetland areas, playas, and mapped 100-year floodplains; however, this would not apply in areas with high and moderate potential for oil and gas development. The additional buffer associated with Alternative B would be expected to minimize the introduction of INNS into riparian-wetland areas. In addition, the larger buffer area would provide more herbaceous coverage for filtering sediments and dissipating water energy before water enters riparian-wetland areas, resulting in a net beneficial impact. Alternative B promotes the use of natural management strategies such as timing restrictions, road closures, and livestock management to maintain and meet PFC in riparian-wetland areas. These strategies would result in long-term beneficial impacts to riparian-wetland areas, but would not achieve riparian-wetland improvements as quickly as using fencing, as identified under Alternative A. Alternative B requires a reduction in AUMs to achieve use objectives based on monitoring, which would have a beneficial impact on riparian-wetland resources that currently do not meet Wyoming Standards for Healthy Rangelands. Watershed improvement projects under Alternative B would be anticipated to disturb the fewest acres. While these projects could result in short-term adverse impacts in terms of surface disturbance, they would result in long-term beneficial impacts to these areas.

4.4.4.3.3.2. Resources

The Little Red Creek Complex in Dubois is managed as non-WSA land with wilderness characteristics under Alternative B and would be managed to preserve its wilderness characteristics. This management prohibits surface disturbance or other activities that would adversely impact the area's wilderness characteristics, which would also have a beneficial impact on riparian-wetland areas. Local beneficial impacts in the Little Red Creek Complex would be major, but planning area-wide the beneficial impacts from this management would be minor.

Alternative B's management of forests and woodlands and forest products would be similar to those under Alternative A. However, prohibiting clear-cut of timber harvest under Alternative B should minimize overland flow and sedimentation into riparian-wetland areas, as described for Alternative A. There would be an increased risk of landscape-level fire over Alternative A in the short term, which would result in adverse impacts to riparian-wetlands. On a timeframe beyond the scale of this RMP, this would be expected to be a beneficial impact. Lack of market demand suggests that sales of forest products would result in only a minor beneficial impact to riparian-wetlands.

Management actions designed to protect wildlife and special status species habitat apply greater restrictions on surface-disturbing activity under Alternative B than under the other alternatives, and therefore would result in more beneficial impacts to riparian-wetland resources. The expansion of the greater sage-grouse buffer to 0.6 miles under Alternative B would result in moderate to major beneficial impacts to riparian-wetland areas because there would be no degradation of riparian-wetland resources from surface disturbance. Management actions designed to improve fisheries would also result in more beneficial impacts under Alternative B through the removal and minimization of barriers to fish and more in-stream flow requirements when considering projects. These restoration activities would result in beneficial impacts to riparian-wetland resources.

4.4.4.3.3.3. Resource Uses

Alternative B authorizes the fewest number of oil and gas wells. Under Alternative B, there would be a total of 17,780 acres of short-term disturbance from oil and gas development activities and 9,184 acres of long-term disturbance. Of this projected disturbance, 10,720 acres of initial disturbance and approximately 5,478 acres of long-term disturbance would be from federal wells. The remaining acres of disturbance would be associated with wells on state and private lands.

Compared to alternatives A and C, Alternative B prohibits surface-disturbing activities associated with mineral development within 1,320 feet of surface water, riparian-wetlands, playas, and 100-year floodplains, which would mitigate most direct and indirect impacts associated with mineral development. However, well pad construction, pipeline development, road construction, and gravel pit development and use would still contribute some sediment to local streams. The projected amount of surface disturbance associated with mineral development under Alternative B would be the lowest of all alternatives. Most of the impacts would be temporary during the life of the operation. Upon completion of operations and ultimate recovery of the mineral resource, all the existing disturbance would be reclaimed; however, in the short term, mineral extraction activities would increase the potential for riparian-wetland health degradation. Activities such as well pad and road construction would increase runoff and sediment loading in streams. Alternative B prohibits the surface discharge of produced water on BLM-administered surface, negating the impacts (both beneficial and adverse) described under Alternative A.

The closure of greater sage-grouse Core Area including the Beaver Rim area to oil and gas leasing would beneficially impact riparian-wetland resources in those areas by limiting oil and gas surface disturbance. This would be more beneficial than Alternative A which has a far smaller NSO protective area around leks.

The smaller amount of surface disturbance and larger riparian-wetland buffer proposed under Alternative B compared to the other alternatives would result in the least impact associated with INNS in riparian-wetlands due to surface-disturbing activities outside areas with high to moderate potential for oil and gas. Alternative B allows the Authorized Officer to require livestock flushing for 72 hours before allowing livestock to move onto or within BLM-administered land if it is suspected that livestock are carrying ingested INNS seeds. Discretionary livestock flushing would limit the risk of spreading INNS to riparian-wetland areas from ingested seeds.

Alternative B would involve the least short- and long-term surface disturbance associated with road development for oil and gas and other mineral development in the planning area. Fewer roads in the planning area would decrease opportunities for direct water flow into riparian-wetland areas, thus reducing the potential for the riparian-wetland channel to become incised and reducing the potential for INNS introduction.

Alternative B opens fewer acres to non-oil and gas mineral leasing than Alternative A. Alternative B opens 464,859 acres to leasable minerals. Solid minerals leasing involves extensive surface disturbance, so closing areas to leasing would result in beneficial impacts to riparian-wetlands to the extent that solid mineral potential exists in an area.

Alternative B allows motorized vehicle use on existing and designated roads and trails in the smallest area and would result in the fewest acres of surface disturbance associated with new road and trail creation of any alternative. Limiting motorized vehicle use to a greater percentage of designated roads and trails and a lower percentage of existing roads and trails would limit public access and reduce the associated potential impacts to riparian-wetland areas described under Alternative A. Alternative B closes the largest area to motorized vehicle use compared to other alternatives. Cross-country motorized travel to retrieve big game carcasses and perform other necessary tasks such as repairing range improvement projects is prohibited in areas with limited travel designations, and would limit erosion and sediment loading from trail proliferation near riparian-wetland areas. Alternative B emphasizes developing camping or recreation sites, reducing the potential for adverse impacts associated with concentrated recreational activities. Recreation management areas such as SRMAs and ERMAs that implement more intensive management of recreation activities in these areas would result in beneficial impacts to riparian-wetlands by restricting surface disturbance and placing emphasis on ensuring recreation activities do not conflict with rangeland health objectives in these areas. Alternative B designates seven SRMAs and 12 distinct ERMAs.

Livestock grazing management is more restrictive under Alternative B compared to the other alternatives. A ½-mile buffer prohibiting the placement of salt and mineral supplements near water, wetlands, and riparian areas would provide more protection for these resources from livestock and native ungulate grazing. Alternative B would result in many fewer range improvement projects than other alternatives – perhaps none other than for the benefit of wildlife. While restricting infrastructure would limit disturbance associated with these activities in the short term, riparian-wetland areas would not experience the long-term beneficial impacts of riparian-wetland exclosures. Limiting range improvement project development would necessitate a reduction in stocking rates; however, livestock concentration would continue to impact

riparian-wetland resources. Under Alternative B, use levels would be limited to light (21 to 40 percent) in areas livestock prefer, which would prevent adverse impacts from improper livestock grazing management in riparian-wetland areas.

4.4.4.3.3.4. Special Designations

Compared to other alternatives, Alternative B includes the most acres managed as special designations and places more restrictions on surface-disturbing activities in special designation areas. Restrictions such as NSO, mineral withdrawals, and prohibitions on surface-disturbing activities would limit adverse impacts on approximately 21,782 acres of riparian-wetland resources in these areas. Alternative B manages all NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS, and would result in the most beneficial impacts to riparian-wetland areas. The demand for surface disturbance in these areas is not known.

4.4.4.3.4. Alternative C

4.4.4.3.4.1. Program Management

Alternative C manages riparian-wetland areas to meet PFC using all management tools available, such as range improvement projects, travel management, and new road construction. Alternative C allows the greatest level of surface disturbance, including surface-disturbing activities in floodplains and riparian-wetland areas on a case-by-case basis. By having the fewest prohibitions on surface-disturbing activities, Alternative C would result in the fewest beneficial impacts to riparian-wetlands compared to other alternatives. Like Alternative A, Alternative C would not require an MLP in the Beaver Rim area.

4.4.4.3.4.2. Resources

Alternative C does not manage any areas as non-WSA lands with wilderness characteristics and, consequently, the beneficial impacts from non-WSA lands with wilderness characteristics management would not be realized, the same as Alternative A.

Alternative C manages grasslands and shrublands to maximize forage production which favors a shift in herbaceous community to more of a grass-dominated plant community. This would have no different impacts to riparian-wetland resources than Alternative B, so long as grazing management did not allow overuse of the riparian-wetland areas by livestock preferring the grasses.

Alternative C management of forests and woodlands and forest products would result in more adverse impacts to riparian-wetland areas than Alternative B, and impacts would be similar to those under Alternative A. Under Alternative C, management actions designed to expedite and prioritize replanting would result in beneficial impacts on riparian-wetland areas by minimizing the impacts of long-term overland flow and sedimentation.

Alternative C would result in more adverse impacts associated with INNS than the other alternatives because it includes fewer restrictions on surface-disturbing activities near and in riparian-wetland areas. An increase in INNS would alter the vegetative communities, introducing species that use more water and lack the high level of soil-binding properties of native

riparian-wetland species. Alternative C does not require livestock flushing, which would increase the chance of spreading ingested INNS seed in riparian-wetland areas.

Like Alternative A, Alternative C applies fewer management restrictions on surface-disturbing and surface-disruptive activities designed to protect wildlife and special status species. The absence of or decrease in these restrictions would result in fewer beneficial impacts to riparian-wetland resources compared to Alternative B. To the extent that the 0.6-mile buffer includes many more riparian-wetland areas, adverse impacts under Alternative C would be much more substantial when compared to Alternative B. Management actions designed to improve fisheries would be similar to Alternative A and would therefore result in similar beneficial impacts.

4.4.4.3.4.3. Resource Uses

Alternative C makes the most acres available for mineral development. Adverse impacts to riparian-wetlands from mineral development would be greater under Alternative C than under Alternative B, and would be similar to impacts under Alternative A. During the planning period, Alternative C would result in the short-term disturbance of approximately 22,543 acres and long-term disturbance of 11,743 acres. Of these totals, 15,473 acres of short-term disturbance and 8,032 acres of long-term disturbance would from federal wells; the remainder would be from wells on state and private lands.

However, due to buffers around riparian-wetland areas, almost all of this disturbance would occur in the uplands (the exceptions being roads and pipelines); therefore, direct adverse impacts to riparian-wetland resources would not result. The projected amount of surface disturbance associated with mineral development under Alternative C is the highest of the alternatives. Activities such as well pad and road construction would increase runoff and sediment loading in streams. Alternative C allows disposal of produced water through surface-water discharge. Impacts to riparian-wetland resources from surface-water discharge would be similar to those under Alternative A. The impacts to the riparian-wetland resources under Alternative C would be the same as under Alternative A because both apply only standard riparian-wetland stipulations.

Management of salable minerals under Alternative C would likely disturb the same number of acres as the other alternatives. However, impacts would likely be more adverse to riparian-wetlands than under Alternative B, because Alternative B includes a larger riparian-wetland setback and protects a larger portion of the transition area between riparian-wetland areas and uplands. This difference would probably be minor to moderate because mineral materials disposals avoid riparian-wetland areas under all alternatives.

Most of the planning area is open to livestock grazing under Alternative C. Livestock management strategies will be developed to meet the Wyoming Standards for Healthy Rangelands and PFC. Alternative C uses range improvement project infrastructure to implement livestock grazing management designed to protect riparian-wetland areas. These strategies must incorporate many different facets of livestock management to be successful. Systems that prove to be ineffective will be reevaluated and revised as necessary to achieve rangeland health objectives and riparian-wetlands PFC. In contrast to the other alternatives, Alternative C uses the placement of salt and mineral supplements to maximize use of the forage resource. This management strategy could result in more livestock near riparian-wetland areas, which would result in the greatest potential adverse impact to riparian-wetland areas. Alternative C manages for moderate use (41 to 60 percent) in areas livestock prefer, resulting in more use of riparian-wetland vegetation. Concentrated livestock grazing would adversely impact bank stability, and increase runoff in a

watershed due to soil compaction and loss of vegetative cover. In addition, increased livestock grazing in these areas would result in a greater potential to introduce INNS. Under Alternative C, livestock grazing use levels in preferred areas would result in greater forage removal than under Alternative B. Alternative C would result in the most range improvement projects. In the short term, these projects would result in increased surface disturbance. However, in the long term, these projects would result in the most beneficial impacts to riparian-wetland resources compared to the other alternatives by drawing livestock away from sensitive areas.

Motorized vehicle use under Alternative C would result in the most impacts to riparian-wetland areas of all the alternatives. Impacts to riparian-wetlands associated with motorized vehicle uses would be similar to Alternative A, only to a greater extent. Alternative C designates most BLM-administered land in the planning area as limited to existing roads and trails and closes the fewest acres to motorized vehicle use compared to the other alternatives, which would result in adverse impacts to riparian-wetland resources in more areas. Alternative C minimizes restrictions on OHV use more than other alternatives, which would result in an increase in associated adverse impacts to riparian-wetland areas. Alternative C also allows the use of cross-country motorized travel for casual-use activities, such as well staking, that could damage vegetation and cause erosion in some riparian-wetland areas. If demand warrants, the BLM would develop or upgrade recreation sites and associated amenities, which would result in impacts similar to Alternative A. Alternative C identifies one SRMA and 13 distinct ERMA. Restrictions on surface-disturbing activities in SRMAs and ERMA would help reduce potential impacts (such as erosion and sediment loading in nearby streams) to riparian-wetland areas.

4.4.4.3.4.4. Special Designations

Alternative C places the fewest restrictions on surface-disturbing activity in special designations and designates the fewest of these areas. Alternative C does not designate ACECs, including the NSO stipulations so that the impacts to riparian-wetland areas would be more adverse than Alternative A. In the Beaver Rim area and the proposed expanded Green Mountain ACEC, Alternative C's management is standard stipulations so that the adverse impacts to riparian-wetland resources would be the same and more adverse than Alternative B. Alternative C does not manage any NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS. Special designations under Alternative C include approximately 1,574 acres of riparian-wetland resources. Therefore, special designations under Alternative C would result in the fewest beneficial impacts to riparian-wetland areas.

4.4.4.3.5. Alternative D

4.4.4.3.5.1. Program Management

Program management under Alternative D would result in more beneficial impacts to riparian-wetland resources than those under Alternative A or Alternative C, but fewer than those under Alternative B. Alternative D prohibits surface-disturbing activities within 500 feet of riparian-wetland areas except in DDAs. Alternative D includes fewer restrictions on mineral development in DDAs, but places more restrictions on development throughout the remainder of the planning area. Beneficial impacts to riparian-wetland resources would be a product of restrictions on surface-disturbing activities and the use of Required Design Features (from mineral development, travel management, recreational use, and modifications to livestock grazing strategies).

Alternative D includes smaller buffers around riparian-wetland areas than Alternative B, and therefore would provide less herbaceous cover for water dissipation and sediment capture than Alternative B. The adequacy of riparian-wetland buffers varies greatly based on a number of factors including slope, soil type, adjacent land use, precipitation, and stream size. Given the large number of variables, 500 feet would likely be adequate to account for these variables while providing the necessary attributes for water dissipation, sediment capture, and habitat needs of amphibians and other wildlife species to beneficially impact riparian-wetland resources. It is currently undetermined what level of beneficial impact there would be from the additional buffer under Alternative B.

Alternative D utilizes management strategies such as timing restrictions, road closures, and livestock management to maintain and meet PFC in riparian-wetland areas rather than new infrastructure such as fences and water improvement projects unless the proposed infrastructure is part of a Comprehensive Grazing Strategy. Where natural strategies are employed, Alternative D would result in broader beneficial impacts to riparian-wetland areas than relying on actions such as fencing identified in for alternatives A and C. However, Alternative D uses fencing in many more situations than Alternative B. While fencing would not be practical on a large scale, and could result in conflicts with other resources such as wildlife, when combined with a broader management strategy that includes restricting use levels in riparian-wetland areas, and where site-specific conditions are favorable, fences could be effective in improving riparian-wetland systems.

Alternative D applies an MLP to the Beaver Rim area and applies NSO management to areas south of the Green Mountain ACEC for the protection of soils and viewshed.

4.4.4.3.5.2. Resources

Alternative D manages the Little Red Creek Complex as non-WSA land containing wilderness characteristics to maintain its wilderness characteristics but on a smaller area than under Alternative B. This management would beneficially impact riparian-wetland values in the area by limiting surface disturbance and development. This would be more beneficial than Alternative A or Alternative C, neither of which manage the area with any special protections for wilderness characteristics.

Alternative D manages grasslands and shrublands similar to Alternative A with the same neutral impacts. The difference in goals for vegetation communities inside DDAs are different than outside. However, both will meet Wyoming Standards for Healthy Rangelands, and both would be capable of stabilizing soils, dissipating water-flow energy, and increasing water infiltration rates and water-holding capacity, thereby minimizing sediment movement offsite into riparian-wetland areas. Conversely, degraded grasslands and shrublands that do not meet Standards for Healthy Rangelands would allow for more overland flow during storm events and ultimately more sediment movement into riparian-wetland areas. The desired herbaceous communities would vary from those under alternatives B and C; however, impacts to riparian-wetland resources would not be expected to vary as a result.

Alternative D management of forests and woodlands and forest products allows for clear-cuts, determining the size and location based on resource values and silviculture objectives. There is no standardized buffer for riparian-wetland areas, and the size of clear-cuts is not regulated through this process. Alternative D allows for site-specific analyses to identify the appropriate buffer width and size of clear-cut to minimize impacts to riparian-wetland resources. Identifying

riparian-wetland buffers adequate to filter and capture sediment based on regional topography and clear-cut size would have a greater beneficial impact on riparian-wetland systems than the standardized buffer widths and slope restrictions under alternatives A and C. However, given the lack of local demand for forest products and the limited resources in the planning area, it is anticipated that impacts to riparian-wetland areas due to the harvest of forest products would be minor under all alternatives.

Alternative D applies more restrictions on surface-disturbing activities than alternatives A and C, but not as many as Alternative B for the protection of wildlife, cultural values, and viewsheds. Accordingly, impacts to riparian-wetland resources would be less than those under alternatives A and C, but more than those under Alternative B. Restrictions on surface disturbance due to special status species limit the amount of bare ground allowed, particularly in the greater sage-grouse Core Area, and therefore would reduce overland flow and sedimentation into riparian-wetland areas. Impacts to riparian-wetland areas from surface disposal are more likely under Alternative D than Alternative B, which prohibits surface disturbance. However, whether the impacts would be beneficial or adverse would depend on site-specific factors. Required Design Features would limit adverse impacts associated with many mineral developments. Outside the Core Area, the limitation on surface disturbance around leks is the same under Alternative D as under alternatives A and C, with moderate to major adverse impacts to riparian-wetland areas. The closure of the Dubois area under Alternative D to surface-disturbing activities such as oil and gas development, phosphate leasing, mineral materials disposals, and major ROWs would result in a net beneficial impact to riparian-wetland resources by reducing sedimentation from upland runoff. However, the Dubois area has not historically been an area of intensive mineral development, so the beneficial impact to riparian-wetland resources could be limited.

4.4.4.3.5.3. Resource Uses

Alternative D makes available more acres for mineral development and authorizes more wells than Alternative B, but not as many acres as alternatives A and C. Under Alternative D, there would be a total of approximately 21,533 acres of initial surface disturbance and 11,201 acres of long-term disturbance. Approximately 14,473 acres of initial disturbance and approximately 7,495 acres of long-term disturbance would be associated with federal wells. The remaining acres would be associated with wells on state and private lands. Similarly, Alternative D withdraws fewer acres from locatable mineral entry than Alternative B, but not as many as Alternative A and substantially fewer than Alternative C. Alternative D proposes to withdraw approximately 461,073 acres from locatable mineral entry. Therefore, Alternative D will result in more adverse impacts to riparian-wetland areas due to mineral development than Alternative B. However, Alternative D would result in more beneficial impacts than Alternative A, and substantially more beneficial impacts than Alternative C, based on greater number of acres withdrawn from locatable mineral entry, closed to mineral leasing, or leased with more restrictions including the requirement for Required Design Features. Generally, Alternative D would protect approximately 125,403 fewer acres of riparian-wetland resources than Alternative B. Conversely, Alternative D would protect more acres than alternatives A and C because more riparian-wetland areas would be protected by other management.

Alternative D would result in more initial and long-term surface disturbance associated with linear features such as roads and pipelines than Alternative B, but less than alternatives A and C. Fewer linear disturbances, primarily as a product of restrictions on mineral development, would reduce opportunities for direct water flow into riparian-wetland areas, thus reducing the potential

for stream channel degradation and reducing the potential for INNS introduction which would further benefit from Required Design Features.

Alternative D allows motorized vehicle use on existing roads and designated roads and trails in a larger area than Alternative B, but a smaller area than alternatives A and C. The result would be less surface disturbance and fewer new roads and trails created than under alternatives A and C. Alternative D would impact approximately 125,403 more acres of riparian-wetland resources than Alternative B. Conversely, Alternative D would impact approximately 20,000 fewer acres than alternatives A and C due to motorized vehicle closures. Motorized vehicle use would increase adverse impacts to riparian-wetland areas, as described under Alternative A, and would increase the likelihood of user-created roads.

As identified for the other alternatives, Alternative D opens most of the planning area to livestock grazing. Livestock grazing management would be less restrictive under Alternative D than under Alternative B because Alternative D allows moderate use levels when accompanied with a Comprehensive Grazing Strategy, and would use more infrastructure to improve rangeland health and meet rangeland health objectives. However, in cases where livestock use is continuous or takes place annually during the critical growing season for uplands or during the riparian-wetland hot seasons, light use might be necessary. Use levels would be based on the results of monitoring data. Given that a large number of grazing allotments in the planning area have continuous use during the critical growing season or during the riparian-wetland hot season, it is anticipated that light use would be necessary to achieve Wyoming Standards for Healthy Rangelands and meet PFC for riparian-wetland systems. In addition, Alternative D requires that forage requirements for big-game herd objectives be considered when determining stocking rates for livestock and wild horses. Because riparian-wetland systems are critical to all wildlife species, it is anticipated that Alternative D would require lower stocking rates for livestock than alternatives A and C, but would not reduce stocking rates as much as under Alternative B. Moderate livestock grazing use would result in beneficial impacts to riparian-wetland systems by reducing over use, hummocking, and stream bank shearing. With healthier herbaceous communities, riparian-wetland areas would be capable of filtering and trapping more sediments and contaminants, and would enhance water infiltration. Alternative D restricts the placement of mineral supplements similar to Alternative B, which would result in similar beneficial impacts. While these beneficial impacts would be more pronounced under Alternative D than under Alternative A, and far exceed those under Alternative C, they would not be as widespread or effective as under Alternative B.

Recreation management areas such as SRMAs and ERMAs that implement more intensive management of recreation activities in those areas would beneficially impact riparian-wetland areas by restricting surface disturbance and placing emphasis on ensuring recreation activities do not conflict with rangeland health objectives. In this regard, Alternative D would result in beneficial impacts to riparian-wetland areas similar to Alternative B, fewer impacts than Alternative A, and more impacts than Alternative C, which emphasizes motorized recreation.

4.4.4.3.5.4. Special Designations

The surface disturbance limits associated with the NTMC would beneficially impact riparian-wetland areas.

Alternative D manages 11,185 acres of riparian-wetland resources within special designations. Furthermore, Alternative D limits or closes to surface disturbance 51,055 acres within 500 feet of riparian-wetlands as part of special designation management.

4.4.5. Fish and Wildlife Resources – Fish

For purposes of analysis, the fish species addressed in this section include species endemic to the planning area not addressed in the *Special Status Species – Fish* section. Implementation of certain management actions could impact fish, depending on alternative. This section describes the direct, indirect, short-term, and long-term adverse and beneficial impacts to fish under each alternative.

4.4.5.1. Summary of Impacts

Management actions and activities that result in soil erosion and increased sediment flow into fish-bearing waterbodies typically result in adverse impacts to fish populations and fish habitat. Actions that maintain or increase the amount of vegetative cover along stream banks that helps regulate water temperatures beneficially impact fish habitat and macroinvertebrate production. Direct impacts to fish can occur from vehicles directly entering stream channels on roads and trails. Alternative B provides the greatest protection from surface-disturbing activities and would result in the greatest beneficial impacts to fish resources. Alternative C provides the least amount of protection and would result in the greatest potential for adverse impacts to fish resources. Alternative D is similar in many aspects to Alternative A, but Alternative D increases protection in areas important for other resources, particularly in special designation areas.

4.4.5.2. Methods and Assumptions

Management actions or resource uses that contribute to a decrease in abundance or distribution of native fish species adversely impact fish resources. Conversely, management actions or measures that protect fish species from disturbance improves habitat, or leads to increased populations or viability beneficially impacts fish resources.

For purposes of this analysis, direct impacts are those that cause damage to habitat or habitat quality or results in the loss or decline of fish populations. Direct impacts can result from recreational use, toxicity from chemical contamination, or sedimentation. Indirect impacts include the loss of suitable habitat for future occupation or reproduction. Conversely, management actions that help protect suitable habitat result in indirect beneficial impacts to fish resources.

This analysis considers short-term impacts to fish species as those that contribute to a decline in abundance or distribution within 5 years of an activity or management action, and long-term impacts as those that do not manifest themselves until more than 5 years after an activity or management action.

Methods and assumptions used in this impact analysis include the following:

- Activities that cause substantial disturbance to soils and vegetation can adversely impact water quality and quantity, reducing habitat quality for fish that require clear water, moderated streamflows, and clean substrates. Thus, to the extent that one alternative has less disturbance to soils and vegetation, it will have less potential to adversely impact fish habitat.
- Surface disturbance accelerates runoff and sediment delivery to stream channels, which can alter streamflows and adversely impact most fish species. This analysis focuses on the degree of surface disturbance anticipated to occur under each alternative.
- The potential for sedimentation of streams and rivers can be minimized through the use of BMPs applied as Required Design Features.
- The Wyoming State Engineer's Office regulates activities that affect water quantity.

- The Wyoming DEQ regulates activities that affect water quality.
- The Wyoming Game and Fish Department (WGFD) will continue to manage fish populations and the BLM will continue to manage fish habitats in coordination with the WGFD.
- Disturbance during sensitive periods can adversely impact fish populations.
- Consideration of aquatic habitat conditions when conducting BLM assessments, such as PFC and rangeland health, will help to identify areas for stream habitat management and watershed management efforts.
- The health of fisheries in the planning area is directly related to the overall health and functional capabilities of riparian-wetland resources.
- Activities that affect the ecological condition of the watershed and its vegetative cover will directly or indirectly affect the aquatic environment. The degree of impact attributed to any one disturbance or series of disturbances is influenced by location within the watershed, time and degree of disturbance, existing vegetation, and hydrologic condition.
- As riparian-wetland systems adjust in response to the removal of vegetation or changes in hydrologic conditions, the availability of habitats required to fulfill the life history requirements of fish populations is likely to be affected.

4.4.5.3. Detailed Analysis of Alternatives

Management actions and resource uses that could impact fish species and their habitats include all surface-disturbing activities, grazing (livestock, wild horses, native ungulates), chemical or hydrocarbon contamination of water resources, OHV use, fire management, and activities that deplete water quantity and the addition, timing, and temperature of clean water (CBNG produced water).

Conversely, resource uses prescribed under the alternatives that would adversely impact fish could, in turn, be limited by management actions that protect fish species.

4.4.5.3.1. Impacts Common to All Alternatives

Although the types of impacts to fish species under the alternatives are similar, the intensity of these impacts would vary by alternative. Potential impacts common to all alternatives are described below.

Impacts that result in a decline in abundance or distribution of fish species can be generally divided into two broad categories: (1) impacts associated with a change in water quality and (2) impacts associated with a change in water quantity. For this analysis, water quality is defined in terms of sediment loading, water temperature, and water chemistry. Water quantity is assumed to be average flows under natural conditions.

An integrated management approach is used to achieve fish habitat objectives. In cooperation with partners, strategies will be developed and implemented to prevent the introduction and spread of aquatic invasive species, which can severely impact fish habitat by reducing food sources for fish and outcompeting native fish for limited resources. Movement of water from one drainage to another is avoided to prevent the transfer of aquatic invasive species and disease.

Road crossings of streams are designed and located to minimize impacts to fish movement. Where feasible, existing road crossings identified as restricting fish passage will be modified. During wildfire suppression activities, fire retardant would not be aerially applied within 300 feet of waterbodies to prevent chemicals from reaching waters. Due to the difficulty in judging

distance from the air and the possibility of chemical drift, some fire retardant could get into the water. The potential for adverse impacts would depend on the amounts and types of chemicals to which fish are exposed.

Wild horses can indirectly impact fish habitats by contributing to soil erosion through trampling of stream banks and adjacent trails. However, wild horse numbers do not change among the alternatives, thus there would be no differences in anticipated impacts.

Impacts to fish species and habitat from air quality, geologic, and cave and karst resource management would not vary by alternative. No lands identified for disposal contain fish habitat; therefore impacts would not be expected under any alternatives.

4.4.5.3.2. Alternative A

4.4.5.3.2.1. Program Management

Under Alternative A, the Lander Field Office can, on a case-by-case basis, apply seasonal restrictions on surface-disturbing activities that would adversely impact fish spawning and manage human-caused barriers to fish passage. Actions that would result in the removal or depletion of water from fish-bearing streams can be authorized. Current management prohibits surface-disturbing activities within 500 feet of a riparian-wetland area, and BMPs that limit offsite soil erosion or runoff are typically applied to all surface-disturbing activities.

4.4.5.3.2.2. Resources

Soil disturbance and erosion can adversely impact water quality. Fugitive dust from wind erosion of surfaces exposed by road building, oil and gas development, fire and fuels management, mining, and concentrated livestock grazing can enter surface water directly or be washed into it during precipitation events. Once in the water, this dust adds to the sediment load in the stream and can impact fish populations, both directly and indirectly. Increased sediment can directly suffocate fish eggs or impair the overall production of macroinvertebrates upon which mature fish depend. Other pollutants suspended in the air that alter the chemistry of precipitation (i.e., acid rain) can result in similar impacts to fish habitat. Soil erosion from surface-disturbing activities leads to sediment loading as described above and can also change water chemistry by leaching minerals into the water that have been exposed by mining or other surface disturbances. Under Alternative A, cumulative short-term surface disturbance in the planning area is expected to be approximately 52,591 acres, and cumulative long-term surface disturbance would be 12,439 acres during the planning period.

Alternative A does not specifically manage lands with wilderness characteristics. Small drainages are present on these lands, but they are not known to support fish.

Alternative A forest management actions could impact fish species through the generation of additional sediment, as described above, and through surface disturbance associated with the construction of access roads and harvesting techniques. A variety of silviculture practices are used to meet forest health objectives and the demand for forest products. Alternative A prohibits clear-cuts on slopes greater than 45 percent or larger than 25 acres, reducing the potential for large amounts of sediment being generated. Actions on steep slopes that result in large areas devoid of vegetation (i.e., clear-cuts) would have the greatest potential for accelerated soil erosion that could add sediment to fish-bearing waterbodies.

Wildfire, and to some degree, prescribed burning, can adversely and beneficially impact fish, depending on fire intensity. In situations where the fire is intense, temperatures can become high enough to destroy both plant communities and the soil fertility upon which they depend. This could produce a large area of little or no vegetative cover, resulting in increased sediment entering aquatic systems. However, low-intensity fuels reduction burning could beneficially impact fish by preventing more intense, landscape-level wildfires while retaining enough plant litter to slow runoff and recycle nutrients to encourage vigorous growth of groundcover. Fire that reduces plants that require a lot of water, such as conifers and sagebrush, could increase the amount of water from rain and snow events reaching streams, resulting in beneficial impacts to fish populations. Approximately 800 acres of treatments to reduce fuels and manage vegetation are expected to occur each year under Alternative A.

Management actions that alter vegetative communities, whether they be forest/woodland, grassland/shrubland, or riparian-wetland habitats, can indirectly impact fish species in various ways. Actions that disturb vegetation can alter plant composition and structure within that habitat. Loss or alteration of vegetative cover through surface disturbance, wildfire, or vegetative treatment can change the hydrologic regime of the watershed in which it occurs. With less vegetation to retain water from precipitation and snowmelt, more surface erosion occurs and streams tend toward brief high-water events that further erode their banks and add to sedimentation of the waterbody. As water is quickly released into streams, less is held in reserve to maintain streamflow during drier periods. Therefore, conversion of habitat results in adverse impacts both to quality and quantity of water for fish. Loss of shade cover in riparian-wetland habitats also results in increases in water temperature that can make the adjacent stream unusable for species such as trout that require colder water. Management actions that maintain healthy rangelands in their natural condition generally would beneficially impact fish and their habitats.

The introduction or proliferation of INNS might result in little direct impact to fish species. However, because INNS are typically able to outcompete native plants and establish themselves in habitat that might otherwise be suitable for colonization by native plant species, they can prevent the growth of plants better able to retain soil during precipitation events. For example, cheatgrass is a shallow-rooted INNS that establishes itself quickly in disturbed areas. As a vegetative cover for holding soil and preventing erosion, it is far less desirable than a more deeply rooted native grass species. Moreover, the presence of INNS can require the use of herbicides that could alter water quality or kill fish outright if used near riparian-wetland areas.

Over-utilization of vegetation by certain wildlife species, primarily big game, could adversely impact fish by contributing to the loss of streamside vegetation necessary to shade water and maintain water temperatures. Most game fish require colder water temperatures, and heavy browsing by moose, elk, and deer of willows and other woody species could lead to reduced shading and increased water temperatures. Over-utilization is often a product of competition between big game species and domestic livestock or wild horses in localized areas.

Alternative A protections for cultural, paleontological, and visual resources from disturbance could also have a beneficial impact on fish and fish habitats by preventing surface disturbance that could contribute to soil erosion and sedimentation.

4.4.5.3.2.3. Resource Uses

Exploration for, or development of, locatable and leasable minerals and/or mineral material disposals could adversely impact fish and fish habitats by creating surface disturbance, thereby

contributing to soil erosion and the accompanying sedimentation. Such development could also introduce contaminants such as hydrocarbons and other chemicals into fish habitats. In addition, oil and gas development produces water as a byproduct (called produced water) that is often disposed of on the surface and can flow into fish habitats, changing both the temperature and chemistry of the water and further contributing to erosion potential. Under Alternative A, most of the planning area is open to mineral development, and actions associated with these activities are expected to produce approximately 21,234 acres of short-term disturbance and 9,895 acres of long-term disturbance on BLM-administered lands during the planning period.

Impacts to fish and their habitats from wind-energy development and ROW/utility corridors would be similar but would vary among alternatives by the acres open to development. All these uses involve some level of surface disturbance that could contribute to soil erosion and subsequent sedimentation. Alternative A opens 2,113,512 acres to wind-energy development, although it is expected that development would only occur in areas with high potential for wind-energy and not across the entire planning area. Alternative A opens 2,188,294 acres (91 percent of the planning area) to ROWs, excludes ROWs on 205,916 acres, and avoids ROWs on 66,099 acres. Alternative A designates one ROW/utility corridor, the 79-216 national energy corridor, but does not designate a specific number of acres for this corridor. Alternative A considers oil and gas leases in the area to the east of Boysen Reservoir on a case-by-case basis which has the potential of adversely impacting fish and aquatic resources.

Alternative A allows livestock grazing on 2,324,934 acres (97 percent of the planning area) and manages forage utilization levels and the construction of range improvements such as fences and water developments on a case-by-case basis. Livestock grazing can adversely impact fish habitats, both directly and indirectly. If forage utilization levels are not established and livestock are allowed to concentrate, such as would occur around watering locations, mineral supplement sites, and along fences, soil-holding vegetation could be lost to improper livestock grazing management or excessive trampling. In turn, this could compact and erode soil, making the site prone to soil loss, either by wind or water, and contribute to additional sedimentation of fish-bearing waterbodies. Heavy grazing use in riparian-wetland areas produces direct erosion into watercourses, removes stream bank vegetation, and contributes to the desiccation of these areas and the loss of their water-holding capacity. The loss of capacity to retain water in riparian-wetlands would contribute to lower water levels in downstream fish habitats during the drier seasons, which would result in direct adverse impacts to fish and impacts to the macroinvertebrates and aquatic insects on which fish feed.

Recreation and recreation management could result in a variety of impacts, both adverse and beneficial, to fish and their habitats. Alternative A designates a total of 2,394,210 acres SRMAs or ERMAs, with limited restrictions on mineral and realty actions. Restrictions on such activities would result in indirect beneficial impacts to fish habitat by reducing the potential for surface disturbance and sedimentation.

Recreational fishing can reduce populations of certain game fish species over a prolonged period, but this would not be likely to result in the loss or modification of habitat. Other forms of recreation can adversely impact fish and fish habitats similar to impacts from industrial uses. Unauthorized establishment of trails, whether by hikers or OHV users, can also result in soil compaction, erosion, and the generation of fugitive dust with the associated problems of sedimentation.

Travel management is of particular importance to fish habitat because roads, and to a lesser degree, trails are often major sources of runoff and sediment. Roads where vehicles must enter the water to cross the stream would result in more adverse impacts than roads that have culverts and bridges installed at stream crossings. Alternative A closes 5,923 acres (0.25 percent of the planning area) to motorized travel, which would beneficially impact fish resources in those areas. In addition, Alternative A designates open roads and trails on 163,075 acres (7 percent of the planning area), which would reduce the number of roads and the potential for soil erosion and sediment entering fish-bearing waterbodies on these lands. Alternative A limits motorized travel to existing roads and trails on approximately 93 percent of the planning area, which increases the potential for additional sediment to enter fish habitats.

4.4.5.3.2.4. Special Designations

Lands designated for special management in the planning area beneficially impact fish and fish habitats because they have more restrictions on activities that can generate surface disturbance and adversely impact water quality and stream health. Alternative A designates 119,622 acres (5 percent of the planning area) into nine ACECs that also support fish resources, even though fish habitat is not the focus for the ACEC designation. For example, management prescriptions to protect wildlife resources in the Lander Slope and Green Mountain ACECs improve habitat quality for tributaries of the Popo Agie and Sweetwater rivers, respectively.

There are 55,338 acres within eight WSAs in the planning area; the Sweetwater Canyon WSA is the only one containing fish resources. The segments eligible for inclusion in the NWSRS support fish populations, and the Sweetwater River is one of the largest and most productive public land fisheries in the planning area. Alternative A does not specifically manage these eligible waterways, but the alternative does manage in accordance with prescriptions for the Lander Slope, Red Canyon, South Pass, and the NHTs ACECs and the Sweetwater Canyon WSA for all but the Rock Creek and Warm Springs Creek segments.

4.4.5.3.3. Alternative B

4.4.5.3.3.1. Program Management

Compared to alternatives A and C, Alternative B is generally more protective of resources and is more restrictive to resource uses.

Alternative B applies seasonal restrictions to surface-disturbing activities within floodplains or within 1,000 feet (whichever is greater) of fish-bearing streams to protect game and nongame fish species during spawning, egg incubation, and fry stages. Dates vary by fish species, and mineral and realty actions would be somewhat restricted from surface-disturbing actions. Seasonal restrictions would prevent the loss of eggs and young, and beneficially impact local fish populations.

Alternative B removes human-caused barriers to fish passage where feasible to facilitate genetic diversity and population stability. Barriers are placed if needed to conserve populations from hybridization or competition, and fish passages could be built if necessary. These actions would benefit local fish populations whether on or off of BLM-administered lands.

Alternative B prohibits new actions that would result in removal or depletion of water from fish-bearing streams, and removes existing projects that affect the sustainability of fish populations. The availability of water is essential to maintaining fish populations.

4.4.5.3.3.2. Resources

The nature of impacts to fish species and their habitats related to soil erosion are the same under Alternative B as Alternative A, except that the intensity of impacts would differ. Under Alternative B, cumulative short-term surface disturbance for the planning period is expected to be approximately 74,689 acres, or approximately 30 percent more acres than Alternative A. The increase in short-term disturbance primarily derives from an increase in vegetation treatments, including forest products, which can result in both adverse and beneficial impacts to fish habitats. Anticipated cumulative long-term surface disturbance is 7,502 acres, or approximately 40 percent fewer acres than Alternative A.

Alternative B closes 5,490 acres of lands with wilderness characteristics to motorized and mechanized travel. This action would beneficially impact fish and fish habitats downstream from those lands through reduced potential for increased sedimentation from surface disturbance.

Forest management under Alternative B prohibits the use of harvest techniques that create clear-cuts. Alternative B would result in greater beneficial impacts to fish and fish habitats than Alternative A, because soil erosion, vegetative cover loss, and road construction associated with clear-cuts would not occur. Soil erosion would likely occur from the use of other silviculture practices, but soil loss and potential sedimentation in nearby waterbodies would be reduced by eliminating clear-cuts.

Adverse and beneficial impacts to fish habitats from wildfire and fuels treatments under Alternative B would be the same as under Alternative A. However, 2,500 acres per year are expected to be treated under Alternative B, more than triple the projected 800 acres per year under Alternative A, increasing the potential for beneficial and adverse impacts over a larger area.

Under Alternative B, management actions that disturb vegetation communities could indirectly impact fish species as described for Alternative A. The mechanism of impact is the same under each alternative; however, differences in impact intensity would vary, primarily with the resource uses that alter these habitat types. See the vegetation subsections of the *Biological Resources* section for a more detailed discussion of vegetation management.

Alternative B INNS treatment would be the same as under Alternative A, except that Alternative B includes greater efforts to identify and prioritize areas with substantial infestations and treat those areas with a more integrated approach. This includes such techniques as livestock flushing and stricter controls on authorized activities that can spread INNS from one area to another. Under this alternative, annual brome species would be treated throughout the planning area instead of in specific areas, as would be the case under Alternative A. To the extent that these additional efforts would likely reduce impacts to fish habitats by providing better protection from sedimentation, impacts would be beneficial. However, a more aggressive approach to INNS control could also increase the potential for contamination of fish-bearing streams through herbicide application.

Wildlife over-utilization of woody species would likely occur in situations where there is increased competition between big game and livestock for forage. Under Alternative B, forage allocations for livestock and wild horses are adjusted as necessary to meet the forage requirements for big game, alleviating the need for forage competition. Such an adjustment should reduce the

potential for adverse impacts to fish habitats from reduced stream bank shading that increases water temperatures.

Under Alternative B, protection for cultural, paleontological, and visual resources is expanded considerably to include entire landscapes or viewsheds around important resources. These expanded protections close lands to most surface-disturbing activities and would beneficially impact fish habitats by reducing the potential for soil erosion and attendant sedimentation into streams in those areas.

4.4.5.3.3. Resource Uses

Alternative B places more constraints on the exploration and development of locatable and leasable minerals and mineral material disposals for the purpose of protecting other resource values, including fish-bearing habitats. Alternative B opens substantially fewer acres in the planning area to mineral development than Alternative A, which would reduce the potential for impacts from surface disturbance and stream sedimentation associated with mineral activities. More acres of protection and fewer acres of potential surface disturbance would beneficially impact fish and their habitats. During the planning period, Alternative B is expected to produce approximately 16,549 acres of short-term disturbance on BLM-administered lands and 7,378 acres of long-term disturbance from mineral development. Alternative B closes the area to the east of Boysen Reservoir to oil and gas leasing which is more beneficial to fish and aquatic resources than Alternative A.

Alternative B opens 41,372 acres (approximately 2 percent of the planning area) to wind-energy development in the planning area compared to the 2,113,512 acres open under Alternative A. Alternative B opens less land to ROWs (159,962 acres) and manages more land as ROW exclusion areas (1,919,029 acres) or ROW avoidance areas (315,962 acres) than Alternative A. Alternative B designates utility corridors on 15,364 acres to concentrate surface disturbance, although designating corridors would not necessarily preclude ROW development in other areas. Alternative B closes more lands to wind-energy and ROW development; therefore, this alternative would decrease the potential for soil erosion and sediment generated from surface-disturbing activities to enter streams and adversely impact fish and fish habitat. Alternative B would result in greater beneficial impacts to fish and fish habitat from management of wind-energy and ROW development than Alternative A.

Although Alternative B allows for nearly the same number of acres open to livestock grazing (2,312,095 acres, or 97 percent of the planning area), it requires light utilization (21 to 40 percent) while Alternative A can allow for higher utilization on a case-by-case basis. In addition, Alternative B closes Sweetwater Canyon to livestock grazing to protect a premier trout fishery and recreational values. Alternative B also prescribes livestock grazing management primarily without the use of infrastructure or range improvements such as fences and water developments. These provisions under Alternative B tend to decrease the likelihood of the adverse impacts described for Alternative A and would result in indirect beneficial impacts to fish and their habitats by reducing the potential for sedimentation, loss of streamside vegetation, and loss of water-holding capacity.

Alternative B expands the recreation program to include numerous new recreation management areas to facilitate various types of recreation use. Alternative B decreases the acreage of the Lander ERMA by 536,770 acres to provide more specific management in SRMAs and other ERMAs. Alternative B applies management prescriptions to SRMAs and distinct ERMAs to enhance their recreation values, including restricting surface uses from mineral and realty actions

in these areas which would benefit fish resources. Alternative B would result in greater beneficial impacts to fish habitats from these increased protections than Alternative A.

Alternative B increases the number of acres closed to motorized travel over Alternative A to 71,761 acres (3 percent of the planning area). Alternative B designates open roads and trails on 193,704 acres (8 percent of the planning area), which is an increase of 1 percent over Alternative A. Alternative B would result in greater beneficial impacts to fish and fish habitats than Alternative A by reducing the potential for soil loss and sedimentation from roads and trails.

4.4.5.3.3.4. Special Designations

In addition to the protections afforded to fish and their habitats by special management designations described under Alternative A, Alternative B creates several new ACECs and expands protections for many of the existing ACECs. Alternative B designates 1,492,990 acres (62 percent of the planning area) as ACECs, approximately 11 times more acres than Alternative A. Increased mineral, realty, and travel management restrictions would beneficially impact fish populations and habitats within or downstream of these special management areas by protecting them from adverse impacts associated with surface disturbance.

Alternative B closes all eight WSAs to motorized and mechanized travel, which would reduce soil erosion from roads and trails and beneficially impact fish resources in these areas. The premier trout fishery in the Sweetwater River that flows throughout the Sweetwater River WSA and the drainages of the Popo Agie River would particularly benefit from this management. All nine eligible segments are recommended as suitable for inclusion in the NWSRS and managed to maintain or enhance the waterways, including fish habitat. Alternative B would result in a greater beneficial impact than Alternative A, because Alternative B subjects more acres to restrictive prescriptions that reduce the surface disturbance that can adversely impact fish and their habitats.

4.4.5.3.4. Alternative C

4.4.5.3.4.1. Program Management

Compared to alternatives A and B, Alternative C is generally less protective of resources and less restrictive to resource uses.

Under Alternative C, seasonal restrictions to protect fish during reproductive periods would be applied on a case-by-case basis, as would removing human-caused barriers to fish passage and allowing actions that remove or deplete water from fish-bearing streams. Alternative C would result in the same impacts as Alternative A, and fewer beneficial impacts to fish and fish habitat than Alternative B, which applies these management actions in all cases.

4.4.5.3.4.2. Resources

Impacts to fish and fish habitat from fugitive dust, soil erosion or compaction, and excess runoff or sedimentation of water resources would be likely to increase under Alternative C. Approximately 160,065 acres of cumulative short-term surface disturbance is expected to occur in the planning area during the planning period, an approximate 200 percent increase over Alternative A and 115 percent increase over Alternative B. Cumulative long-term surface disturbance is expected to be 60,631 acres, or more than 400 percent more acres than Alternative A and more than 700 percent

more acres than Alternative B. Alternative C would result in more adverse impacts from soil erosion and additional sediment into waterbodies that support fish than alternatives A and B.

Alternative C does not apply special management to the lands with wilderness characteristics. Impacts to fish and fish habitats downstream of these lands would be the same under Alternative C as Alternative A, and less beneficial than impacts under Alternative B, which closes the area to motorized and mechanized travel.

Forest management under Alternative C allows the use of clear-cuts and does not restrict the number of acres of the cut. In addition, clear-cuts using a cable system or helicopter would be allowed on slopes in excess of 45 percent. Ground-based logging would be limited to areas with 45 percent slopes or less. Logging on steep slopes would increase the potential for soil loss that could end up in waterways. Alternative C would result in a greater risk for adverse impacts from soil loss and additional sediment entering fish-bearing waterbodies than alternatives A and B.

Adverse and beneficial impacts to fish habitats from wildfire and fuels treatments under Alternative C would be the same as Alternative A. Alternative C is expected to result in 800 treatment acres per year, the same as Alternative A and 1,700 fewer acres than Alternative B.

Similar to the other alternatives, Alternative C management actions that disturb vegetation communities could indirectly impact fish resources. Impacts from vegetation management under Alternative C would be the same as Alternative A. The differences in intensity of impacts vary primarily with resource uses that alter these habitat types. See the vegetation subsections of the *Biological Resources* section for a more detailed discussion of vegetation management.

Alternative C treatment of INNS is the same as Alternative A. This approach would be expected to produce the same level of beneficial impacts to fish and their habitats as Alternative A, but would result in fewer beneficial impacts than Alternative B, which utilizes a more aggressive approach to treatments.

Over-utilization by wildlife, as described under Alternative A, is most likely to occur in situations where there is increased competition between big game and livestock for forage. Alternative C gives priority to livestock in allocation of forage. In times when forage is in short supply (i.e., drought years), competition between big game and livestock/wild horses for the remaining forage would likely increase, increasing the risk of over-utilization of streamside vegetation. Compared to alternatives A and B, Alternative C increases the potential for adverse impacts to fish habitats from forage management.

Protections for cultural, paleontological, and visual resources are the same as or less restrictive than Alternative A, and much less restrictive than Alternative B. Protecting cultural, paleontological, and visual resources from surface-disturbing activities also protects fish habitats; because Alternative C affords fewer protections for these resources, it would result in a greater risk of adverse impacts to fish resources than alternatives A and B.

4.4.5.3.4.3. Resource Uses

Alternative C eases some of the constraints under alternatives A and B to protect other resource values, including fish and their habitats, to promote exploration and development of locatable and leasable minerals and mineral material disposals. Withdrawals from locatable mineral exploration would not be pursued and existing withdrawals, except the one for desert yellowhead critical habitat, are allowed to expire. Fewer restrictions on oil and gas leasing and fewer restrictions on

minerals exploration and development could increase the likelihood of more surface disturbance and increase the likelihood of adverse impacts to fish and their habitats. Under Alternative C, substantially more acres in the planning area are open to mineral development than under Alternative B and slightly more acres are open than under Alternative A. Actions associated with these activities on BLM-administered lands are expected to produce approximately 21,302 acres of short-term disturbance and 9,932 acres of long-term disturbance during the planning period. Short-term and long-term disturbance acres would be approximately the same under Alternative C as Alternative A and more than Alternative B (32 percent and 46 percent more acres, respectively). Alternative C would result in more adverse impacts to fish and fish habitats from minerals management than alternatives A and B. Alternative C, like Alternative A, has the same potential adverse impacts to fish and aquatic resources in the area east of Boysen Reservoir from oil and gas leasing on a case-by-case basis.

Alternative C opens 2,284,235 acres (95 percent of the planning area) to wind-energy development, approximately 7 percent more acres than Alternative A and 98 percent more acres than Alternative B. Similarly, Alternative C opens more lands to ROWs (94 percent of the planning area) and manages less acres as ROW exclusion or avoidance areas (147,053 and 11,714 acres, respectively) than alternatives A and B. Alternative C designates utility corridors on 660,908 acres. Alternative C opens more lands to wind-energy and ROW development than alternatives A and B, and would result in a greater risk of surface-disturbing activities that can cause soil erosion and stream sedimentation. Alternative C would result in more adverse impacts to fish and fish habitat from wind-energy and ROW development than alternatives A and B.

Alternative C allows for livestock grazing on approximately the same number of acres as Alternative A. It also allows moderate (41 to 60 percent) utilization, while Alternative A establishes utilization levels on a case-by-case basis and Alternative B manages for light utilization (21 to 40 percent). Alternative C also prescribes a more intensive use of infrastructure or range improvements to manage livestock. The increased use of range improvement projects to manage livestock can increase the amount of soil disturbance and bare ground from fence and water development construction and associated trailing and trampling. The provisions in Alternative C would tend to increase the likelihood of adverse impacts (e.g., trampling, over-utilization, soil disturbance, sedimentation), increasing the likelihood of adverse impacts to fish and fish habitats.

Potential adverse impacts to fish from recreation management would increase under Alternative C. Although the number of total acres in specific (not Lander General) SRMAs or ERMAs is greater (332,055 acres) under Alternative C, proposed restrictions on motorized travel that could benefit fish habitat are essentially the same or less than those under alternatives A and B.

Travel management under Alternative C is similar to Alternative A. Alternative C closes 451 fewer acres to motorized travel than Alternative A and 66,289 fewer acres than Alternative B. Alternative C designates open roads and trails on 50,776 acres (2 percent of the planning area), a decrease of 1 percent from Alternative A and a decrease of 6 percent from Alternative B. Alternative C would result in a greater potential for adverse impacts to fish and fish habitat than alternatives A and B by increasing the potential for soil loss and subsequent sedimentation.

4.4.5.3.4.4. Special Designations

As opposed to the protections afforded fish and fish habitats by special management designations under the other alternatives, Alternative C does not designate any ACECs. Previously designated

ACECs are open to mineral and realty surface-disturbing actions that can accelerate soil loss and add sediment to fish-bearing streams, either within or downstream of the area.

Alternative C does not close WSAs to motorized and mechanized travel except in the Dubois Badlands WSA. The nine eligible segments are not recommended as suitable for inclusion into the NWSRS and are managed with other resource and resource use prescriptions for the area. Alternative C includes substantially fewer protections from surface disturbance that would increase the likelihood of adverse impacts to fish and their habitats within or downstream of these special management areas. Beneficial impacts to fish habitats as described for alternatives A and B, would not occur under Alternative C.

4.4.5.3.5. Alternative D

4.4.5.3.5.1. Program Management

Alternative D applies timing limitations to all surface-disturbing activities that would adversely impact spawning, egg production, and fry areas in fish-bearing streams. On a case-by-case basis, Alternative D allows actions that result in the removal or depletion of water from fish-bearing streams, unless the action would result in the loss of a sustainable fish population. In addition, human-caused barriers to fish passage are removed on a case-by-case basis. In areas where conservation populations are threatened by hybridization or competition with other species, fish passages are built and barriers are removed or installed to mitigate these threats. Alternative D would result in slightly fewer adverse impacts to fish and fish habitats than alternatives A and C, and fewer beneficial impacts than Alternative B.

4.4.5.3.5.2. Resources

Alternative D would result in fewer impacts to fish and their habitat from fugitive dust, soil erosion or compaction, and excess runoff or sedimentation of water resources than alternatives A and C, and more than Alternative B. Under Alternative D, cumulative short-term soil disturbance in the planning area during the planning period is expected to be approximately 53,894 acres, approximately the same as Alternative A, 28 percent less than Alternative B, and more than 66 percent less than Alternative C. Cumulative long-term surface disturbance is expected to be approximately 11,453 acres, approximately the same as Alternative A, 35 percent more than Alternative B, and more than 400 percent less than Alternative C.

Alternative D closes lands with wilderness characteristics in the Little Red Creek Complex to motorized travel and limits mechanized travel to designated routes. Beneficial impacts to downstream fish habitats from reducing the potential for soil erosion would be slightly less than under Alternative B, and greater than under alternatives A and C.

Forest management under Alternative D allows clear-cuts and other harvest techniques in consideration of other resource values and silvicultural objectives. Similar to alternatives A and C, Alternative D could increase the potential for soil erosion and sedimentation of fish-bearing waterbodies from vegetative cover loss related to clear-cuts, cutting on steep slopes, and associated road building. Alternative D would result in more impacts to fish and fish habitats from forest management than Alternative B.

Alternative D includes more acres of wildfire and fuels treatments than alternatives A and C, but less than Alternative B. Adverse and beneficial impacts to fish and fish habitats under Alternative D from fuel and fire management would be the same Alternative A.

Impacts from management actions under Alternative D that disturb vegetation communities and subsequently adversely impact fish habitat would be similar to those under alternatives A and C, and less beneficial than those under Alternative B. See the vegetation subsections of the *Biological Resources* section for a more detailed discussion of vegetation management.

Alternative D treatment of INNS uses the same approach to controlling the spread of weeds as Alternative B. Alternative D management is directed at livestock flushing and the adjustment of terms for any authorized activity believed to contribute to the spread of INNS. Alternatives D and B would result in greater beneficial impacts to fish and fish habitat than alternatives A and C, by taking management actions that can reduce the establishment of INNS and reduce the need for INNS treatment actions.

Alternative D considers forage requirements for big game when making forage allocations in the planning area. This alternative also extends mule deer seasonal restrictions in crucial winter habitat to winter habitat. These actions would reduce competition and the potential for over-utilization of streamside vegetation that can lead to increased water temperatures that adversely impact fish. Alternative D would result in greater beneficial impacts to fish and fish habitats from forage management than alternatives A and C, and a less beneficial impact than Alternative B.

Management prescriptions to benefit wildlife, viewsheds, and cultural resources that limit surface disturbance in the Hudson-Atlantic City area, primarily related to mineral and ROW development, would also benefit fish resources in the area.

Protections for cultural, paleontological, and visual resources are considerably more restrictive under Alternative D than under Alternative A, much more restrictive than Alternative C, and less restrictive than Alternative B. Fish habitats in areas of cultural, paleontological, and visual resources would be protected from the impacts of soil erosion and sedimentation of waterbodies from surface-disturbing activities.

4.4.5.3.5.3. Resource Uses

Compared to management actions for resource uses under the other alternatives, Alternative D is very similar to Alternative A, less restrictive than Alternative B, and more restrictive than Alternative C.

Compared to alternatives A and C, Alternative D opens fewer acres to mineral exploration and development activities that can cause soil disturbance and increase the potential for sediment to enter fish-bearing waterbodies. Closing lands to surface-disturbing activities reduces the risk of adverse impacts from soil loss and movement to fish and their habitats. Actions associated with these activities on BLM-administered lands during the planning period are expected to produce approximately 20,302 acres of short-term disturbance, 4 percent less than Alternative A, 23 percent more than Alternative B, and 5 percent less than Alternative C. Long-term disturbance is estimated at 9,395 acres, 5 percent less than Alternative A, 27 percent more than Alternative B, and 6 percent less than Alternative C. Alternative D would result in greater beneficial impacts to fish than alternatives A and C, and more adverse impacts than Alternative B, which opens the fewest acres to mineral-related surface-disturbing activities. Like Alternative B, closing the area

to the east of Boysen Reservoir to oil and gas leasing would beneficially impact fish and aquatic resources in this area. Required Design Features under Alternative D would provide indirect benefits to fish by limiting the size and location of disturbances and reduce adverse impacts associated with under-designed impoundment ponds. Alternative D allows surface disturbance of produced water which can be either beneficial or adverse, depending upon site-specific factors.

Alternative D opens 224,289 acres (9 percent of the planning area) to wind-energy development, which is substantially fewer acres than alternatives A and C, and more acres than Alternative B. Similarly, 19 percent of the planning area is open to ROWs and more acres are managed as ROW exclusion or avoidance areas (1,215,599 acres and 954,322 acres, respectively) than under alternatives A and C. Alternative D designates utility corridors on 103,646 acres, approximately 25 percent fewer acres than Alternative C and approximately 2 percent more acres than Alternative B. Alternative D would result in less risk of soil erosion and stream sedimentation from wind-energy and ROW development than alternatives A and C, and more risk than Alternative B.

Alternative D's designated corridor management is more similar to Alternative C than to alternatives A or B. Therefore, its impacts (both beneficial and adverse) would be similar to Alternative C but less. Designated corridors can focus surface disturbance in areas to minimize resource damage from surface disturbance. However, more disturbance may be needed to reach the corridor and the existence of corridors may make the disturbance larger in one place and thus with greater potential to adversely impact resources.

Alternative D's ROW avoidance and exclusion areas will beneficially impact fish habitat but less so than Alternative B which has more restrictions on ROW development. All alternatives seek to co-locate new ROWs in existing disturbance.

Alternative D allows livestock grazing on 2,317,368 acres (97 percent of the planning area), 7,566 fewer acres than alternatives A and C, and 5,273 more acres than Alternative B. Alternative D opens Sweetwater Canyon to grazing, which could result in more adverse impacts to the trout fishery from the reduction of bank vegetation and increased sedimentation than Alternative B, which closes the area to livestock grazing. Alternative D closes additional lands in the East Fork ACEC to grazing, which would beneficially impact fish habitat in the area by eliminating the impacts of soil loss from grazing activities. Alternative D would allow the use of range improvements and higher utilization levels when combined with a Comprehensive Grazing Strategy. The potential for adverse impacts to fish and fish habitats under Alternative D is the same as under alternatives A and C, but adverse impacts could be offset by better vegetation management resulting from the grazing strategy. Alternative D would result in more beneficial impacts to fish and fish habitat from grazing management than alternatives A and C, but more adverse impacts than Alternative B, which requires lighter utilization levels and uses fewer range improvements, thus generating less surface disturbance, to manage livestock.

Impacts to fish and fish habitats from recreation management are the same as Alternative B, except that SRMAs and distinct ERMAs constitute 589,638 fewer acres under Alternative D than under Alternative B. Mineral, realty, and travel management in these areas is more constrained under Alternative D than under alternatives A and C, which would have a beneficial impact on fish resources by reducing soil erosion/loss from these actions. Alternative D would result in greater beneficial impacts to fish resources than alternatives A and C, and fewer beneficial impacts than Alternative B.

Travel management under Alternative D closes 26,357 acres (1 percent of the planning area) to motorized travel, an increase over alternatives A and C of 20,434 and 20,885 acres respectively,

and a decrease of 45,404 acres from Alternative B. Alternative D allows motorized travel on designated roads and trails on 154,772 acres (6 percent of the planning area), 5 percent less than Alternative A, 20 percent less than Alternative B, and 200 percent more than Alternative C. Alternative D would result in less potential for adverse impacts to fish and fish habitat from soil loss and sedimentation than alternatives A and C, and more potential for adverse impacts than Alternative B. Under all alternatives, most of the planning area is open to existing roads/trails and impacts would be the same as described for Alternative A.

4.4.5.3.5.4. Special Designations

The NTMC management limits surface disturbance. Overtime, this will limit loss of vegetation and erosion, which will be an indirect benefit to fish. This is less protective than under Alternative B, but more than under Alternative A or C.

Alternative D manages three of the segments found eligible under the NSWRS as suitable, which is less beneficial to fish than Alternative B, but more beneficial than either Alternative A or C.

Alternative D designates 243,838 acres (10 percent of the planning area) into eight ACECs, 5 percent more of the planning area than Alternative A, and 52 percent less than Alternative B. There are no ACECs proposed under Alternative C. ACECs support habitat for fish, although fish are not the primary reason for the special designation. Constraints for resource uses related to mineral, realty, and travel management authorizations in ACECs are more restrictive of activities that cause soil erosion that can lead to increased sediment loads in fish-bearing waterbodies. Alternative D is less restrictive than Alternative B, but more restrictive than Alternative A. Alternative D would decrease the likelihood of disturbance to fish and fish habitat that could occur under Alternative C, which does not designate any ACECs or special management areas.

Alternative D closes more WSA acres to motorized travel or designates open roads/trails on more acres than alternatives A and C, which would decrease the potential for adverse impacts from additional sediment entering fish habitats. Alternative D recommends eligible segments on Baldwin Creek, Sweetwater River, and Warm Springs Creek Segment 1, as suitable for inclusion in the NWSRS and manages them to maintain or enhance the segment, including fish habitat. The fish populations and habitat associated with these segments would benefit from management that limits surface disturbance that could contribute sediment to the waterway, impacting macroinvertebrate production and altering streamside vegetation.

Overall, Alternative D management of special designation would result in greater beneficial impacts to fish resources than alternatives A and C, and fewer beneficial impacts than Alternative B.

4.4.6. Fish and Wildlife Resources – Wildlife

Wildlife habitat is found on almost every acre of land in the planning area. It is anticipated that most activities on public lands have the potential to adversely or beneficially impact wildlife. Wildlife health is directly related to overall ecosystem health, habitat abundance, habitat fragmentation, and wildlife security provided; therefore, most resource management actions would result in at least an indirect impact to wildlife. Impacts to wildlife species are generally described as the loss, degradation, or fragmentation of habitat or key habitat features; the disturbance/disruption of wildlife during sensitive time periods; or direct animal mortality. Management actions that impact wildlife and their habitats include resource uses that result in

surface disturbance and disruptive activities, such as mineral development, lands and realty actions, livestock grazing projects, fire, recreation, and vehicle travel. Management actions with potential to enhance wildlife habitat include management of soils, water, vegetation, special status species habitat, and special management areas.

Wildlife populations can fluctuate in response to natural factors such as cycles in the abundance of prey base or extremes in seasonal weather; therefore, it can be difficult to determine whether impacts to wildlife result from specific management actions or from population changes caused by these natural factors. In most cases, it is a combination of these factors.

4.4.6.1. Summary of Impacts

Authorized activities that disturb soil, remove vegetation, and result in habitat loss, modification, or fragmentation adversely impact wildlife. Actions that affect breeding and birthing activities, cause direct mortality, or cause animals undue stress or energy expenditures also adversely impact wildlife. Alternative B provides the greatest protection from surface-disturbing activities and disruptive activities, and therefore would result in the greatest beneficial impacts to wildlife and their habitats. Conversely, Alternative C is the least restrictive and provides the least amount of protection, and therefore would result in the greatest potential to adversely impact wildlife resources. Alternative D is similar in many respects to Alternative A, but Alternative D includes additional management actions that increase habitat protection in areas important to wildlife and other resources, particularly for special status wildlife species and in special designation areas.

4.4.6.2. Methods and Assumptions

Analyses of impacts to wildlife resources assess whether actions could result in loss, degradation, or modification of wildlife habitat and assess actions that could improve or enhance habitat. Impact analyses are based on Interdisciplinary Team knowledge of resources in the planning area, review of existing literature, and the professional judgment of BLM and cooperating agency experts. Impacts are quantified where possible, but in the absence of quantitative data, best professional judgment is used. Acres and percentages described are approximations and impacts are described using ranges of potential impacts, or in qualitative terms, if appropriate.

Surface-disturbing activities and other actions that remove vegetation, disturb soil, and change habitat characteristics, alter habitat quality and indirectly impact wildlife. Indirect impacts to wildlife also result from actions that alter habitats that make them unsuitable for future habitation by wildlife species. Limitations on new disturbances will beneficially impact wildlife and their habitat.

Methods and assumptions used in this impact analysis include the following:

- The BLM would continue to manage wildlife habitats in coordination with the WGFD, which is responsible for managing wildlife populations.
- Impacts to wildlife species are based primarily on potential impacts to BLM-managed habitats. For each alternative, changes to vegetation types, either in quantity, quality, or increased fragmentation, are compared to baseline conditions. Adverse and beneficial impacts to vegetation types (i.e., wildlife habitats) are assumed to have a corresponding adverse or beneficial impact to wildlife species.

- Ground-disturbing activities could lead to modification (beneficial or adverse) of habitat and/or loss or gain of individuals, depending on the amount of area disturbed, the species affected, and the locations of the disturbances.
- Changes in habitat quality could lead to direct impacts and could cumulatively impact species survival.
- The exact locations of future surface-disturbing activities cannot be predicted at the RMP level. For analysis purposes, surface-disturbing activities are assumed to occur in vegetation types in proportion to their availability in the planning area. Impact acreage for vegetation types are not absolute, but serve as a relative comparison among alternatives. Impacts from oil and gas development activities are assumed to occur in areas of high and moderate oil and gas potential.
- Disturbance impacts to wildlife are evaluated by comparison to current management practices in the planning area; increased protections in time or space result in beneficial impacts, reduced protections result in adverse impacts.
- In most cases, disturbance of any component of a species habitat is detrimental, with the degree of detriment depending on the importance of the habitat component to the maintenance of the population.
- Prohibiting surface disturbance or occupancy is more restrictive and provides more protection for wildlife than avoiding surface disturbance or occupancy.
- Disruptive activities displace wildlife, although some wildlife species would adapt to the disruptions.
- Diverse and optimal habitats foster healthy, abundant, and diverse biological communities.
- Disturbance or disruptive activities during sensitive periods can adversely impact wildlife.
- The more acreage of habitat protected from fragmentation, the greater the beneficial impact to big game and other wildlife species.
- Management actions aimed at benefiting specific wildlife species can result in adverse or beneficial impacts to other wildlife species. Management actions that beneficially impact one wildlife species could adversely impact another.
- The potential for adverse and beneficial impacts to wildlife forage and hiding cover is expected to be commensurate with the level of forage utilization from livestock grazing.
- Changing or altering livestock grazing patterns could beneficially or adversely impact wildlife habitat and its use.
- Alternatives that provide the greatest protection of existing wildlife water sources are anticipated to result in the greatest beneficial impact to wildlife.
- The higher the road density in the planning area, the greater the potential to degrade the quality of adjacent wildlife habitat. The greatest impact comes with the initial introduction of roads to unfragmented areas. A secondary impact is the introduction of INNS into new areas.
- OHV use in high-priority habitats or during sensitive periods can adversely impact wildlife.
- The quality and quantity of winter ranges are generally considered to be the limiting factors on big game populations in the planning area. The ability of these areas to support wintering populations is a major factor in determining yearlong population levels.
- Substantial modifications to habitat suitability can impact the survivability and viability of populations (e.g., higher winter mortality and reduced reproductive success).
- Crucial winter ranges, parturition areas, and migration routes are critically important wildlife habitat.
- There is sufficient habitat to maintain current WGFD herd unit objectives.
- Success of mitigation depends on specific protective measures, past results, and the assumption that mitigation measures are properly implemented.

- The rate of habitat fragmentation from development/subdivision of private lands around Dubois and Lander will continue, which would adversely impact the quality and quantity of wildlife habitat in these areas and increase the importance of intermingled public lands.
- The rate of fencing on private lands would continue or increase during the planning period.
- Fencing can be an obstacle and/or potential hazard to big game movement and can adversely impact greater sage-grouse and other species.
- Water developments can be a tool to improve grazing practices and improve habitat, but can expand adverse impacts from grazing to new areas.
- Natural variability in wildlife health, population levels, and habitat conditions would continue. Periods of mild or severe weather and outbreaks of wildlife disease or insects/diseases that impact habitat could impact wildlife population levels.
- Landscape-level fire events, regardless of cause, would impact habitat and wildlife population levels.

4.4.6.3. Detailed Analysis of Alternatives

4.4.6.3.1. Impacts Common to All Alternatives

The impacts to wildlife and wildlife habitats under the alternatives would be similar, but the intensity of impacts would vary by alternative. Impacts to wildlife from program management; other resources, including vegetation, wild horses, and cultural; and resource uses such as minerals, ROWs, recreation and travel management, and livestock grazing management; and special designations, including ACECs, historic and scenic trails, and WSAs are described under individual alternatives. Chapter 3 describes the various WGFD statutory wildlife categories of big game, trophy game, furbearing animals, predatory animals, small game, game birds, migratory game birds, and nongame, including raptors, neotropical migrants, mammals, reptiles, and amphibians. Because impacts would occur in habitats occupied by animals in multiple statutory categories, impacts are addressed collectively, with specific categories identified where appropriate.

Changes to or stressors (e.g., increased human presence and noise) on habitat components such as vegetation, water, and soil would be the most likely to result in direct and indirect impacts to wildlife. Surface-disturbing activities cause habitat fragmentation, loss, or displacement, depending on the types, amounts, and locations of activities.

Impacts to wildlife populations could result from the loss of habitats or key habitat features such as winter range, nest sites, or migration corridors. Changing habitat characteristics or quality can cause wildlife to avoid the area, resulting in a loss of available habitat. Disturbed lands not adequately reclaimed, fire management, road construction and use, facility construction and placement, field facility maintenance, ROW construction, range improvements, and wildlife avoidance areas around these disturbances can result in habitat loss. As the acreage of surface disturbance and level of human activity increases, the quality and quantity of wildlife habitats would likely be reduced. Seclusion areas for wildlife would become smaller and more dispersed in these areas, which could lead to a decrease in wildlife populations as a result of habitat loss. Areas with many access roads and surface disturbances could disrupt big game migration corridors that link crucial habitats. Migration routes could be altered or eliminated, changing some traditional wildlife use patterns on a regional level.

Habitat fragmentation occurs when a contiguous habitat is intersected, divided, or segmented by disturbing activities, resulting in less usable range, and the disruption in movement among seasonal habitats, transitional areas, and parturition areas. Fragmentation also results in the isolation of smaller, less mobile species; a loss of genetic integrity with species or populations; and an increase in abundance of habitat generalists that are characteristic of disturbed environments, such as predators and parasites (Harris 1984). Linear features such as roads and pipelines can fragment habitats and can act as barriers for some species.

Displacement from surface disturbance or disruptive activities moves animals into less desirable habitat and/or increases the competition for available forage with other wildlife species and livestock. In many areas, displacement results in wildlife using private agricultural lands to a greater extent. Density dependency thresholds of suitable habitats for these species could be met, which ultimately could decrease herd size and genetic variability and increase disease frequency. Impacts of human activity to big game and severe winter range include habitat and forage loss caused by surface-disturbing and other disruptive activities at any time of the year. Indirect impacts to wildlife occur from displacement and physiological stress from human presence and activity during sensitive life stages. A fleeing or displaced animal incurs additional impacts through loss of food intake and potential displacement to a poorer (lower) quality habitat. Chronic or continuous disturbance could result in reduced animal fitness and reproductive potential (Geist et al. 1978).

Wildlife can also be disturbed by human activities, potentially causing wildlife to abandon a nest, den, or home range. Disturbance during sensitive periods (e.g., winter and nesting) is known to adversely impact wildlife. Human activities, such as OHV use, recreation, energy facility O&M, and noise from equipment, impact some wildlife species. These activities are considered to be particularly detrimental to breeding and nesting raptors and wintering big game. Disturbance impacts range from short-term displacement and shifts in activities to long-term abandonment of home ranges (Yarmoloy et al. 1988, Miller et al. 1998, Connelly et al. 2000).

Some species of wildlife are more sensitive to noise and disturbance than other species, while other species habituate to certain types of noise or disturbance. Bowles (Bowles 1995) indicates that wildlife can abandon habitats or expend energy as a result of disturbance and can continue to exhibit a response even when they have adapted to the disturbance. Depending on the intensity and frequency of occurrence of the disturbance, incurring energetic expense due to human disturbance during critical periods (e.g., winter) can impact wildlife survival and productivity. The USFWS (USFWS 2002a) identifies courtship, nest construction, incubation, and early brooding as higher risk periods in the life-cycles of raptors when adults are more prone to abandon nests due to disturbance. The USFWS (USFWS 2002a) also indicates that human activities resulting in disturbance to raptors can cause population declines. In general, the more area subject to noise and disturbances from human activities or the higher the density of these activities, the more disturbance and adverse impacts to wildlife.

Because the precise locations of surface disturbances under the alternatives is unknown and because wildlife species utilize more than one vegetation type, the degree of impacts to wildlife from surface disturbance are anticipated to be directly related to the amount of surface disturbance. Long-term surface disturbance accounts for reclamation of some lands following short-term disturbance. Although proper reclamation can restore habitats and reduce long-term surface disturbance acreage, reclamation can have limited effectiveness in restoring suitable habitat, and the locations of permanent facilities (e.g., roads and well pads) adjacent to reclaimed areas can reduce the utility of reclaimed habitats.

Under all alternatives, impacts to wildlife from management of air quality and geologic, water, cave and karst, and visual resources would not vary by alternative. To the extent that management is directed at protecting these resources, there would be a secondary beneficial impact to wildlife and wildlife habitat. See resource-specific sections of this chapter for a description of impacts from these management actions under each alternative.

Resources

Soil

Surface disturbance temporarily or permanently removes wildlife habitats and can degrade the quality of adjacent habitats. For example, erosion and runoff from surface disturbance can extend onto adjacent habitats, causing additional soil erosion. Moreover, dust from surface disturbance can cover adjacent vegetation, thereby reducing photosynthesis and/or the palatability of vegetation. Depending on the intensity of degradation, season, and health condition of wildlife using the habitats, reductions in habitat quality can result in short-term and long-term impacts to wildlife. Surface-disturbing actions typically require BMPs to avoid or minimize impacts to soil resources and, ultimately, to habitats. Temporary protective surface treatments can have a beneficial impact on steep slopes or on soils with high potential for water or wind erosion because these areas are more difficult and often take more time to reclaim compared to other areas. All alternatives prohibit or avoid surface disturbance on steep slopes, with the degree of slope varying by alternative. Avoiding disturbance on slopes would provide a secondary beneficial impact to wildlife by limiting the amount of habitat available for surface-disturbing activities. Once surface disturbance occurs, timely reclamation is important to avoid or minimize soil erosion and the spread of INNS. The longer it takes to restore disturbed areas, the greater the adverse impact to wildlife.

Protection of soil resources has a direct beneficial impact on the production of vegetative resources on which wildlife depend for their habitat requirements. Under all alternatives, management actions that limit soil disturbance would beneficially impact wildlife and actions that disturb soil and remove vegetation would adversely impact wildlife and their habitats, unless vegetative treatments are performed to enhance habitat for a specific species. These impacts would affect wildlife in all statutory categories. Actions that disturb soil are discussed in resource-specific sections of this chapter.

Lands with Wilderness Characteristics

Habitats within areas considered to contain wilderness characteristics support suitable habitat for myriad wildlife species including grassland/shrubland-, forest/woodland-, and riparian-wetland-obligate species. Most importantly, these lands contain winter range for part of the Whiskey Mountain bighorn sheep herd.

Fire and Fuels

Prescribed fire and wildfire can result in short-term and long-term impacts to wildlife. Wildland fire can kill less-mobile wildlife, such as small game, ground-nesting birds, nongame mammals, and reptiles, that are not able to avoid the path of the fire. Wildland fire can cause short-term animal displacement, primarily to big game and trophy game species, and result in short-term or long-term habitat loss, depending on the types of vegetation removed and severity of the fire. In some cases, wildland fire has the potential to burn exceptionally hot, resulting in soil sterilization. Sterilization of soils could delay vegetation establishment on the site for many years, resulting in

long-term loss of wildlife habitat. The removal of vegetative hiding cover, loss of forage, and loss of habitat from wildland fires would directly impact raptors, game birds, small game, and neotropical migrant bird species. The BLM generally uses prescribed fire outside the nesting season, limiting direct impacts to nesting birds.

Wildland fire can reduce dense understory in forest systems, which has mixed values for various species of wildlife. Fire-sensitive vegetation such as bitterbrush, which is an important browse species for big game, is often killed and its composition in the plant community reduced. Historically, less-intense wildland fire that did not affect entire wildlife populations created mosaics, resulting in variability in the vegetation seral stage, species composition, vertical stratification, and herbaceous understory. This situation beneficially impacts species that prefer open habitats, such as mountain bluebirds. Periodic wildland fire can rejuvenate over-mature, decadent shrub communities, improving the palatability and age class diversity of the shrubs.

Over the long term, wildland fire can generally improve habitat conditions for most wildlife species by releasing soil nutrients, reducing fuel loads, or setting back species such as trees that might be encroaching into other habitats such as grasslands and shrublands. Wildland fire would reduce dense understory that has mixed values for various species of wildlife. In vegetative climax communities, wildland fire would return the vegetative community to an earlier stage of succession, increasing forage and cover for a greater diversity of wildlife. Wildland fire can remove excess dead and dying vegetation, reduce hiding cover for prey species, and reduce potential thermal cover in winter. However, post-fire log and limb fall would increase horizontal cover and could produce snags important for nesting birds in the long term. The extent of impacts to wildlife depends on the extent of change in habitat structure and species composition caused by the wildland fire. Landscape-level wildfire could reduce vegetation and habitat across large expanses, which would displace many species of wildlife for the long term, if not permanently.

Fire-line construction, use of heavy equipment, and other fire suppression activities could damage or destroy vegetation and wildlife habitat. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation. Timely rehabilitation from this damage is important to maintaining the quality of wildlife habitats. If rehabilitation is not completed, fire suppression activities can cause erosion or INNS spread, which would result in long-term adverse impacts to wildlife habitat.

Vegetation

Forest management actions can impact feeding, breeding, and sheltering of raptors and other forest-dependent species. Habitat fragmentation and degradation, increased human presence, and habitat access by competitor species that normally cannot use these areas could all impact these species, depending on whether the action is a harvest or thinning, where the access roads are constructed, the types of equipment used, and the rate of habitat rehabilitation. The effectiveness of elk habitat in forested habitats declines with increased road densities. Forest and woodland habitats are used by a myriad of species from each wildlife statutory category and management actions to meet forest health objectives could result in habitat loss and fragmentation, displacement of animals, disturbances from noise, and increased impacts from vehicular traffic. Silvicultural practices in forest and woodland habitats can adversely impact black bears and mountain lions, because providing habitat for these species is generally not the focus of the management action. Management practices designed to alter or set back the seral stage of the forest community could increase wildlife species diversity and richness, depending on different species' habitat

requirements. Species that require late seral stage habitat would lose habitat and be displaced, while species that require early to mid seral stage habitat would benefit from increased range.

Under all alternatives, aspen regeneration is promoted throughout the planning area using a variety of treatment methods to enhance wildlife habitat and improve overall ecological health. Aspen stands are found primarily in the Green Mountain, Dubois, and Lander Slope/South Pass areas and along Beaver Rim, and overlap with high-value big game, trophy game, game bird, and neotropical migrant habitat. These communities provide important forage and cover habitat, and management actions that focus on improving aspen health and regeneration would have beneficial impacts on wildlife in each statutory class. In all timber management activities, the practice of leaving dead and dying trees, trees with heart rot, and other standing unmerchantable timber would meet the ecological needs of numerous species, including woodpeckers, owls, and many neotropical migrants.

Manipulation of juniper and other noncommercial tree species and noncommercial harvest of minor wood products such as poles, firewood, and wildings would result in variable impacts to wildlife species. These impacts, including short-term disturbance of wildlife, minor modification of habitat due to removal of trees or wood products, and other general disruptions caused by temporary human presence, would result in minimal adverse impacts to wildlife resources.

Properly mitigated timber harvests can improve big game habitat in the long term by improving forest age class diversity and distribution, edge effect, and forage community diversity. Conversely, timber harvests can take important habitat components (e.g., snags, dead and down components, and the largest trees) out of the ecosystem and result in adverse impacts to species that depend on these components. Amphibians, reptiles, and other smaller animals depend on these habitat components for survival. Thinning practices generally result in adverse impacts to species such as the snowshoe hare.

Grasslands and shrublands would be managed to meet the Wyoming Standards for Healthy Rangelands and for specific plant species and vegetative attributes (plant density, composition, cover, and diversity), which would directly impact wildlife habitat. Plant communities lacking a balance of herbaceous and woody components would adversely impact wildlife in the planning area, because most species depend on sagebrush/grass and mixed shrub communities, at least seasonally, to meet part of their forage, cover, or migration needs.

Under all alternatives, the BLM would utilize an integrated management approach, including mechanical and chemical treatment, fire, and grazing to manipulate vegetative communities to achieve wildlife habitat objectives. Maintenance of contiguous habitat blocks and the corridors between them would have beneficial impacts on many wildlife species that depend on large areas of habitat to carry out their life history requirements. In addition, corridors between habitat blocks are important for seasonal movements of wildlife. Appropriate reclamation would restore biological integrity and habitat function lost as a result of the initial surface-disturbing activity; however, returning a sagebrush site to predisturbance condition can take 30 or more years. Successful reclamation is needed to reestablish connectivity within previously fragmented habitats and to achieve and maintain ecosystem function.

Invasive Species and Pest Management

The spread of INNS contributes to the loss or degradation of wildlife habitats. Adverse impacts to wildlife habitats from INNS would be commensurate with the amount of wildlife habitat affected. Targeting and eradicating INNS particularly detrimental to certain wildlife habitats

would beneficially impact wildlife using the area. For example, salt cedar is an INNS often found adjacent to or within water courses and riparian-wetland habitats important to numerous wildlife species. Actions to prevent and control INNS could reduce, or at least slow, the rate of INNS increase in the area and the severity of impacts to wildlife habitats. Controlling INNS under all alternatives would reduce competition with native species important to wildlife habitat and populations. Improved plant vigor, health, and forage production would maintain or improve forage production, cover, and vertical structure for wildlife. Increased forage availability and forage quality (nutrient content) increases wildlife fitness and survival. Controlling the spread of INNS is necessary to maintain habitats to support wildlife carrying capacities.

Under all alternatives, the required use of certified weed-free forage and mulch would beneficially impact wildlife by reducing the opportunity for weeds to establish in key habitat features. Working with stakeholders to control grasshoppers and Mormon crickets would beneficially impact many wildlife species, particularly mammals, in all statutory categories because infestations can reduce the amount of vegetation available for forage and cover. Impacts to wildlife from activities such as herbicide spraying can cause short-term animal displacement from vehicle use and human presence. Pesticide spraying can also cause short-term animal displacement and a loss of insects birds use for food. It is expected that insect control efforts would not result in the eradication of the insect population. Impacts to wildlife from the presence of INNS or INNS control methods would not vary by alternative.

Riparian-Wetland Areas

Riparian-wetland areas support the greatest biological diversity of all habitats in the planning area. Therefore, management actions that protect, develop, restore, and improve these areas would result in direct beneficial impacts to wildlife. Management of riparian-wetland areas to meet PFC and the Wyoming Standards for Healthy Rangelands improves habitat conditions for various wildlife species, including big game, furbearing animals, small game, migratory game birds, neotropical migrants, and amphibians. In addition to their importance to wildlife, riparian-wetland areas are important for livestock and wild horses, and concentrated grazing by all animals can lead to overuse of these habitats. Actions that improve riparian-wetland PFC would improve habitats for riparian-wetland-dependent wildlife species, especially via increases in the quantity and quality of riparian-wetland vegetation. Areas managed to standards greater than the minimum requirement of PFC would result in greater beneficial impacts to wildlife.

Fish, Wildlife, and Special Status Species

Impacts to wildlife species resulting from surface-disturbing and disruptive activities would be addressed through the implementation of mitigation measures and BMPs, such as timing stipulations and designations of spatial buffers, including those found in the WGFD *Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats* (WGFD 2009a). These stipulations provide some mitigation for loss of habitat function or habitat value for wildlife species. Big game are sensitive to human activity, and timing stipulations offer protection during critical birthing and winter periods. For example, mule deer exhibit a stress response to disturbances associated with noise and activity up to 0.29 mile from the source (Frisina 1992). Crucial winter range is considered the “limiting factor” to big game populations, and modifications to habitat suitability can impact species survivability and viability (e.g., higher winter mortality and reduced reproductive success), ultimately leading to reductions in population size. This impact is intensified on lands that are crucial winter range for more than one big game species and in areas where crucial winter range is in degraded or poor condition.

Surface-disturbing and disruptive activities are prohibited within identified big game crucial winter range from November 15 to April 30 and in big game parturition areas from May 1 to June 30 unless the BLM grants an exception, modification, or waiver. At present, 605,898 acres of crucial winter range and 27,768 acres of parturition habitat are identified on public land in the planning area. Raptor nest sites and associated buffers are protected during the nesting period, with nesting dates and buffer distances varying by alternative. Some raptor species are more sensitive to disturbance than others and disruptive activities can cause raptors to abandon nests or chicks, resulting in the loss of that season's nest production. The BLM would adhere to fence standards for new fence construction to allow wildlife movement and would remove or modify existing fences that are a hazard to wildlife where opportunities exist. Impacts to wildlife would be minimized through appropriate placement of facilities and projects and maintaining connectivity of large blocks of undisturbed habitat.

The BLM would cooperate with the WGFD and the USFWS to reintroduce wildlife species, including special status species, into historic or suitable ranges to enhance existing populations or genetic diversity. In addition, the BLM would seek opportunities to develop wildlife viewing areas in the planning area.

In addition to the stressors from BLM-permitted activities on game animals (big game, trophy game, small game, furbearers, and game birds), many of these species are also hunted seasonally. Pursuit of game animals during hunting seasons can create additional short-term stressors. Hunting seasons vary from weeks to months, depending on the game species, and are designed to harvest animals to maintain established population objectives and/or maintain populations at or below the sustainable habitat carrying capacity. Adjustments in big game herd objectives would be recommended to the WGFD when habitat monitoring data indicate adjustments are needed.

The USDA Animal and Plant Health Inspection Service (APHIS) Wildlife Services conducts animal damage control, typically for coyote, red fox, and skunk. Impacts to predatory animals from control efforts would not vary among the alternatives.

Wildlife and special status species occupy the same habitats; therefore, there is a direct beneficial impact to wildlife in all statutory categories from actions that conserve habitat for special status species. All alternatives prohibit surface-disturbing and disruptive activities around greater sage-grouse leks, with the buffer distance varying by alternative. Protecting habitat from loss or fragmentation would beneficially impact wildlife species using the same areas. All alternatives apply a TLS on surface-disturbing and disruptive activities in nesting habitats for greater sage-grouse and mountain plover. The TLS would have beneficial impacts on other birds nesting in the area. Special status fish management would help protect and improve riparian-wetland ecosystems essential for wildlife. Actions that minimize impacts from road crossings in fish habitat and implement management strategies to prevent the introduction and spread of aquatic invasive species would result in indirect beneficial impacts to other wildlife species inhabiting the riparian-wetland areas. Actions directed at managing for vegetation diversity, managing to meet or exceed PFC in riparian-wetland areas, and improving sagebrush communities would beneficially impact all wildlife species.

Wild Horses

Wild horses compete directly with wildlife for water, forage, and habitat on approximately 25 percent of the planning area. The number of wild horses does not vary by alternative. Allowing horse populations to increase could allow expansion of wild horses into new areas, increasing the amount of competition between wild horses and wildlife. Higher numbers of wild horses can

displace big game into less suitable habitats or onto private lands. Wild horses also contribute to riparian-wetland habitat degradation, which reduces the quality or suitability of these habitats for wildlife species. Wild horses that tend to dominate water sources can force wildlife to find alternative water sources. This can displace wildlife into lower-quality habitat or force wildlife to travel farther to find water. Wild horse use of small, isolated desert riparian-wetland systems can decrease the value of these areas for wildlife as a result of trampling, loafing, and forage reduction. The capability of these areas to support a diversity of wildlife can be reduced as vegetative cover, structure, and forage quality and quantity are reduced or altered.

Wild horse gathers would create short-term localized disturbance to wildlife from human activity related to gathers. Vehicle traffic, helicopter use, wranglers on horseback, and the movements of the wild horses during gathers would contribute to wildlife stress and displacement. Maintenance of the wild and free-roaming nature of wild horses would beneficially impact wildlife by promoting open spaces and minimizing fences, which would result in fewer obstructions to the movement of wildlife across the landscape.

Cultural and Paleontological Resources

Management for cultural and paleontological resources provides varying degrees of habitat protection under the alternatives. Cultural resource protection generally results in beneficial impacts to wildlife by restricting surface-disturbing activities. Cultural and paleontological inventories and excavations would result in short-term localized displacement of wildlife and a short-term loss of habitat at excavation sites. It is expected that adverse impacts associated with cultural and paleontological resources management would be limited to relatively small areas and would not vary among the alternatives.

Resource Uses

Minerals

Adverse impacts from mineral exploration and development include the displacement of wildlife in developed areas, wildlife avoidance of areas around development from noise and human presence, the reduction in usable habitat, and the disruption of migration corridors that link seasonal ranges. Adverse impacts would be greater in areas experiencing steady development and large amounts of surface disturbance. Surface disturbance that results in the loss of sagebrush habitat would be a long-term adverse impact because of the difficulty of establishing shrubs in reclamation areas due to the time it takes plants to establish and grow. Under all alternatives, it is anticipated that approximately 183 acres of long-term disturbance would occur each year from locatable mineral activities and another 183 acres of long-term disturbance would occur from mineral material disposals. A pre-FLPMA mineral withdrawal on 3,432 acres in the East Fork area is not subject to expiration and will be maintained under all alternatives.

Most oil and gas development is expected to occur in areas with high and moderate potential for both conventional gas and CBNG, primarily in the Lysite and Beaver Creek areas and south of Jeffrey City. Oil and gas development fractures vegetative communities, changes plant community structure and diversity, and alters grassland/shrubland landscapes. As the numbers of wells, roads, and facilities increase, habitats in and near well fields become less suitable until most mobile animals no longer utilize these areas. Although vegetation and other natural features might remain physically unaltered, wildlife make proportionately less use of areas near oil and gas facilities. The WGFD estimates that adverse impacts to pronghorn from oil and gas

development would occur on at least 170 acres surrounding each well pad (WGFD 2009a). The greater the mobility and adaptability of wildlife species to human activity and disturbed areas, the less likely there would be long-term impacts to species populations. However, it is feasible that big game behavior or populations would be altered in the long term at any level of development. Animals that remain within the affected zones would be subject to increased physiological stress. This avoidance and stress response impairs habitat function by reducing the capability of wildlife to use the habitat effectively. In addition, physical or psychological barriers lead to habitat fragmentation, further limiting the availability of suitable habitat. An area of intensive activity or construction would become a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These impacts would be especially problematic if they occurred in limited habitat components such as crucial winter ranges and reproductive habitats (WGFD 2009a). Studies have shown that actions involving increased human presence have resulted in adverse impacts to wildlife populations such as mule deer and greater sage-grouse. Due to prolonged reclamation time, oil and gas development in low precipitation areas could result in long-term impacts from habitat loss and fragmentation.

Long-term impacts would occur from habitat fragmentation associated with roads, utility corridors, construction, and long-term avoidance of development sites and facility locations. Potential impacts to wildlife would include temporary disturbance in localized areas, temporary loss of habitat, long-term degradation of habitat, and possible direct mortality of small mammals or nesting birds.

Oil shale-tar sand leasing is the same under all alternatives because a land use plan amendment would be required prior to approval. The geothermal RFD did not identify any commercially viable geothermal potential, and it is expected that there would be no large-scale geothermal development in the planning area. If geothermal resources were discovered during the drilling of a gas well, impacts to wildlife would be the same as for drilling and completion of an oil and gas well, and no additional disturbance would be expected from geothermal leasing activities. Impacts to wildlife from geothermal development would be the same under all alternatives.

Extraction of phosphate would require stripping of the overburden to reach the phosphate deposit (strip mining), which would result in large-scale surface disturbance and habitat loss. Phosphate deposits in the planning area predominantly overlap big game winter range on Lander Slope, in Red Canyon, on Sheep Mountain, on Schoettlin Mountain, and near the Sweetwater River. If the BLM leased these areas for phosphate mining, there could be a long-term or permanent loss of habitat for mule deer and elk from mining operations.

Geophysical projects, particularly those involving the use of vibroseis trucks, can adversely impact sagebrush habitats by crushing sagebrush plants and understory grass and forb species. Staking and flagging of project areas, noise generated from vehicles and seismic work, and human presence could cause wildlife displacement within and adjacent to the project area. The extent of displacement would depend on the time of year of the activity. Pounding of the ground surface can disrupt breeding and nesting activities for birds and result in a loss of eggs or chicks. Less mobile species such as reptiles and nongame mammals can be crushed by the vibroseis plates or vehicle tires. Truck paths can create trails, thus increasing predator access. Wildlife displacement would be a short-term adverse impact because wildlife would likely return to the project area once operations ceased. Impacts from seismic operations would not vary by alternative; however, the number of acres open to geophysical activities does vary by alternative.

Mineral material disposals for sand, gravel, moss rock, granite, and limestone can impact vegetative communities depending on extraction methods for each specific resource. Impacts include wildlife displacement and disturbance, wildlife avoidance of the larger surrounding area because of noise and human presence, loss of vegetation, and loss or modification of habitat. However, limiting the acreage available for mineral material disposal may require longer transport distances for sand and gravel and other construction materials, potentially increasing the incidence of wildlife collisions with haul trucks. Salable mineral extraction would result in short-term direct impacts to wildlife and associated habitat. The level of impacts would depend on the size of the project area and the importance of the affected habitat to wildlife.

Lands

Lands with important wildlife habitats are considered when making land tenure adjustments in the planning area. The acquisition of lands would result in a direct beneficial impact to all species of wildlife because lands under BLM control are not available for subdivision and are subject to management decisions that consider impacts to wildlife. Land disposals could result in the long-term loss of habitat for wildlife. Lands identified for disposal have undergone an initial screening for impacts to wildlife and would be reevaluated before disposal to determine new or previously unidentified impacts to wildlife or key habitat features. Several parcels identified for disposal are in or adjacent to WGFD Wildlife Habitat Management Areas (WHMAs), and would have restrictions for disposal. These restrictions would ensure that disposal lands are managed for the same values and with similar prescriptions as surrounding lands.

Renewable Energy

Non-wind renewable energy development is considered on a case-by-case basis and wind energy would be developed consistent with the Wind Energy Programmatic EIS (BLM 2005a). The EIS provides guidance to consider micro-siting alternatives when assessing the impacts of proposed facilities to wildlife, but does not discuss broader habitat avoidance issues. Because their footprints are large, wind turbines can cause habitat loss and fragmentation and wildlife avoidance of the area, resulting in long-term adverse impacts. Turbine blades can pull bat and avian species into their rotation, causing mortality. In addition, bats are susceptible to internal injuries and mortality from sudden changes in air pressure generated by turbine blades.

ROWs and Corridors

Impacts to wildlife from ROWs are determined by the location of the action, timing of the activity, and the success of reclamation of disturbed lands. Routing linear ROWs (e.g., pipelines, powerlines, and roads) where impacts would be least detrimental would help minimize fragmentation of sensitive habitats such as winter range, migration corridors, parturition areas, and nesting habitat. Routing decisions are made after site-specific NEPA analysis, and where possible, new utilities are placed in existing ROW corridors. However, habitat fragmentation would still occur as more ROWs are developed or as an area with multiple linear ROWs expands. Short-term adverse impacts would result from the construction of pipelines, buried fiber-optic cables, and other subsurface actions; however, proper reclamation would restore some level of wildlife habitat function. Depending on the soil and vegetation types where actions occur and the long timeframes required for some disturbed sites to return to predisturbance vegetative condition, some impacts to wildlife would be long-term. Aboveground ROW actions, such as communications sites, powerlines, and wind turbines, would result in long-term habitat loss. These types of permanent structures are particularly hazardous to avian wildlife because of the potential for collision or electrocution (Erickson et al. 2005).

ROWs and corridors occur in the planning area under all alternatives and could impact wildlife in various ways. For example, utility poles benefit raptors and other birds by providing perching or nesting structures; however, these same utility structures also can cause mortality to raptors through electrocution and collisions (USFWS 2002a). Erecting artificial nest platforms on utility structures can have beneficial impacts to birds such as osprey, eagles, and hawks, and nest boxes constructed on utility structures can have beneficial impacts to cavity-nesting birds (e.g., bluebirds) and bats (USFWS 2002a). These structures can also adversely impact prey species because raptors will use utility structures as hunting perches. Reclamation on pipeline corridors can be difficult where there is uncontrolled grazing on plant seedlings or repeated disturbance of the site. When these situations occur, disturbances from pipelines would result in long-term adverse impacts to wildlife habitat.

Livestock Grazing Management

Livestock grazing would result in direct competition with wildlife for forage, water, and space. Wildlife disturbance or displacement can result from the construction and maintenance of range improvements. The development of livestock grazing strategies, such as emphasizing the creation of grass banks, would provide the opportunity to improve or maintain range conditions that support a diversity of wildlife species. Management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands would result in actions that would balance the impacts of grazing while sustaining wildlife species and their habitat. Livestock grazing could degrade wildlife habitats through harvesting of vegetation, changes in plant composition, soil disturbance and compaction, and INNS transport. Proper management of livestock grazing, deferring grazing on pastures exposed to wildland fire, and monitoring forage utilization could avoid or minimize adverse impacts to wildlife. Livestock tend to concentrate in riparian-wetland areas also important to wildlife, resulting in impacts to the quality and quantity of vegetation available for security cover and forage. If grazing occurs during the late or post-growing season, vegetation might not be available for wintering wildlife on crucial winter ranges and for security cover for nesting birds the following spring. This could lead to increased predation and lower nesting success.

While there could be adverse impacts to some wildlife species from livestock grazing, there could also be beneficial impacts to other species. Livestock grazing can enhance forage and habitat conditions for wildlife by increasing the palatability of forage, benefiting all grazing animals. Livestock grazing practices impact specific species in different ways. Cattle diets overlap to a high degree with those of elk and bighorn sheep, and domestic sheep diets have a high overlap with pronghorn and mule deer diets, creating year-round competition for forage among livestock and big game species. When cattle are removed during winter months from elk crucial winter range, it eliminates most of the competition for space between these two species during this critical period. Competition for space between cattle and bighorn sheep is considerably less because of the steeper and rougher topography sheep inhabit. Winter use by domestic sheep can cause competition with mule deer and pronghorn on their respective crucial winter ranges. Conversely, summer and fall cattle use of grasses balances wildlife use on pronghorn and mule deer crucial winter range, which appears to maintain a more diverse and healthy mixture of grasses and shrubs in these habitats. Under all alternatives, the BLM continues to manage lands in the Whiskey Mountain bighorn sheep area in cooperation with the WGFD and the USFS and in accordance with recommendations of the statewide bighorn/domestic sheep report and Western Association of Fish and Wildlife Agencies (WAFWA) guidelines (WSWG 2012). Domestic sheep use would not be authorized in bighorn sheep core herd units to prevent the possibility of disease transmission to the resident bighorn sheep population.

Range improvements, such as fencing and water developments, are designed to assist in the management of livestock grazing distribution and use patterns, which impacts wildlife in various ways. Under all alternatives, forage supplements used to facilitate livestock distribution must be safe for wildlife. Wildlife escape ramps will be required in all stock water troughs and tanks to reduce the potential for drowning by birds and small mammals. Fences may benefit wildlife habitat by controlling or eliminating livestock grazing in areas important to wildlife, increasing vegetative cover and forage availability. Existing fences, particularly those that do not conform to BLM standards for fence construction, create travel barriers, alter distribution patterns, increase stress and energy loss, and cause injury or death from entanglement. Fences become a larger concern during periods of deep snow and late in the winter season when animal body condition is poor. New fences constructed to BLM standards would present the same impacts to wildlife, but to a lesser degree. Fences create hazards for flying birds, perches for avian predators, and fragments seasonal habitats. The indirect beneficial impact of fences is the control of appropriate levels and durations of livestock grazing, which improves health, vigor, cover, and production of vegetation important to wildlife.

In the immediate vicinity of new water developments, livestock use intensifies and plant harvest increases. Water developments provide the opportunity to defer or rest certain habitats from livestock grazing to improve vegetative values that would have beneficial impacts on wildlife species. Development of offsite water sources could beneficially and adversely impact wildlife. Development of offsite water in areas lacking water can benefit wildlife by providing additional water in arid areas. Offsite water can also allow streams and/or water sources to be fenced out, providing quality wildlife habitat. However, creating additional water sources can increase livestock use in areas heavily used by wildlife. Increased grazing use can degrade the value of these habitats wildlife depend on by removing vegetation, altering plant community structure and composition, trampling of ground-nesting birds or small mammals, and displacement of wildlife.

Recreation and Travel Management

Wildlife can be directly disturbed by recreation activities, potentially causing wildlife to abandon a nest site or home range. Disturbance during sensitive periods (i.e., winter and nesting) could adversely impact wildlife populations. The impact from disturbances can be short-term, where the population could be displaced or shift its activities, or long-term, where the population could permanently abandon its home range, threatening its viability. Maintenance or improvement of existing sites or development of new recreation sites would cause short-term displacement of wildlife in the immediate area. There would be small amounts of habitat disturbed in association with maintenance and development activities, which would reduce the availability of that habitat. Because most animal species generally avoid human activities, this could reduce wildlife use of adjacent areas.

OHV use, mountain bikes, and intensive hiking can disturb wildlife. These activities remove vegetation, disturb soil, and transport INNS, which degrade wildlife habitats. In addition to direct impacts of vegetation removal and soil disturbance, the disturbance to wildlife associated with OHV use comes from the movement and noise of vehicles and riders. Road construction activities, mineral exploration and extraction, recreation, and vehicle travel can cause noise that adversely impacts wildlife.

Dispersed recreation activities such as hiking, biking, camping, fishing, hunting, rock climbing, and sightseeing result in increased human presence and would result in localized impacts to wildlife species. Human presence and activity result in both direct impacts to wildlife from

hunting and vehicle collisions, and indirect impacts from wildlife displacement and physiological stress at any time of the year. Rock climbing on cliff walls that support nesting raptors can cause nest or chick abandonment from prolonged periods of disturbance.

Transportation routes tend to fragment habitats and can act as barriers to some species, especially in severe winter conditions. A new road or trail into a previously roadless area would create the greatest amount of habitat fragmentation and facilitate the pioneering of other roads or trails, increasing the amount of habitat wildlife avoid and habitat degradation through vegetation loss. OHV use can alter wildlife seasonal use patterns and migration routes, changing some traditional use patterns. Wildlife seclusion areas can become smaller and more dispersed in some areas. Motorized vehicle use decisions that result in increased human presence would result in localized impacts to wildlife. Impacts include increased wildlife displacement, increased stress during important periods (e.g., winter and nesting), and habitat degradation.

Motorized over-snow travel on winter range can cause stress to wintering animals. Increasing the number of transportation routes can increase public access to areas that previously were relatively inaccessible to vehicles during winter and spring months. Travel management will become more important during the planning period, because increased demands for the use of public lands would increase the number of roads and the likelihood of additional proliferation of routes, legal or not, which would increase adverse impacts to wildlife. Vehicle-wildlife collisions could increase in areas of high wildlife use and high human activity. Limiting the acreage available for mineral material disposal may require longer transport distances for sand and gravel and other construction materials, potentially increasing the incidence of wildlife collisions with haul trucks. Closure and reclamation of unnecessary roads would reduce fragmentation and restore habitat integrity, while reducing the potential to disturb wildlife.

Road construction causes habitat loss by removing vegetation and compacting surfaces, which can promote soil erosion and runoff into wildlife habitats and degrade them. In addition to direct impacts, roads also contribute to habitat fragmentation and can establish barriers to some wildlife species. For example, Towry (Towry 1984) indicates that roads generally decrease habitat quality for mule deer for a distance of ½ mile either side of the road. Forman et al. (Forman et al. 2003) acknowledge that ungulates and large carnivores generally avoid buffer areas around roads. Forman et al. (Forman et al. 2003) identify mortality, habitat loss, and reduced habitat connectivity as the three ways roads impact wildlife. Wildlife mortality and loss of habitats due to road construction are direct impacts; vehicle speed and traffic volume generally have increased wildlife mortality due to vehicle collisions (Forman et al. 2003).

Special Designations

Management prescriptions for ACECs, national historic and scenic trails, WSRs, and WSAs that reduce or eliminate surface disturbance would beneficially impact wildlife. Protections aimed at conserving vegetation, limiting surface-disturbing and disruptive activities, and preserving wilderness characteristics would result in beneficial impacts to wildlife by preventing disruptive activities in sensitive habitats, and limiting habitat loss, fragmentation, and degradation.

BLM Manual 6330, *Management of Wilderness Study Areas*, which restricts surface-disturbing and other disruptive activities and manages for wilderness characteristics on 55,338 acres would have long-term beneficial impacts on wildlife utilizing habitat in the eight WSAs. Loss or alteration of wildlife habitat would be minimal because only uses that meet the non-impairment criteria would be authorized. Conversely, the management of WSAs requires the use of natural

processes to the extent possible and generally does not allow surface-disturbing activities designed to benefit wildlife habitat, such as vegetative treatments, which could benefit lands in the WSA. Impacts to wildlife would not vary by alternative except for road and trail closure areas, which are addressed in the *Comprehensive Trails and Travel Management* section of this chapter.

Wildlife habitat adjacent to NHTs is also protected from development; however, the distance the protection extends either side of NHTs varies among the alternatives. Further analysis is provided under *Special Designations*.

4.4.6.3.2. Alternative A

4.4.6.3.2.1. Program Management

Management actions under Alternative A include reducing the footprint of surface-disturbing activities and facilities on a case-by-case basis to reduce adverse impacts to wildlife from habitat loss. In addition to protecting elk crucial winter range, Alternative A protects 166,525 acres of general winter range for elk from surface-disturbing and disruptive activities from November 15 to April 30.

Fences would be removed or modified, on a case-by-case basis, to address concerns about habitat fragmentation and limitations to big game movement. Fencing can impede big game movement and animals can become entangled in the wires when crossing the fence. Fencing that does not conform to BLM standards can prevent big game from migrating between seasonal ranges, which could force animals to use poorer quality habitats or result in animal death. Birds can strike fences during flight, which typically causes bird mortality. The development of livestock water projects, including wells, springs, and reservoirs, can beneficially impact wildlife if the water projects are developed in areas where water is scarce and the development does not result in undesirable concentrations of livestock. If projects are developed in sensitive or limited habitats, such as reptile hibernacula, crucial winter range, and parturition areas, the project could result in the long-term loss of habitat around the project site from concentrated livestock use.

Alternative A considers forage requirements needed to meet big game herd objectives on a case-by-case basis when making forage allocations. There can be competition for forage among big game, livestock, and wild horses in areas where animals occupy habitats at the same time or during years when forage production is limited. Alternative A manages vegetation on big game crucial winter range or parturition areas on a case-by-case basis to benefit big game species. When taken, these actions would beneficially impact wildlife and wildlife habitat.

Buffer zones around active raptor nests minimize disturbance impacts to nesting raptors. Alternative A applies a TLS to prohibit surface-disturbing activity within $\frac{3}{4}$ mile of raptor nests from February 1 through July 31, which would protect approximately 301,237 acres around known raptor nests. Some raptor species are more sensitive to disturbance than others and might require larger buffers to ensure they aren't disturbed during the nesting period. Protective buffers help to minimize, but cannot completely prevent, impacts to raptors because most species are mobile beyond these buffers. The impact from habitat degradation and loss would be commensurate with the amount of surface disturbance. Alternative A does not avoid surface-disturbing activities in reptile hibernacula.

Alternative A manages wind-energy development consistent with the Wind Energy Programmatic EIS ROD (BLM 2005a). Limited or sensitive wildlife habitats such as big game crucial winter

range and parturition areas, raptor concentration areas, and greater sage-grouse leks and nesting areas are not specifically excluded from development. Wind turbines and associated infrastructure could make these habitats unusable to wildlife, which could result in localized population declines.

4.4.6.3.2.2. Resources

Lands with Wilderness Characteristics

Alternative A does not apply special management prescriptions for lands with wilderness characteristics. The majority of the lands managed under Alternative A lie within the existing Whiskey Mountain ACEC and are subject to ACEC management.

Fire and Fuels

It is anticipated that 300 acres per year would be treated through the use of prescribed fire and 500 acres would be treated using mechanical treatment methods to address fuels and fire concerns. Prescribed fire and mechanical treatments would beneficially and adversely impact wildlife. In situations where the fire is intense, temperatures could be high enough to destroy both the plants and the soil fertility on which the plants depend. Fire that removes the majority of timber and shrubs in habitats would result in long-term adverse impacts due to the length of time it takes for new timber or shrubs to establish and grow. However, in low-intensity, lower-temperature fires, plants might be only top-killed and could resprout with greater vigor. Fuels reduction through low-intensity burning also could beneficially impact wildlife by preventing loss of habitat from large landscape-level wildfires.

Alternative A allows full suppression strategies for wildland fire, including soil-disturbing activities, on a case-by-case basis. Full fire suppression in areas of sensitive wildlife habitats would result in indirect beneficial impacts to wildlife habitat in the short term; however, without the use of fire to regenerate plant communities, there could be long-term deterioration of wildlife habitat in full suppression areas. Suppression that includes the use of heavy equipment to construct fire lines would likely remove topsoil, which can affect a disturbed site's ability to reestablish vegetation, resulting in long-term loss of habitat. Vehicles and equipment that disturb soil can facilitate the establishment or spread of INNS on disturbed sites, reducing habitat quality for wildlife. Impacts to wildlife would be less if post-fire vegetation seeding is performed and reclamation is successful.

Fire suppression activities (e.g., vehicles, heavy equipment, pedestrians, and aircraft) could displace species that are sensitive to disturbance, such as roosting or nesting birds. Fire suppression activities in fish and amphibian habitats also could harm populations of these species as a result of the application of toxic fire-fighting chemicals in riparian-wetland areas. In addition, roads or other surface disturbance associated with fire suppression activities would likely increase sedimentation rates into riparian-wetland habitats.

Vegetation

Alternative A manages forests and woodlands in response to forest health, wildlife habitat, and demand for forest products. Forest insect and disease outbreaks are managed on a case-by-case basis and a variety of silviculture techniques are utilized to manage forest health and protect resource values, including wildlife habitats. Alternative A restricts clear-cuts to 25 or fewer acres and prohibits them within 100 feet of riparian-wetland areas. Restricting the size of clear-cuts would protect the amount of elk security cover that could be affected at any one time and reduce

the potential for soil erosion. The riparian-wetland buffer would capture soil that moves off treated areas, protecting riparian-wetland habitats for use by wildlife. Areas affected by treatment would be replanted if vegetation does not regenerate naturally. Forest management practices under Alternative A would result in short-term adverse impacts to wildlife, but also would result in long-term beneficial impacts by treating insect and disease outbreaks, protecting riparian-wetland areas, and replanting affected areas, which ultimately improves habitat for wildlife.

Alternative A limits forest product sales, including sawlogs, posts and poles, firewood, Christmas trees, and burlwood, to the Green Mountain, Lander Slope/Red Canyon, South Pass, and Dubois areas. Tree or firewood cutting during sensitive seasonal periods for wildlife (e.g., winter and nesting) can cause nest abandonment or animal displacement. Timber harvest practices could lead to short-term impacts from increased human presence and wildlife harassment. Forest product removal can also increase hunting success by reducing hiding cover. Long-term impacts would include loss of security and calving cover, and displacement of elk to other portions of the habitat for long periods. Alternative A timber management activities would improve big game habitat by improving age class diversity and distribution, edge effect, and forage diversity.

Alternative A manages grasslands and shrublands to achieve the vegetation attributes described in the NRCS Ecological Site Descriptions. These attributes include the appropriate plant composition for the site and the pounds of forage the site should produce. Alternative A would beneficially impact wildlife, because site descriptions include a balance of grasses, forbs, and shrubs that would provide forage, security, and thermal cover needed for wildlife species in all statutory categories. On a case-by-case basis, soil and vegetation treatments would be used to increase rangeland forage production. Historically, treatments have predominantly focused on increasing grass production that has a beneficial impact on grazing animals including livestock, wild horses, elk, and bighorn sheep. Increasing grass production could reduce the amount of shrubs present on the site, which could result in adverse impacts to sagebrush-obligate and other shrub-obligate species, including small game, game birds, trophy game, reptiles, neotropical migrants, pronghorn, and mule deer.

Riparian-Wetland Areas

The BLM manages riparian-wetland areas to meet PFC and utilizes various site-specific management actions to move areas toward PFC where needed. Management actions include water developments in upland habitats to draw grazing animals away from riparian-wetland areas, exclusionary fences to eliminate use by livestock, wild horses, and some species of wildlife, and frequent herding of livestock away from the problem areas. These actions are anticipated to ultimately result in a riparian-wetland system with increased vegetation and structural diversity, leading to an increase in abundance and diversity of wildlife, particularly neotropical migrants. Although this management would improve wildlife habitat, because the PFC assessment methodology does not incorporate the habitat requirements of wildlife, additional management might be necessary to ensure that habitats provide conditions suitable to meet the life history requirements of various wildlife species. Alternative A prohibits surface-disturbing activities within 500 feet of water and riparian-wetland areas, which would beneficially impact wildlife by conserving vegetation and valuable habitat for multiple species occurring in or downstream of these areas.

Fish and Special Status Species

Alternative A allows BLM actions that result in the removal or depletion of water in fish-bearing streams on a case-by-case basis. There would be adverse impacts if projects are developed that

substantially reduce water availability needed for wildlife, including amphibians, to meet their habitat needs.

Alternative A requires, on a case-by-case basis, surveys to determine presence or absence of BLM sensitive species be completed prior to authorizing actions on public land. If species are present, measures are required to protect the species and limit adverse impacts to their habitat. Beneficial impacts to other wildlife using these same habitats would occur if mitigation measures were applied. Surface-disturbing and disruptive activities are prohibited on or within ¼ mile of occupied greater sage-grouse leks and avoided in greater sage-grouse nesting habitat within 2 miles of occupied leks from February 1 to July 31. This action would provide long-term protection of 16,283 acres of lek habitat and short-term protection of 794,452 acres of nesting habitat on public surface. Protections that eliminate habitat loss or restrict activities during sensitive breeding and birthing periods would result in beneficial impacts to many sagebrush-obligate wildlife species that use these same habitats. Alternative A management prescriptions do not vary by greater sage-grouse Core Area or non-Core Area.

Alternative A allows water developments and new fences to be constructed in greater sage-grouse nesting habitats on a case-by-case basis. Livestock water projects can adversely impact the quantity of hiding cover available for songbirds and small mammals by facilitating increased harvest of standing grasses. Development of water can also beneficially impact wildlife by providing additional watering areas in arid areas. Fences can be hazardous to birds and big game movement because the animals can strike or become entangled in the fence wires, which usually results in severe injury or death.

Wild Horses

Alternative A does not specifically establish travel loops to facilitate wild horse viewing, and considers wild horse movement and genetic diversity for fencing decisions in HMAs. Where applied, decisions that limit or modify fences in HMAs would beneficially impact wildlife movement in the same areas.

Cultural and Paleontological Resources

Alternative A protects cultural and paleontological resources in the Warm Springs Canyon Flume area, around sacred and TCPs, and in the Beaver Rim and Bison Basin areas from surface-disturbing activities. Actions that prevent surface disturbance and subsequent habitat loss near these sites would beneficially impact wildlife. Management of cultural and paleontological resources that includes excavation would adversely impact wildlife, but that impact would be minimal (60 acres during the planning period).

4.4.6.3.2.3. Resource Uses

Minerals

Alternative A opens most of the planning area (99 percent) to locatable mineral exploration and development. Uranium and bentonite have the greatest potential to be present in the planning area. These minerals are not found throughout the planning area, but are generally limited to the Lander Slope/Red Canyon, Gas Hills, and Green Mountain areas. Where there are exploration and mining activities, so would there be adverse impacts to wildlife and their habitats. There is little opportunity under the 1872 General Mining Law to prevent or mitigate adverse impacts to wildlife other than for species listed under the ESA. Under Alternative A, mining activities

would result in the loss, fragmentation, and modification of predominantly grassland/shrubland and forest/woodland habitats, loss of nests and young, mortality of less mobile animals, and displacement and disturbance from equipment noise, vehicles, and human presence. Alternative A closes approximately 16,004 acres of big game crucial winter range and 338 acres of big game parturition habitat to locatable mineral entry. The amount of habitat lost, fragmented, or altered would depend on the scale of mining activities.

Under Alternative A, the requirement for Plans of Operation for mining activities in the Lander Slope, Red Canyon, Dubois Badlands, Beaver Rim, Green Mountain, and South Pass Historic Mining Area, and NHTs ACECs would result in beneficial impacts to wildlife in these areas. A Plan of Operations gives the BLM some opportunity to mitigate surface disturbance and the impacts of project timing with the project proponent.

Alternative A withdraws a total of 22,322 acres of federal mineral estate in big game crucial winter range and elk and bighorn sheep parturition areas to locatable mineral exploration. These withdrawals would beneficially impact wildlife by ensuring habitat is not lost due to mining activities. There are two existing locatable mineral withdrawals for 11,040 acres of mineral estate in the Whiskey Mountain ACEC to protect bighorn sheep crucial winter range. Alternative A recommends that these withdrawals, implemented in 1990 and 2000 for a period of 20 years, be extended when they expire. There are three existing withdrawals covering 13,967 acres of surface and subsurface minerals in the East Fork ACEC. These acres were withdrawn to protect elk and bighorn sheep winter range and capital investments made by the WGFD in the area. Two of these withdrawals were implemented in 1953 and 1969 (pre-FLPMA) and do not expire. The third withdrawal was implemented in 1993 for a period of 20 years and Alternative A pursues an extension of the withdrawal.

Alternative A opens a total of 2,280,345 acres (95 percent) of public land in planning area to geothermal leasing and opens 2,380,925 acres (99 percent) of the public land in the planning area to oil and gas leasing. It is anticipated that approximately 770 acres would be disturbed each year under Alternative A through oil and gas development activities, 400 acres of which would be long-term. There would no additional acres disturbed through geothermal leasing under Alternative A. Alternative A applies a TLS for active raptor nests, big game crucial winter range, elk winter range, and big game parturition areas, which would result in short-term beneficial impacts. Alternative A opens 609,631 acres of big game crucial winter range and big game parturition habitat (25 percent of the planning area), which would result in surface disturbance from development activities and new road construction; this would adversely impact big game habitat. Lands open, including crucial winter range and parturition habitat, are subject to an NSO stipulation, which would result in long-term beneficial impacts to big game and other wildlife species occupying the same habitats. TLS and NSO stipulations would protect wildlife from impacts that result in physiological stress and the loss or abandonment of young or nests. Surface-disturbing activities allowed during the stipulated period would likely disturb and displace wildlife in the short term. Surface disturbance occurring outside stipulated period would cause habitat loss and fragmentation in these same habitats, and would result in long-term adverse impacts.

Large-scale development would result in greater levels of habitat loss and fragmentation because there would be more roads, pipelines, well sites, and powerlines than with wildcat wells or isolated small fields. Developments could adversely impact linkages between habitat patches needed to ensure connectivity of populations. Large-scale habitat loss and fragmentation

combined with the increased level of human presence, vehicles, and infrastructure could cause wildlife to avoid the area, which would result in long-term adverse impacts.

Seasonal protections from surface-disturbing and disruptive activities do not apply to the maintenance and operation of oil and gas wells and facilities unless specifically identified in the project analysis and applied as a COA on the permit. These activities can stress and disturb wildlife during sensitive periods (e.g., winter and nesting) and would result in short-term and long-term adverse impacts. Alternative A closes and reclaims roads determined to be redundant and that contribute to higher than desired road densities or habitat fragmentation on a case-by-case basis. Habitat previously lost to road disturbance or avoided by big game, particularly elk, would be returned to usable habitat. This would result in long-term beneficial impacts to wildlife species in all statutory categories. Road development for permitted activities in sensitive or limited habitats (i.e., crucial winter range and parturition areas) can result in long-term habitat loss and avoidance by wildlife.

Alternative A opens the entire planning area to geophysical activities subject to COAs to protect wildlife. Areas closed to mineral leasing would likely not be authorized for geophysical activities due to incompatible resource values.

Alternative A opens a total of 2,240,104 acres (94 percent of the planning area) to phosphate leasing. It is expected that phosphate leasing and extraction could occur on approximately 42,291 acres identified as having potential for phosphate that are open to leasing. Alternative A closes phosphate leasing on 154,106 acres of federal mineral estate in ACECs and on lands within 500 feet of riparian-wetland areas. Alternative A opens 372,035 acres of crucial winter range and 157,445 acres of raptor nesting habitat having phosphate leasing potential; this would adversely impact wildlife if leases were developed. The greatest potential for phosphate development overlaps crucial winter range for big game, primarily elk and mule deer. The Lander Slope, Sheep Mountain, and Schoettlin Mountain areas support large concentrations of wintering elk and mule deer, and impacts from phosphate development would severely reduce the amount of crucial winter range available to support these herds. Development of leases in crucial winter range would result in the long-term, if not permanent, loss of habitat because the area would be stripped of vegetation and soil. Elk and mule deer populations would likely decline with the loss of suitable habitat. Closing the Red Canyon ACEC to mineral leasing would benefit elk and mule deer using crucial winter range and wildlife using riparian-wetland habitats in the area. Alternative A management of phosphate leasing in the Lander Slope ACEC offers some protections, but Alternative A does not close the area to phosphate leasing.

Alternative A opens 2,165,196 surface acres (90 percent of the planning area) to mineral material disposals. Of these acres, 494,892 overlap big game crucial winter range and parturition habitat, and 278,268 acres are in raptor nesting habitats. Alternative A closes 229,014 acres to mineral material disposals, primarily in riparian-wetland areas and in greater sage-grouse leks, and habitat loss in these areas would not be attributed to mineral materials disposals. Closing areas in sensitive wildlife habitats would result in long-term beneficial impacts to many species of wildlife.

Lands

In general, land acquisition or disposal actions would consider land tenure adjustment criteria with the goal that the exchange, acquisition, or disposal would increase public benefits, including wildlife resources. Any acquisition of land that includes high-value habitat can result in beneficial impacts to wildlife by maintaining or enhancing the habitat using BLM management restrictions or mitigation for surface-disturbing and disruptive activities. Any disposal of BLM-administered

land with high-value habitat is typically avoided; such disposals could increase the risk of habitat loss through development activities because there would not be any BLM-required mitigation. Lands no longer administered by the BLM could also experience increased human presence that can increase disturbance to wildlife utilizing the area. All land tenure actions are analyzed site specifically, using a public process, to determine the public interest before making a decision. Consolidating land ownership through land tenure adjustments increases the manageability of lands and results in more contiguous blocks of habitat, which would beneficially impact wildlife. Alternative A identifies 8,573 acres for disposal by sale, exchange, or other methods, and makes an additional 1,475 acres available with restrictions on future use. Many of the lands with restrictions are in, or adjacent to, the East Fork and Whiskey Mountain ACECs and would require management similar to the adjacent lands. Access is a primary goal in land tenure adjustments, which could adversely impact wildlife by increasing human activity in areas currently inaccessible to the public.

Renewable Energy

Alternative A opens 2,113,512 acres (88 percent of the planning area) to wind-energy development consistent with the Wind Energy Programmatic EIS (BLM 2005a). It is expected that wind energy would not be developed universally across the planning area, but only in areas identified as having high wind-energy potential. Allowing wind-energy development would create collision hazards for bats and avian species because they can collide with wind turbine blades, resulting in mortality of individual animals. Bats can also be killed from internal injuries related to rapid pressure changes caused by the turbine blades. Wind-energy facilities result in habitat loss and human disturbance through construction and maintenance of wind towers and associated facilities, including high-voltage transmission lines. Wind-energy infrastructure is considered permanent on the landscape, and therefore would result in permanent loss and fragmentation of wildlife habitat. Alternative A management actions that avoid or exclude wind-energy development on 280,697 acres would beneficially impact wildlife.

ROWs and Corridors

Alternative A opens 2,188,294 acres (91 percent of the planning area) to ROWs. Alternative A manages 205,916 acres as ROW exclusion areas, of which 134,606 acres are in big game crucial winter range or parturition areas, primarily in the Whiskey Mountain, East Fork, Red Canyon, and Sweetwater Rocks areas, and along the NHTs. This management would beneficially impact wildlife in the long term, particularly in areas with sensitive or limited habitats; it prohibits surface disturbance or aboveground structure ROWs that could result in the loss and fragmentation of habitats or become hazards to wildlife. Alternative A identifies 66,099 acres as ROW avoidance areas, which offers less protection from habitat loss and fragmentation than exclusion areas; however, large ROWs are generally not authorized in avoidance areas. Alternative A avoidance areas are in big game crucial winter range and parturition habitats, primarily in the Lander Slope, South Pass, Beaver Rim, and Green Mountain areas, which would result in long-term beneficial impacts to wildlife. The only utility corridor designated under Alternative A is the Energy Corridor 79-216 north of Lysite. Alternative A co-locates major ROWs with existing utilities on a case-by-case basis to minimize surface disturbance. Co-locating utility lines would result in long-term beneficial impacts to wildlife by eliminating or reducing surface disturbance in intact habitats. Because Alternative A does not mandate co-location or close other areas to major ROWs, there could be additional new routes, which would adversely impact wildlife through the loss or fragmentation of habitats.

Livestock Grazing Management

Alternative A allows livestock grazing on 2,324,934 acres (97 percent) of public land suitable for grazing in the planning area. It does not allow livestock grazing on 69,276 acres (3 percent of the planning area), including on previously closed allotments (which do not vary by alternative) and remaining lands deemed unsuitable for grazing (e.g., rock outcrops and roads). Of the lands open to grazing, 4,021 acres in the East Fork and Dubois Badlands area have not been actively grazed since 1993 because these lands were associated with private lands purchased by the WGFD for the Spence/Moriarity Wildlife Management Area (WMA). Most livestock grazing in the planning area is by cattle, and areas open to grazing overlap 60,232 acres of crucial winter range for elk and 6,848 acres of crucial winter range for bighorn sheep. Cattle grazing on elk and bighorn sheep crucial winter range predominantly occurs during spring, summer, and fall; therefore, direct spatial impacts would be limited. Livestock forage utilization would directly impact the forage available for wintering elk and bighorn sheep. Winter sheep grazing typically overlaps pronghorn winter and crucial winter range in the planning area and would adversely impact the quality and quantity of shrubs available for wildlife. Activities related to sheep herding (the presence of humans and dogs) would displace wildlife. Livestock forage utilization levels would be established on a case-by-case basis under Alternative A, which typically manages forage use to not exceed moderate utilization. There would be no direct competition for forage between livestock and wildlife on closed lands, which would beneficially impact wildlife. Alternative A prohibits salt or mineral supplements within $\frac{1}{4}$ mile of riparian-wetland habitats to prevent livestock congregation at water sources. This management action would beneficially impact wildlife species requiring riparian-wetland areas for water, forage, and hiding cover.

Range improvements can change livestock grazing patterns and alter the way wildlife use their habitats. Alternative A allows range improvements on a case-by-case basis, and it is expected that new projects would disturb approximately 43 acres each year during construction and/or development of projects. It is assumed that approximately two reservoirs and/or pits, three wells, two spring developments, and 15 miles of fence would be constructed each year during the planning period. New water developments constructed in big game crucial winter range would modify natural movement patterns, potentially leading to reduced quantity and quality of available forage for big game the following winter. Water can draw livestock into areas either not previously used or under-utilized, which can increase plant utilization and potentially alter the plant composition in these areas but could benefit vegetation in other areas. New fences would add to the 2,285 miles of existing fence on public lands in the planning area that can adversely impact wildlife movement and be a hazard to flying birds. Fences impede wildlife movement if they are not constructed to wildlife-compatible standards and even then, fences can adversely impact wildlife, particularly when considered on a cumulative basis. Existing fences having net wire, five or six wires, or wires too tall for wildlife to safely jump can prohibit big game movement and prevent wildlife from reaching seasonal habitats. Under Alternative A, fences and cattleguards would be modified or removed on a case-by-case basis to facilitate wildlife movement.

Recreation and Travel Management

Under Alternative A, there would be adverse impacts to wildlife from increased human activity along NHTs, the CDNST, and in areas surrounding developed recreation sites and campgrounds in the South Pass and Green Mountain areas, because wildlife tend to avoid areas having people, pets, and noise. Recreation activities during breeding and birthing/nesting periods can cause animals to abandon their nests and/or young. Lands around the developed recreation sites and campgrounds encompass 724 acres and are withdrawn (pre-FLPMA) from locatable

mineral exploration and development under Alternative A. Alternative A does not apply special management prescriptions for intensive recreation areas, including Johnny Behind the Rocks, The Bus @ Baldwin Creek, Sinks Canyon climbing area, Dubois Mill Site, the Sweetwater River WSA, Sweetwater Rocks, and the Coal Mine Draw area, and manages these areas as a planning area-wide ERMA. Alternative A management is directed at protecting resources, which would result in some beneficial impacts to wildlife habitat by addressing adverse impacts from mechanized or motorized vehicle use, camping, rock climbing, and hiking.

Alternative A limits motorized travel predominantly to existing roads and trails on 2,226,504 acres (93 percent of the planning area), including the East Fork, Beaver Rim, South Pass Historic Mining Area, and NHTs ACECs. Alternative A allows OHV use off existing roads and trails to perform necessary tasks such as retrieving big game kills, repairing range improvements, and conducting mineral exploration activities where surface disturbance is less than 5 acres. Alternative A limits 163,075 acres (7 percent of the planning area), primarily in the Whiskey Mountain, Lander Slope, Red Canyon, and Green Mountain ACECs, to designated roads and trails. Areas where travel is limited to designated roads and trails reduces road density and habitat fragmentation and road proliferation in sensitive habitats, more than areas where travel is limited to existing roads and trails. If frequent OHV use occurs during critical periods (e.g., winter and birthing), adverse impacts to wildlife would increase, potentially leading to decreased health, mortality to individuals, or overall population declines. Alternative A closes a total of 5,923 acres (0.2 percent of the planning area) to motorized travel in the Dubois Badlands ACEC. Areas closed to motorized travel would beneficially impact wildlife by eliminating habitat loss caused by roads and reducing vehicle disturbance to animals using the area. Alternative A subjects a total of 111,002 acres (0.5 percent of the planning area) to seasonal travel closures, which would be implemented predominantly on Green Mountain and in the Lander Slope, Red Canyon, and Whiskey Mountain ACECs. In addition, Alternative A closes 14,729 acres in the Red Canyon area to over-snow travel, including motorized and nonmotorized use. These seasonal closure areas overlap big game winter range and parturition areas, which would result in direct beneficial impacts to wintering elk and bighorn sheep. The Red Canyon area supports a large population of elk during winter and is a desired area to collect shed antlers. The over-snow travel closure would protect big game from disturbance and harassment from over-snow vehicles during the stressful winter and spring months.

4.4.6.3.2.4. Special Designations

Alternative A designates nine ACECs totaling 119,622 acres (5 percent) in the planning area, which would protect wildlife and associated habitat from surface-disturbing activities and related disruptive activities. ACEC management includes (1) closing lands or applying NSO stipulations for mineral leasing, (2) requiring a Plan of Operations for locatable mineral development and maintaining locatable mineral withdrawals in the Whiskey Mountain and East Fork ACECs, (3) prohibiting or limiting motorized vehicle use, and (4) avoiding major ROWs. Potential adverse impacts to wildlife could be mitigated to some degree from the requirement for a Plan of Operations before locatable mineral exploration in an ACEC. This requirement would allow the BLM an opportunity to identify and address potential impacts to wildlife with the mining proponent; however, the 1872 General Mining Law gives preference to the mining proponent over the protection of wildlife habitat.

The Whiskey Mountain, East Fork, and Red Canyon ACECs are in, or adjacent to, WGFD's Whiskey Basin, Inberg/Roy, and Red Canyon WHMAs and the Spence/Moriarity WMA, all of which were established to protect and provide big game crucial winter range. BLM management

of the ACECs complements WGFD management of its lands, and all the lands together provide the majority of the big game winter range in these areas. Alternative A manages the Whiskey Mountain and East Fork ACECs to provide the greatest degree of habitat protection (closed to oil and gas and other mineral leasing, withdrawn from locatable mineral entry, and avoided for major ROWs) and prevent habitat loss and fragmentation on irreplaceable winter range. Alternative A manages the Red Canyon, Lander Slope, and Green Mountain ACECs with less restrictive prescriptions (NSO for mineral leasing, open for locatable mineral entry, and avoided for major ROWs). In addition, Alternative A closes big game crucial winter range in the Red Canyon ACEC to phosphate leasing. These management prescriptions would result in long-term beneficial impacts to wildlife. Alternative A manages the WSA lands in the Dubois Badlands ACEC in accordance with BLM Manual 6330, *Management of Wilderness Study Areas* and manages lands with wilderness characteristics with standard stipulations. WSA lands receive a higher degree of habitat protection than lands with wilderness characteristics; therefore, habitat could be lost or fragmented on lands with wilderness characteristics. Alternative A closes the East Fork ACEC and much of the Whiskey Mountain ACEC to livestock grazing to make all forage available for wildlife. Alternative A seasonally closes the Whiskey Mountain, Red Canyon, and Green Mountain ACECs to vehicle travel during winter to protect big game from disturbance that could cause additional stress. The East Fork ACEC is essentially closed to vehicle travel during winter because the surrounding WGFD lands in the Inberg/Roy WHMA are closed. Management actions under Alternative A would result in direct long-term beneficial impacts to big game species, primarily bighorn sheep, elk, and mule deer, and to wildlife species in all the other statutory categories that utilize these areas.

Alternative A management actions for a portion of the Beaver Rim ACEC are less restrictive to minerals, ROW, and surface-disturbing activities that could result in long-term loss or fragmentation of wildlife habitat. The ACEC is designated in part to protect raptor nesting habitats, and activities that would alter suitable nest or perch sites would likely cause raptors to avoid the area. Protections aimed at limiting surface-disturbing activities in the South Pass Historic Mining Area and NHTs ACECs would result in beneficial impacts to wildlife in these areas.

NHTs do not impact wildlife. However, to the extent that Alternative A restricts surface-disturbing and development activities within ¼ mile either side of trails, this management would beneficially impact wildlife habitat for species in all the statutory categories. Alternative A does not specifically manage lands adjacent to the CDNST; therefore, there would be no direct beneficial impact to wildlife species. Alternative A does not specifically manage NWSRS-eligible waterway segments along approximately 21 miles in the Baldwin Creek and the Sweetwater River with WSR-specific prescriptions, but manages them in accordance with the Lander Slope ACEC and Sweetwater Canyon WSA prescriptions, respectively. ACEC and WSA management that protects the overall stream values and maintains habitat in its present condition would beneficially impact wildlife.

Overall, Alternative A management prescriptions would result in long-term beneficial impacts to wildlife on 169,229 acres (7 percent) of the planning area. Wildlife on adjacent non-federal lands in the Whiskey Mountain, East Fork, Lander Slope, and Red Canyon areas would likely experience similar beneficial impacts because of the management of adjacent BLM-administered lands and the presence of several private land conservation agreements.

4.4.6.3.3. Alternative B

4.4.6.3.3.1. Program Management

In all cases, Alternative B requires surfacing-disturbing activities and facilities to have the smallest footprint practical so as to minimize the impacts of wildlife habitat loss and fragmentation and avoids such disturbances within 1,000 feet of identified reptile hibernacula. The BLM would work with project proponents to identify ways to minimize the size of surface disturbances, such as reducing pipeline construction widths, utilizing multi-well pads and directional drilling, and co-locating communication sites. This action would limit the overall number of acres disturbed and number of surface facilities on the landscape, which would reduce adverse impacts to wildlife from habitat loss and fragmentation. Alternative B would result in greater beneficial impacts to wildlife than Alternative A.

Alternative B excludes wind-energy development in big game crucial winter range and parturition areas, raptor concentration areas, and within 3 miles of greater sage-grouse leks. The *Special Status Species – Wildlife* section describes additional greater sage-grouse wind energy management actions. Wind-energy developments have large footprints and require a large number of acres to accommodate facilities, powerlines, and roads. Prohibiting developments in limited and sensitive habitats would result in greater beneficial impacts to wildlife under Alternative B than under Alternative A.

The TLS afforded to big game crucial winter range and elk winter range is the same as Alternative A, but Alternative B extends the TLS for active raptor nests from $\frac{3}{4}$ mile to 1.5 miles and designates specific dates for each raptor species. Alternative B protects 480,406 more acres during the raptor nesting period than Alternative A which would beneficially impact non-raptor nesting birds. Alternative B would result in greater beneficial impacts to raptors than Alternative A. Specifying nesting dates by raptor species would likely shorten the timing restriction period for surface-disturbing and disruptive activities compared to the Alternative A period which encompasses all nesting dates for raptor species. There would be no difference in impacts from raptor nesting dates between alternatives A and B, except for the burrowing owl and northern goshawk, whose nesting periods are not encompassed by the dates under Alternative A. Alternative B management would result in greater beneficial impacts to nesting burrowing owls and northern goshawks; these species are further discussed in the *Special Status Species – Wildlife* section.

Alternative B prohibits new road development in big game crucial winter range and parturition areas, unless it is determined that there would be no adverse impacts to big game species. Protecting sensitive habitats from loss or fragmentation would result in long-term beneficial impacts to wildlife. Reducing or eliminating vehicle traffic during the winter and birthing periods would limit animal displacement and stress. Under Alternative B, roads and trails identified as redundant in areas or where road densities are too high to maintain quality wildlife habitat would be closed and reclaimed. Habitat previously lost to road disturbance or avoided by big game, particularly elk, would be returned to usable habitat. These actions would result in long-term beneficial impacts to wildlife species. Reducing the number and miles of road in an area would reduce wildlife-vehicle collisions, habitat loss, and habitat fragmentation. Alternative B roads management would have greater long-term beneficial impacts to wildlife than Alternative A.

Alternative B does not allow new fences to be constructed unless necessary to address human safety issues, needed to exclude and/or protect wildlife, or where determined to not impact

wildlife resources. Existing fences would be removed, when appropriate, to reduce habitat fragmentation and facilitate big game movement. Fencing that does not conform to BLM standards can prevent big game from migrating between seasonal ranges and force animals to use poorer quality habitats or cause animal mortality. Wildlife habitats currently unfragmented by fencing would remain unfragmented under Alternative B, and limiting and/or removing the number of fences in migration corridors would reduce risks associated with animals jumping over or crossing under fence wires. Alternative B management actions regarding fences would result in greater long-term beneficial impacts to wildlife than Alternative A.

Alternative B prohibits livestock water development projects in big game crucial winter range and parturition areas. Water developments, which can increase the amount of livestock forage harvest, could adversely impact wildlife if plant utilization increases substantially. Wildlife depend on vegetation being available, appropriate to the wildlife species, and in ample quantities to meet winter forage demands and nutritional needs in these limited habitats. Alternative B management would result in greater long-term beneficial impacts to wildlife than Alternative A.

Management under Alternative B would adjust livestock and wild horse forage allocations, where necessary, to make available the forage needed to meet big game herd objectives. Alternative B would reduce authorized livestock AUMs as necessary and would manage wild horse numbers at the lower end of the appropriate management level to provide forage for wildlife. Alternative B would manage forage utilization at a lower use level than Alternative A to ensure adequate vegetation remains for wildlife and plant health. Alternative B manages vegetation on big game crucial winter range and parturition areas to benefit the big game species requiring the range. These actions would result in greater long-term beneficial impacts to wildlife than Alternative A.

4.4.6.3.3.2. Resources

Lands with Wilderness Characteristics

Alternative B manages approximately 5,490 acres of the Little Red Creek Complex as non-WSA land with wilderness characteristics, and manages the area to protect wilderness characteristics. Through overlapping management of the Whiskey Mountain ACEC, most of the area is closed to mineral development, mining, livestock grazing and excluded from ROW development. These prescriptions would conserve wildlife habitat in these areas. Closing the areas designated as non-WSA lands with wilderness characteristics not located in the Whiskey Mountain ACEC to motorized and mechanized travel and managing them for naturalness and solitude would have beneficial impacts to resident wildlife species in all statutory categories. Habitats would remain unfragmented by roads under Alternative B, which would result in long-term benefits to wildlife. Occasional human presence and activity could result in short-term wildlife displacement.

Fire and Fuels

Under Alternative B, there would be approximately 1,000 acres of prescribed fire and 1,500 acres of mechanical treatment conducted each year to address rangeland fire and fuel concerns. Impacts would be the same as under Alternative A, but would occur on more acres. Assuming these treatments were carefully planned and implemented, there would be beneficial impacts to wildlife habitat by reducing the risk of wildfire, which would likely result in more adverse impacts than beneficial impacts. Fuels and fire management under Alternative B would use full suppression tactics, including the use of heavy equipment to address wildland fire, but only in high-priority areas for resource protection (identified WUI areas, developed recreation sites, areas of known

cultural resources, and aboveground utility ROWs). Except for areas with known cultural sites, the other areas typically have limited value to wildlife; therefore, adverse and beneficial impacts to wildlife would be minor. Alternative B could result in increased risks to wildlife from landscape-level fires that would have both short-term and long-term adverse impacts to wildlife.

Vegetation

Alternative B focuses on letting forests and woodlands evolve naturally without using most traditional silviculture techniques, except in areas with public safety concerns or where forest health goals cannot be met. Forest management plans would be developed for the Green Mountain, Lander Slope/Red Canyon, South Pass, and Dubois areas to address forest product sales and management of forest insect infestations. Forest insect and disease outbreaks would be managed to address safety concerns primarily in WUI areas and around developed campgrounds. Wildlife typically avoid using forest habitats in WUI areas and campgrounds due to increased human presence and activity, noise, and pets. Not managing disease outbreaks can result in long-term loss of forest/woodland habitat. Areas affected by treatment would be replanted to meet forest health goals on a case-by-case basis, which would result in long-term beneficial impacts to wildlife dependent on timbered areas to meet all or part of their seasonal requirements. Alternative B does not allow forest product sales in the Lander Slope/Red Canyon and South Pass areas unless they are necessary to address public safety or are identified for wildlife habitat improvement. These areas contain sensitive habitats for wintering big game, trophy game, small game, raptors, and neotropical migrants. Less disturbance caused by noise and increased human presence related to tree or firewood cutting during sensitive seasonal periods would beneficially impact wildlife.

Alternative B manages grasslands and shrublands for biological diversity and to benefit wildlife, not necessarily to meet NRCS Ecological Site Descriptions. Management would focus on plant communities that improve wildlife habitat, such as managing for more shrubs on sites than identified in the NRCS Ecological Site Descriptions. Soil and vegetation treatments would be used where needed to improve plant diversity on the sites. Diverse plant communities would beneficially impact wildlife because each species has its own particular forage and cover requirements; generally the more diverse the habitat, the more species of wildlife it can support. Beneficial impacts to wildlife would be slightly greater under Alternative B than Alternative A, because wildlife needs would be the focus for managing grassland and shrubland habitats.

Riparian-Wetland Areas

Alternative B prohibits surface-disturbing activities within ¼ mile of surface water, riparian-wetland areas, playas, and delineated 100-year floodplains. This action would protect 820 more feet of habitat adjacent to or surrounding these areas from surface-disturbing activities than Alternative A, or a total of 125,403 more acres across the planning area. Habitats remaining available and unfragmented would result in direct beneficial impacts to wildlife.

Unlike Alternative A, which incorporates all types of management, including infrastructure to improve riparian-wetland health, management under Alternative B focuses on using the natural healing capacity of sites and reduced levels of livestock grazing to improve riparian-wetland areas toward PFC. Infrastructure-based projects, primarily offsite water developments and protective fencing, is de-emphasized and management actions, including closing roads, applying stipulations, and changing livestock grazing management, are emphasized. Less riparian-wetland fencing that can be a hazard to birds and wildlife or restricts access of some species of wildlife to riparian-wetland habitats would result in long-term beneficial impacts to wildlife. Using a natural healing approach could require a longer time period to achieve riparian/wetland improvement than

using projects but the healing time would depend on how quickly changes in management occur. Alternative B road closures and subsequent reclamation would beneficially impact wildlife by improving habitat and water quality. Closure and reclamation of unnecessary roads could reduce fragmentation and restore habitat integrity, while reducing the potential for wildlife disturbance.

Fish and Special Status Species

Alternative B prohibits new BLM projects that would result in the removal or depletion of water from fish-bearing streams, and would remove existing projects that affect sustainability of populations of fish species. Alternative B also requires surveys and subsequent mitigation, if required, for all BLM Sensitive Species in a project area before authorizing surface-disturbing and disruptive activities. Protection measures implemented for Sensitive Species would likely result in beneficial impacts to wildlife using the same area. For both of these management actions, Alternative B would result in greater beneficial impacts to wildlife than Alternative A, which implement the actions only on a case-by-case basis.

Alternative B prohibits livestock water development projects in greater sage-grouse nesting areas, which would prevent heavy grazing utilization and make more vegetation available to wildlife in those areas. Alternative B prohibits surface-disturbing and disruptive activities within 0.6 mile of occupied or undetermined greater sage-grouse leks, which also protects habitat for other wildlife utilizing the same area. Alternative B protects 93,410 acres of habitat on public surface lands over the long term, which represents an almost 600 percent increase in habitat protected over Alternative A. Alternative B avoids surface-disturbing and disruptive activities from February 1 to July 31 within 3 miles of occupied greater sage-grouse leks, equating to approximately 1,339,609 acres of public surface lands. This seasonal protection would have a beneficial impact on many other species of sagebrush-obligate neotropical migrants nesting in these habitats. Alternative B protects 69 percent more acres of nesting habitat (794,452 acres) in the short term than Alternative A. Alternative B closes the designated greater sage-grouse Core Area to oil and gas leasing, which would beneficially impact other wildlife species by eliminating habitat loss and animal disturbance/displacement from development and operations activities. Overall, Alternative B would result in greater beneficial impacts to wildlife from the larger buffer areas and the closure of the greater sage-grouse Core Area to oil and gas leasing than Alternative A.

Wild Horses

Alternative B wild horse management would result in direct beneficial impacts to big game, game birds, raptors, and neotropical migrants because fences would be removed or modified to facilitate free movement among wild horse herds. Removing fences would reduce hazards to big game animals and birds. Modifying fences to allow wild horse movement would facilitate big game movement that might otherwise be limited or restricted. Establishing viewing loops for wild horses would result in displacement of wildlife using areas adjacent to the loop road from vehicle use and human presence, but wildlife should return once vehicles have left the area.

Cultural and Paleontological Resources

The area of protection surrounding cultural and paleontological resources increases under Alternative B, which would increase the amount of wildlife habitat protected near these sites. Alternative B would pursue locatable mineral withdrawals for the Warm Springs Canyon Flume and fossil areas in the Beaver Rim and Bison Basin proposed NNLs preventing the alteration or loss of wildlife habitat. In addition, these same areas would be subject to an NSO restriction for mineral leasing. Alternative B would result in greater beneficial impacts to wildlife

than Alternative A because Alternative B protects more acres from mineral exploration and development that would result in habitat loss and fragmentation.

4.4.6.3.3. Resource Uses

Minerals

Alternative B allows locatable mineral entry on 954,776 acres of public surface (40 percent) in the planning area. Impacts to wildlife from exploration and development activity would be the same as Alternative A, but could occur on approximately 59 percent fewer acres of habitat. Alternative B makes available 237,264 acres of crucial winter range and parturition habitat open to exploration and development. In addition to the withdrawals under Alternative A, Alternative B pursues an additional 1,609,491 acres of federal surface and subsurface for withdrawal. Withdrawals would be for lands primarily in designated ACECs, of which 782,105 acres are big game crucial winter range and parturition habitat. Alternative B would result in greater beneficial impacts to wildlife than Alternative A, because Alternative B would withdraw more land from exploration and development, which would result in less habitat loss, fragmentation, and wildlife disruption.

Alternative B opens a total of 816,619 public surface acres (34 percent) in the planning area to geothermal leasing and opens 529,576 acres (22 percent) of public surface to oil and gas leasing. Impacts of exploration and development activities under Alternative B would be the same as under Alternative A, but would occur on approximately 60 percent fewer acres of wildlife habitat than under Alternative A. It is anticipated that approximately 536 acres would be disturbed each year under Alternative B through oil and gas development activities, with 274 acres being disturbed yearly over the long term. Alternative B would disturb approximately 23 percent fewer acres than Alternative A, resulting in fewer adverse impacts to wildlife and their habitats. Alternative B manages exploration and development in portions of crucial winter range and parturition habitat with a TLS. Alternative B opens the fewest acres to mineral leasing and potential future development, resulting in the least amount of habitat and habitat connectivity loss and fragmentation; this would result in the greatest beneficial impacts to wildlife.

Alternative B does not apply an MLP; instead, lands with resource conflicts are closed to oil and gas leasing. This is more beneficial to wildlife than Alternative A which does not have a method for resolving conflicts prior to leasing.

Alternative B extends seasonal protections for big game crucial winter range, elk winter range, and raptor nesting, and seasonal protections for special status species (greater sage-grouse and mountain plover) to the O&M activities for developed projects if the activities would be detrimental to wildlife. Activities such as hydraulic fracturing (“fracking”), powerline reconstruction, and range improvement and road maintenance are subject to timing limitations to protect wildlife. These types of activities can stress and disturb wildlife during the sensitive winter and nesting periods due to the time it takes to complete the work, the level of noise generated, and the presence of people and equipment. It is expected that project O&M activities would result in both short-term adverse impacts related to animal displacement and long-term adverse impacts if the level of activity results in area avoidance or loss of nests or young. Alternative B would result in greater short-term beneficial impacts to wildlife than Alternative A.

Under Alternative B, areas closed to leasing or subject to major constraints are closed to geophysical activities and areas open are subject to stipulations for surface-disturbing activities, disruptive activities, and vehicle travel for the area. Closing areas would provide long-term

protection from the adverse impacts of cross-country motorized travel, vegetation crushing with possible plant mortality, and wildlife displacement. Restricting geophysical activities during sensitive times such as breeding, nesting, and winter periods would prevent abandonment or loss of nests or young, providing short-term beneficial impacts to wildlife.

Alternative B opens a total of 464,859 acres (19 percent) of the planning area to phosphate leasing, of which 2,699 acres are in areas having identified potential for phosphate. In areas with potential, Alternative B opens 488 acres of crucial winter range and 836 acres of raptor nesting habitat to leasing, which, if developed, would adversely impact wildlife. Closed lands are primarily in the existing and proposed ACECs, which encompass sensitive wildlife habitats such as big game crucial winter range, parturition areas, and nesting habitats. Alternative B would result in long-term beneficial impacts to wildlife because habitat would not be lost or fragmented as a result of phosphate development. Where phosphate leasing is open and development occurs, there would be adverse impacts to wildlife from the long-term, and possibly permanent, loss of habitat. Wildlife would likely avoid closed areas adjacent to open areas because of development activities and noise from phosphate mining operations. Alternative B would result in greater beneficial impacts to wildlife than Alternative A.

Alternative B opens approximately 185,266 surface acres (8 percent) of the planning area to mineral materials disposals, 79 percent fewer acres than Alternative A. Of these acres, 1,574 overlap big game crucial winter range and parturition areas and 73,165 acres are in raptor nesting habitats. Alternative B closes 2,208,943 acres to mineral materials disposal primarily in the new and existing ACECs. Closing areas in sensitive wildlife habitats would have beneficial impacts, and Alternative B would result in greater beneficial impacts than Alternative A.

Lands

Under Alternative B, 5,436 acres are available for disposal by sale, exchange, or other methods, with an additional 1,435 acres available but with restrictions on their future use. Alternative B would result in fewer adverse impacts to wildlife habitat than Alternative A because, under Alternative B, more acres remain in public ownership and subject to management that considers wildlife values. Alternative B makes approximately 32 percent fewer acres available for exchange and sale than Alternative A, which could also limit the acquisition of lands important to wildlife.

Renewable Energy

Alternative B opens 41,372 acres (2 percent) of the planning area to wind-energy development, which is 98 percent less acres than Alternative A. Alternative B closes big game winter range, parturition areas, and migration corridors, and identified raptor concentration areas to wind-energy projects. This action would result in beneficial impacts to wildlife using these key habitat areas. Alternative B provides the greatest planning area-wide guidance for wind-energy project locations, and would result in the fewest adverse impacts to wildlife compared to the other alternatives.

ROWs and Corridors

Alternative B opens fewer acres to ROWs (475,181 acres, or 20 percent of the planning area) and manages more acres as ROW exclusion areas (1,919,029 acres, or 80 percent of the planning area) than under Alternative A. ROW exclusion areas encompass 640,718 acres of big game crucial winter range and 27,636 acres of big game parturition habitat. Alternative B manages 315,962 acres as ROW avoidance areas. Alternative B designates three utility corridors on 15,364 acres in the planning area; corridor widths vary from 400 feet near NHTs to a minimum of 3,500

feet in Energy Corridor 79-216. Concentrating ROWs in corridors would beneficially impact wildlife by reducing the amount of new surface disturbance in undisturbed and unfragmented habitats. Alternative B would result in the fewest adverse impacts to wildlife in relation to the other alternatives.

Livestock Grazing Management

Alternative B opens approximately 2,312,095 acres (97 percent) of the planning area to livestock grazing, 12,839 fewer acres than Alternative A. This management closes lands to livestock grazing in the WGFD Spence/Moriarity WMA, Whiskey Mountain WHMA, and in Sweetwater Canyon. Because of their unique wildlife resources, these areas are priority wildlife wintering and viewing areas for elk, bighorn sheep, and moose. Closing these areas to livestock grazing would reduce competition for forage between livestock and wildlife. Lands closed in the Whiskey Mountain area are in and adjacent to bighorn sheep crucial winter range. These lands have shallow soils that produce limited vegetation, so closing lands would allow all produced vegetation to be available to bighorn sheep. Sweetwater Canyon is crucial winter range for moose and elk and supports a diversity of wildlife species from all wildlife statutory categories. Due to steep canyon walls, livestock tend to concentrate in the canyon bottom and heavily utilize the riparian-wetland grass and willow community, reducing the quality and quantity of forage and thermal cover for moose and elk. Closing the Spence/Moriarity, Whiskey Mountain, and Sweetwater Canyon lands to livestock grazing would eliminate competition for forage between livestock and big game, and result in greater long-term beneficial impacts to big game and other species of wildlife using these habitats than Alternative A.

Alternative B livestock grazing levels would not exceed light utilization on areas preferred by livestock, which often include riparian-wetland areas. Higher utilization levels, such as the moderate use allowed under Alternative A, can reduce forage and cover for wildlife and plant diversity and result in a decline in the number of wildlife species the area can support. However, some species of grassland birds prefer areas that receive higher plant utilization levels (Derner et al. 2009). Alternative B prohibits salt or mineral supplements within ½ mile of riparian-wetland habitats to aid in preventing livestock from congregating at water sources, increasing the protection by ¼ mile over Alternative A. Alternative B uses livestock grazing management strategies that do not require developing additional water or fences to maintain, enhance, or achieve rangeland health. It is assumed that new reservoirs and/or pits, wells, spring developments, or fences would not be constructed during the planning period, a reduction of 860 acres of disturbance over Alternative A. Limiting new range improvements that can impede migration and result in habitat loss, fragmentation, and displacement would beneficially impact wildlife. As opportunities arise, fences and cattleguards installed for livestock management would be removed or modified to facilitate wildlife movement under Alternative B. Alternative B would result in greater long-term beneficial impacts to wildlife than Alternative A.

Recreation and Travel Management

Alternative B proposes to withdraw 1,609,491 more acres from locatable mineral exploration than Alternative A; this would beneficially impact wildlife. This management action would protect wildlife habitat on these lands and would withdraw the most acres compared to all other alternatives. Alternative B designates more acres as SRMAs and distinct ERMAs than Alternative A. Alternative B applies special management to these designations, such as closing the areas to mineral leasing, withdrawing the areas from locatable mineral exploration and development, and excluding the areas to wind-energy development and ROWs; this would protect

and maintain wildlife habitat. These actions would result in greater beneficial impacts to wildlife than Alternative A, but increased human presence from recreationists could adversely impact wildlife utilizing the SRMAs and distinct ERMAs. Increased human activity in these areas is expected to occur outside the winter months when wildlife are less likely to be present in large numbers/groups. Closing recreation areas to motorized vehicle use would beneficially impact wildlife by minimizing noise and reducing or eliminating habitat loss and fragmentation from road and trail use.

Alternative B increases restrictions on motorized vehicle use; it closes 57,456 more acres to motorized and mechanized travel than Alternative A. Closing areas would prevent additional habitat loss and fragmentation resulting from road use. Roads and trails in closure areas would rehabilitate over time, returning disturbed roadbeds to usable habitat. Alternative B changes 37,989 acres limited to motorized travel on existing roads and trails to limited to designated roads and trails. Increasing the number of acres where specific roads can be designated increases the protection of wildlife habitat by directing road travel away from sensitive habitats such as winter range, parturition area, and nesting habitat. Closing or decreasing the number of roads and trails available to hunters by impact the ability to achieve or maintain wildlife population objectives set by the WGFD. Alternative B includes seasonal closures on 5,803 more acres of wildlife habitat than Alternative A, which would result in greater long-term beneficial impacts to wintering and birthing wildlife than Alternative A.

4.4.6.3.3.4. Special Designations

Alternative B designates 15 ACECs totaling 1,492,990 acres (62 percent) of public land in the planning area. The types of beneficial impacts to wildlife would be similar to Alternative A, but these impacts would apply to 1,373,368 more acres, roughly 12 times the number of acres designated under Alternative A. Alternative B manages ACECs with the most restrictive mineral and realty prescriptions, which would protect wildlife habitat from loss or fragmentation over the long term. This management would result in direct beneficial impacts to wildlife and their associated habitats by (1) closing lands to mineral leasing, (2) pursuing locatable mineral entry withdrawals, (3) closing or limiting areas to motorized vehicle use, (4) excluding major utility systems, ROWs, and wind-energy development, and (5) prohibiting other surface-disturbing activities not compatible with retaining or enhancing the areas' values. Beneficial impacts to wildlife from management actions for the Whiskey Mountain, Lander Slope, Red Canyon, and Dubois Badlands ACECs would increase under Alternative B compared to Alternative A. In addition, Alternative B closes the Whiskey Mountain ACEC to livestock grazing, which would eliminate the competition for forage on bighorn sheep winter range. Alternative B closes the Lander Slope, Red Canyon, and Dubois Badlands areas to mineral leasing and withdraws the areas from locatable mineral exploration and development; this would provide greater protection of wildlife habitat from surface-disturbing activities than Alternative A. Alternative B expands the size of the East Fork, Green Mountain, Beaver Rim, South Pass Mining Area, and NHTs ACECs, increasing the acres of wildlife habitat protected from surface-disturbing activities over Alternative A. Alternative B specifically expands the Green Mountain and East Fork ACECs to protect more elk crucial winter range and parturition habitat.

Alternative B designates six additional ACECs in addition to the nine ACECs designated under Alternative A that overlap big game crucial winter range, nesting habitat for all bird species, and habitat for wildlife species in each statutory category. These lands would be closed to mineral leasing and withdrawn from locatable mineral exploration and developments which would protect wildlife occupying the area. Management actions that preclude new surface disturbance would

protect seasonal habitats, movement corridors, and connectivity habitats from loss, fragmentation, and modification, which would result in long-term beneficial impacts to all wildlife species. Of the six new ACECs, the Government Draw/Upper Sweetwater Sage-Grouse ACEC is designated specifically for greater sage-grouse. Management that protects the sagebrush ecosystem and riparian-wetland habitats would have beneficial impacts for other wildlife species, particularly sagebrush-obligate species.

There would be long-term beneficial impacts to wildlife that use habitats in ACECs because management actions would protect habitats year-round versus the seasonal protections that come with standard stipulations. This would be especially beneficial to big game winter range because management would prevent habitat disturbance and loss that can occur outside the winter period.

Under Alternative B, the area of surface protection increases from ¼ mile to 5 miles either side of NHTs, unless the project would not be visible from the trails; therefore, Alternative B would protect more acres of wildlife habitat from loss or fragmentation than Alternative A. This action would result in long-term beneficial impacts to wildlife. Alternative B's management of the expanded Green Mountain ACEC is more beneficial to wildlife because all of the elk parturition areas are closed to oil and gas leasing and withdrawn from locatable mineral entry. The area has both uranium and oil and gas potential so the beneficial impacts could be considerable in comparison to Alternative A.

Overall, Alternative B management prescriptions would result in long-term beneficial impacts to wildlife on a larger part of the planning area than Alternative A. These beneficial impacts would likely also be seen on the adjacent non-federal lands in the Whiskey Mountain, East Fork, Lander Slope, and Red Canyon areas due to the management of adjacent lands and the number of land conservation agreements in place.

Alternative B recommends NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS, closes lands within ¼ mile of those waterways to mineral and realty actions, and recommends they be withdrawn from locatable mineral entry. Alternative B also closes these areas to motorized and mechanized travel and activities that change the character of the waterway and the adjacent area. This management would reduce or eliminate habitat loss and fragmentation, which would result in long-term beneficial impacts to wildlife. Alternative B increases the level of protection for surface-disturbing activities, and would result in greater beneficial impacts to wildlife than Alternative A.

4.4.6.3.4. Alternative C

4.4.6.3.4.1. Program Management

Alternative C does not require that the footprint of surfacing-disturbing activities and facilities be reduced to minimize the impacts of wildlife habitat loss and fragmentation. Not reducing the footprint could lead to greater amounts of unnecessary habitat loss than Alternative B and somewhat more than Alternative A. Alternative C does not avoid reptile hibernacula, which would result in the same impacts as Alternative A and greater adverse impacts than Alternative B, which avoids surface disturbance within 1,000 feet of den sites.

Alternative C manages wind-energy development consistent with the Wind Energy Programmatic EIS ROD (BLM 2005a), and does not specifically exclude big game crucial winter range and parturition areas, raptor concentration areas, and habitats within 3 miles of greater sage-grouse

leks from wind-energy development. Alternative C would result in adverse impacts to wildlife the same as Alternative A and greater than Alternative B, because Alternative C makes more area available for surface-disturbing and disruptive activities related to wind-energy development.

Alternative C does not apply a TLS for surface-disturbing and disruptive activities in elk winter range (166,525 acres). Alternative C would result in more adverse impacts to wintering elk on non-crucial winter range than alternatives A and B. The Alternative C TLS buffer for active raptor nests is ½ mile and nesting dates are specific to each raptor species. Alternative C protects less raptor nesting habitat (158,199 acres) during the nesting period than Alternative A (301,237 acres) or Alternative B (781,643 acres). A ½-mile protective buffer would not be adequate to protect raptor species that are more sensitive to disturbance, and disturbance could cause the raptor to abandon the nest or chicks. Like Alternative B, Alternative C would specify nesting dates by raptor species would likely shorten the timing restriction period for surface-disturbing and disruptive activities compared to the Alternative A timeframe, which encompasses all nesting dates for raptor species.

Like Alternative A, Alternative C does not manage any areas with MLP protections and so it has the potential for more adverse impacts to wildlife than Alternative D, which applies an MLP in the Beaver Rim area, and Alternative B, which closes the Beaver Rim area to oil and gas leasing.

Alternative C allows new road development in big game crucial winter range and parturition habitat except in areas closed to surface-disturbing activities. Roads identified as redundant would not be closed or reclaimed. These actions could increase or maintain road densities in sensitive habitats and increase habitat fragmentation. Alternative C allows new fences in the planning area and the miles of fence would steadily accumulate. Existing fences would be removed or modified on a case-by-case basis to address habitat fragmentation and impediments to big game movement in migration corridors. Alternative C allows livestock water development projects in big game crucial winter range and parturition areas, which could impact the availability of forage and increase habitat disturbance to wildlife. Alternative C would result in more adverse impacts to wildlife than Alternative B and about the same as Alternative A.

Management under Alternative C gives priority to livestock forage needs when allocating vegetation resources in the planning area. Vegetation on big game crucial winter range or parturition areas is not managed specifically to benefit big game, but managed instead to benefit all grazing and browsing animals (livestock, wild horses, and wildlife). In habitats where forage is limited or over allocated, this would adversely impact wildlife because adequate forage might not be available on a consistent basis. Alternative C would have an increased potential for adverse impacts to wildlife than alternatives A and B.

4.4.6.3.4.2. Resources

Lands with Wilderness Characteristics

Alternative C manages lands with wilderness characteristics in the Little Red Creek Complex for multiple use, which would increase the risk of adverse impacts to wildlife habitat as a result of the area being open to surface-disturbing activities. Increased human presence in the area from authorized activities would result in short-term wildlife displacement, with the degree of disturbance depending on the extent and timing of the activity. Alternative C does not designate the Whiskey Mountain ACEC; therefore, protections afforded under alternatives A and B would not apply. Alternative C limits motorized travel to existing roads and trails, which would result in

impacts similar to Alternative A and more adverse than under Alternative B. Because Alternative B designates only a small area (5,490 acres) as non-WSA lands with wilderness characteristics to protect the area's wilderness character, the adverse impacts under Alternative C from not specially managing these areas would not be substantially greater.

Fire and Fuels

Under Alternative C, approximately 300 acres per year would be treated by prescribed fire and 500 acres per year would be treated using mechanical methods. Alternative C would result in impacts the same as Alternative A, and decreases the use of prescribed fire over Alternative B. Alternative C allows full suppression to address wildland fire across the planning area, including the use of heavy equipment. Alternative C impacts to wildlife would be the same as impacts under Alternative A. Full suppression could adversely impact wildlife in sagebrush-grass ecosystems that benefit from periodic fire needed to rejuvenate sagebrush and promote plant diversity, but would limit adverse impacts from landscape-level wildland fire that results in long-term habitat loss and wildlife displacement across a large landscape.

Vegetation

Impacts to wildlife from forest management actions under Alternative C would be similar to impacts under Alternative A. The full range of silviculture techniques would be used to manage forests and woodlands to improve forest health, provide forest products to the public, and address forest insect and disease outbreaks. Alternative C uses thinning and selective timber removals to maintain forest health and reduce the risks of tree mortality from insects, disease, and wildfire. Alternative C allows clear-cuts with no limitations on size, which could result in the long-term loss of adequate security cover for elk. Replanting efforts would follow timber harvest, which would beneficially impact wildlife once trees grow enough to offer hiding cover.

Under Alternative C, forest management plans would be developed for the Green Mountain, Lander Slope/Red Canyon, South Pass, and Dubois areas to address forest health, product sales, and commercial timber production. These are important areas to many species of wildlife, in particular, big game. Managing for forest health and limited forest product sales would beneficially impact wildlife by maintaining intact healthy habitats. Large-scale commercial sales would adversely impact wildlife in the short term through disturbances from noise and human presence, and the potential loss of soil and degraded water quality. Animal displacement from the affected area and habitat loss or alteration would adversely impact wildlife in the long term.

Alternative C manages grasslands and shrublands to maximize forage production on the ecological site, as described in the NRCS Ecological Site Descriptions. In most areas this action would result in an increase in the amount of herbaceous vegetation present in the plant community and a decrease in the amount of shrubs. Treatments focused on increasing grass plant production would result in beneficial impacts to wildlife grazers such as elk and bighorn sheep, and could adversely impact wildlife browsers such as pronghorn, mule deer, and moose. In addition, neotropical migrants, nongame mammals, predatory animals, and some game birds would experience beneficial impacts from increased habitat, while shrub-obligate species, including small game, game birds, trophy game, reptiles, and neotropical migrants, would likely experience adverse impacts from loss of habitat. Most wildlife species present in the planning area are sagebrush/grass obligates; a few species are grassland obligates. Beneficial impacts to wildlife would be expected to be lower under Alternative C than under alternatives A and B, because the action would be likely to manage for more grass and fewer shrubs, which can adversely impact a larger number of wildlife species.

The Alternative C management to prohibit surface-disturbing activities within 500 feet of riparian-wetland areas is same as management under Alternative A, except that Alternative C allows a smaller distance if it can be shown that riparian-wetland area protection could still be achieved. Under Alternative C, more acres of wildlife habitat adjacent to riparian-wetland areas could be disturbed than under Alternative A and substantially more acres than under Alternative B.

Similar to Alternative A, Alternative C management to improve riparian-wetland areas toward PFC would consist of all available techniques; however, Alternative C likely would utilize more livestock control fences and water developments to achieve improvement than Alternative A. As described under Alternative A, additional fencing and water developments can result in both adverse and beneficial impacts to wildlife. Because fences can be hazardous to wildlife movement, Alternative C would result in the greatest risk for adverse impacts to wildlife. Compared to the other alternatives, Alternative C would result in the greatest risk to wildlife from new fencing and water developments.

Fish and Special Status Species

Impacts to fish and special status species under Alternative C would be the same as impacts under Alternative A, and Alternative C management of fish and special status species is much less restrictive than Alternative B. Required surveys and subsequent mitigation for sensitive species, actions that remove or deplete water from fish-bearing streams, and the development of livestock water projects in greater sage-grouse nesting habitat are all authorized on a case-by-case basis. Alternative C management of the greater sage-grouse Core Area and the size of greater sage-grouse lek and nesting protection buffers is the same as Alternative A, and much less restrictive than management under Alternative B; therefore, Alternative C would provide fewer habitat and seasonal protections than Alternative B.

Wild Horses

Alternative C considers impacts to wild horse movement from new fences in HMAs, but existing fences would not be specifically removed or modified to facilitate wild horse movement. Adverse impacts to wildlife from wild horse management actions under Alternative C would be the same as impacts under Alternative A and greater than under Alternative B, which removes fences. Alternative C establishes wild horse viewing loops and impacts would be the same as under Alternative B.

Cultural and Paleontological Resources

Alternative C would result in beneficial impacts to wildlife from cultural and paleontological resources protection the same as Alternative A and less than Alternative B. Compared to all other alternatives, Alternative B protects the largest number of acres and increases the level of protection for cultural and paleontological resources.

4.4.6.3.4.3. Resource Uses

Minerals

Alternative C opens 2,385,576 acres (99 percent) of BLM-administered surface to locatable mineral exploration and development, which could occur on almost the same amount of wildlife habitat as Alternative A and 40 percent more acres of wildlife habitat than Alternative B. Alternative C does not withdraw additional acres; however, pre-FLPMA withdrawals would

remain and therefore close exploration and development in those areas. Alternative C allows existing withdrawals in bighorn sheep and elk crucial winter range in the Whiskey Mountain and East Fork areas to expire. Allowing locatable mineral exploration and development in crucial winter range and parturition areas would adversely impact big game herds through loss of limited and sensitive habitat. Alternative C would result in more adverse impacts to wildlife than Alternative B, and slightly more adverse impacts than Alternative A.

Impacts from geothermal and oil and gas leasing under Alternative C would be similar to impacts under Alternative A. Alternative C opens a total of 2,295,114 public surface acres (96 percent) to geothermal leasing and 2,394,132 acres (more than 99 percent of the planning area) to oil and gas leasing. Alternative C closes 99,096 acres to geothermal leasing and 78 acres to oil and gas leasing. Alternative C would result in more adverse impacts to wildlife because more acres would be available for development, resulting in a greater potential for larger losses of habitat, increased habitat fragmentation, and increased disturbances from noise and human presence. It is anticipated that approximately 774 acres would be disturbed each year under Alternative C, 402 of those acres being disturbed over the long term. Alternative C would result in almost the same acres of disturbance as Alternative A and would disturb approximately 31 percent more acres than Alternative B. Alternative B opens the fewest number of acres to mineral leasing and potential future development; this would result in the least amount of habitat and habitat connectivity loss and fragmentation and therefore greater beneficial impacts to wildlife. Overall, Alternative C would result in more adverse impacts to wildlife than Alternative B which could lead to population declines, and almost the same impacts as Alternative A, including in the Beaver Rim area and the proposed expanded Green Mountain ACEC.

Alternative C does not apply seasonal protections for big game crucial winter range, elk winter range, and raptor nesting habitat, or seasonal protections for special status species (greater sage-grouse and mountain plover) to O&M activities for developed projects. Alternative C adverse impacts to wildlife from allowing disruptive activities during sensitive periods would be the same as impacts under Alternative A and greater than impacts under Alternative B.

Alternative C impacts from geophysical exploration activities would be the same as impacts under Alternative A. Alternative C would result in more adverse impacts to wildlife than Alternative B because Alternative C opens more acres to geophysical activities that can adversely impact habitats and cause nest abandonment or chick/young mortality.

Alternative C opens a total of 2,272,359 public surface acres (95 percent) to phosphate leasing. In areas with phosphate potential, Alternative C opens 24,860 acres of crucial winter range and 1,367 acres of raptor nesting habitat to leasing, which would result in adverse impacts if the phosphate resource was developed. Alternative C opens 95 percent of the acres with phosphate potential to leasing and development, slightly more acres than Alternative A and 15 times more acres than Alternative B. Alternative C impacts to wildlife from phosphate leasing and development would be similar to impacts under Alternative A, except that Alternative C opens the Red Canyon area to leasing and does not include limitations on phosphate development on the Lander Slope. The Red Canyon area supports a large number of wintering elk and mule deer, and the loss of this habitat from phosphate development would result in long-term adverse impacts to big game herds that depend on the area. It is expected that elk and mule deer populations would decline in this area under Alternative C.

Alternative C opens 2,252,801 surface acres in the planning area to mineral materials disposal. Of these acres, 564,320 overlap big game crucial winter range and parturition habitat and 149,960

acres are in raptor nesting habitats. Alternative C closes approximately 141,409 surface acres to mineral materials disposals, primarily in riparian-wetland areas, around greater sage-grouse leks, and in pre-FLPMA withdrawal areas. Closing areas in sensitive wildlife habitats would beneficially impact wildlife by protecting habitats from surface-disturbing activities. Alternative C allows surface disturbance on more acres than alternatives A and B, and therefore would result in the greatest potential for long-term adverse impacts to wildlife.

Lands

Under Alternative C, 5,436 acres are available for disposal by sale, exchange, or other methods, with an additional 1,435 acres available but restricted. Alternative C impacts to wildlife from land tenure adjustments would be the same as impacts under Alternative B and less than impacts under Alternative A. Alternatives B and C retain the most acres in public ownership and subject to management that considers wildlife values when making land use decisions.

Renewable Energy

Alternative C opens 2,284,235 acres (95 percent of the planning area) to wind-energy development. Impacts to wildlife from wind-energy project locations and turbines in the planning area would be the same as impacts under Alternative A. Alternatives A and C allow for construction in sensitive or limited habitats for wildlife, which would result in more adverse impacts than Alternative B, which closes these habitats to development.

ROWs and Corridors

Alternative C opens 2,247,157 acres (94 percent of the planning area) to ROWs, more than all the other alternatives. Alternative C designates 660,908 acres across the planning area as ROW corridors with widths up to 3 miles, except in the Dubois area. Alternative C excludes ROWs on 147,053 acres, with most of the exclusion acres being primarily along NHTs and in the Sweetwater Rocks. Alternative C avoids ROWs and corridors on another 11,714 acres. Alternative C opens more acres to ROWs and corridors than the other alternatives, and would result in the greatest potential for adverse impacts to wildlife.

Livestock Grazing Management

Alternative C opens the same areas to livestock grazing as Alternative A, and 12,839 more acres than Alternative B. Alternative C opens public lands in the Spence/Moriarity WMA to livestock grazing. These lands are isolated, unfenced, lack available water, and have limited to no vehicle access. Allotment boundary fencing, water developments, and access roads would be necessary to prevent livestock trespass on adjacent WGFD lands. Authorized grazing would result in a reduction of forage needed to support the large concentrations of elk and bighorn sheep that winter on the lands, and required grazing infrastructure would result in hazards to movement and habitat fragmentation.

Under Alternative C, the BLM would utilize all livestock grazing management strategies, including the increased use of infrastructure, to maintain, enhance, or achieve rangeland health. Livestock management actions would disturb approximately 100 acres each year during construction and/or development of range improvements, including reservoirs and pits, fences, pipelines, and spring developments. It is assumed that approximately two reservoirs and pits, six wells, four spring developments, and 49 miles of fence would be constructed each year during the planning period. An increase in the amount of fencing in the planning area would increase habitat

fragmentation for many species of wildlife and increase the number of hazards to movement. Developing more water developments to address livestock distribution concerns would alter the way wildlife utilize the habitat. Range improvements under Alternative C would result in greater loss and fragmentation of wildlife habitats than alternatives A and B. Alternative C allows higher livestock utilization levels than Alternative B, which would increase the potential for livestock and big game to compete for forage. Increasing water development could benefit wildlife in very arid parts of the planning area. Alternative C prohibits salt or mineral supplements within $\frac{1}{4}$ mile of riparian-wetland areas, but allows the placement of salt or mineral supplements in all other habitats to maximize range utilization. Increasing livestock grazing use in sensitive wildlife habitats would likely result in wildlife displacement, increased competition for forage, and loss of habitat around supplement locations. Fences and cattleguards would be modified or removed to facilitate livestock movement and management, which might not provide any beneficial impact to wildlife movement. Alternative C would result in more adverse impacts to wildlife than alternatives A and B.

Recreation and Travel Management

Alternative C does not withdraw lands around developed recreation sites, campgrounds, and interpretive sites, and opens lands to locatable mineral exploration and development. Mining operations in these areas would result in habitat loss. The Dubois Mill Site is the only SRMA Alternative C recognizes and it is closed to motorized travel. Similar to Alternative A, Alternative C manages the other recreation management areas as ERMAs and opens them to motorized travel. Alternative C would result in more adverse impacts to wildlife than alternatives A and B, which include more restrictive management of developed recreation sites, campgrounds, and interpretive sites.

Alternative C restricts motorized vehicle use on fewer acres than alternatives A and B. Alternative C limits motorized travel to the less restrictive existing roads and trails in 98 percent of the planning area, 5 percent more of the planning area than Alternative A and 10 more of the planning area than Alternative B. Opening all existing roads and trails to motorized vehicle travel would increase the amount of habitat lost, fragmented, and/or avoided by wildlife. Alternative C designates which roads and trails are open to travel on 50,776 acres, 112,299 fewer acres than Alternative A and 142,928 fewer acres than Alternative B. This could result in more impacts to wildlife because less area would use designated roads and trails as a way to address resource management impacts in sensitive wildlife habitat. Alternative C closes 5,472 acres to motorized travel, fewer acres than Alternative A and substantially fewer acres than Alternative B. Alternative C does not include any seasonal closures, which would result in disturbance and displacement impacts to wintering wildlife in areas closed under alternatives A and B (primarily big game crucial winter range and parturition habitat). Alternative C would result in adverse impacts to wildlife through habitat loss, fragmentation, and avoidance in a greater percentage of the planning area than alternatives A and B.

4.4.6.3.4.4. Special Designations

Alternative C does not designate ACECs and manages areas designated under other alternatives using standard stipulations. A TLS for surface-disturbing activities on crucial winter range and near raptor nesting sites would result in short-term beneficial impacts. Plans of Operation for locatable mineral activities on lands under Alternative A are not required under Alternative C, which could result in long-term habitat loss and fragmentation in sensitive wildlife habitats if exploration occurs. Alternative C allows surface-disturbing activities on crucial winter range

during non-winter months, depending on the type and size of permitted actions, which would result in the loss or fragmentation of habitat. Crucial winter range in the Dubois, Red Canyon, and Lander Slope areas is limited due to high-elevation snows, the availability of exposed forage, and the urbanization of surrounding lands, therefore wintering elk and bighorn sheep depend on lower-elevation public lands extensively.

Disturbed habitats would not be available when animals are highly dependent on them to provide winter forage and cover. Healthy, intact, and available winter range is critical for the survival of wildlife during the most stressful period of the year, as starvation and exposure to extreme weather can result in animal mortality. Under Alternative C, surface-disturbing activities would result in the loss and fragmentation of habitat essential for these species and could result in population declines, an increase in depredation of adjacent private or state lands, and forage conflicts with livestock.

Alternative C would allow locatable mineral withdrawals in the Whiskey Mountain and East Fork areas that are subject to expiration to expire and would not pursue withdrawal extensions. After existing withdrawals expire in the Whiskey Mountain and East Fork areas between 2010 and 2020, Alternative C opens those areas to locatable mineral exploration and development. A withdrawal for approximately 9,600 acres in the Whiskey Mountain area is set to expire in 2010 and an extension is currently being pursued. If the withdrawal becomes final, these acres would be withdrawn for much of planning period. At the point the withdrawal would expire in another 20 years, an extension would not be pursued.

Surface facilities or habitat modifications that prevent or interfere with wintering animals reaching escape habitat could lead to increased mortality from predators. Bighorn sheep are not tolerant of human activities and animals utilizing these winter habitats would avoid the area, which could result in population declines. Reducing opportunities to hunt and view bighorn sheep would result in adverse impacts to recreation opportunities and to local economies that depend on hunting and tourism revenue. Allowing surface-disturbing activities or facilities in the Whiskey Mountain and East Fork areas would adversely impact wildlife by promoting habitat loss and fragmentation on crucial winter range, which would like threaten the long-term viability of the herds.

Under Alternative C, forage in the Whiskey Mountain and East Fork areas would be available for all grazing animals with no preference for wildlife needs. Forage competition can lead to poor animal fitness and low reproductive rates and high utilization of habitats can result in less productive rangelands and long-term habitat loss for wildlife. Alternative C would result in adverse impacts to wildlife from management that opens the Whiskey Mountain and East Fork areas to livestock grazing, compared to the beneficial impacts under alternatives A and B.

Alternative C opens the Green Mountain and Beaver Rim areas to energy development, including wind energy and does not require an MLP. The area has high potential for wind-energy development and surface disturbance from development would result in long-term loss of habitat. If wind-energy projects were established, the area would likely be unsuitable for wintering elk due to adverse impacts from turbine, road, and powerline infrastructure, and noise and human presence. The area also has high potential for uranium and Alternative C would allow exploration activities without the benefit of the project proponent completing a Plan of Operations. Exploration activities could lead to elk crucial winter range habitat loss and/or fragmentation. Alternative C would result in more adverse impacts to wildlife than alternatives A and B.

Alternative C allows surface-disturbing activities, including the placement of surface facilities, and disruptive activities along Beaver Rim. This would adversely impact raptors by reducing

available habitat for prey species, creating hazards around nest and perch sites, and allowing human presence or noise that could cause birds to abandon nests or young. There could be long-term adverse impacts from a reduction in available nesting habitat or a reduction in nesting success.

The WGFD owns land in the Whiskey Mountain, East Fork, and Red Canyon areas to provide crucial winter range, primarily for bighorn sheep, elk, and mule deer. The WGFD purchased much of this land because big game crucial winter range was given priority when managing the surrounding public lands. Alternative C could reduce the value of surrounding WGFD lands if public lands are developed.

Overall, Alternative C would result in the greatest potential for habitat loss and fragmentation, the greatest potential to impair connectivity between seasonal habitats, the least amount of habitat protection for big game winter ranges, and the greatest disturbance to wintering wildlife of all the alternatives.

Alternative C recognizes lands within ¼ mile of NHTs and the CDNST as part of the NLCS landscape and limits management that restricts development to Classes I and II trail segments of the NHTs. Alternative C would result in fewer beneficial impacts to wildlife along NHTs than alternatives A and B, and almost the same beneficial impacts along the CDNST as Alternative A.

Alternative C does not recommend NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS and does not manage those segments specifically to preserve their suitability. Alternative C manages the Sweetwater River Unit and associated wildlife habitat under BLM Manual 6330, *Management of Wilderness Study Areas*, which is the same as Alternative A and less protective than Alternative B. Alternative C manages the Baldwin Creek Unit using standard stipulations that are less protective than Alternative A (ACEC prescriptions) or Alternative B, and would result in the greatest potential for adverse impacts to wildlife species. Overall, Alternative B prescribes the highest level of protection and therefore would result in the most beneficial impacts to wildlife.

4.4.6.3.5. Alternative D

4.4.6.3.5.1. Program Management

Alternative D requires that surfacing-disturbing activities and facilities be minimized to the smallest footprint practical to minimize the impact to wildlife from habitat loss and fragmentation, except when safety and maintenance issues require a larger footprint, and applies Required Design Features to reduce adverse impacts from development. Alternative D applies mule deer crucial winter range timing limitations to winter range. Alternative D management is similar to Alternative B, except that Alternative D allows a larger footprint when needed based on site-specific issues. Alternative D results in greater beneficial impacts to wildlife than alternatives A and C. Alternative D defines exploratory locatable mineral activities in Core Area under a Notice as undue or unnecessary degradation if occurring from March 15 to June 30. Alternative D has extensive locatable mineral withdrawal for the benefit of many resources, including mule deer, elk, moose, and greater sage-grouse. Alternative D prohibits surface-disturbing activities within 200 feet of identified reptile hibernacula sites, less distance than Alternative B but more than alternatives A and C, which do not afford protection of hibernacula sites.

Alternative D establishes DDAs in the Shoshoni-Lysite area, the Gas Hills, and in the Beaver Creek area to focus on energy development. Surface use and TLSs to protect wildlife and special status wildlife would be applied at the leasing stage but exceptions would be frequently authorized to exempt crucial winter range protection to facilitate development. Exceptions would not be routinely authorized for protections for special status species. Granting exceptions for crucial winter range would adversely impact big game using the areas, but due to the level of development activity that occurs in the DDAs, these areas are not considered optimum habitat.

Alternative D applies an MLP to the Beaver Rim area. The parturition area south of the Green Mountain ACEC is closed to oil and gas leasing to protect the important elk calving area.

Alternative D allows wind-energy development in big game crucial winter range, parturition habitat, migration corridors, and raptor concentration areas on a case-by-case basis. Adverse impacts under Alternative D would be the same as under alternatives A and C and greater than under Alternative B, which closes these habitats to wind-energy development.

Alternative D applies a TLS for surface-disturbing and disruptive activities in identified winter and crucial winter range for elk and mule deer. Alternative D would result in impacts the same as alternatives A and B and more beneficial impacts than Alternative C, which applies a TLS only to elk crucial winter range. Alternative D (as well as alternatives A and B) protects approximately 167,000 more acres of elk winter range than Alternative C.

Alternative D applies a TLS to surface-disturbing and disruptive activities within $\frac{3}{4}$ mile of active nests for all raptor species, except ferruginous hawk, for which Alternative D protects the area within 1 mile of nests. Ferruginous hawks are more sensitive to disturbance and require a larger buffer to protect egg incubation, hatching, and chick fledging processes. The protected period is February 1 through July 31 for raptor species other than northern goshawk and burrowing owl. Surface-disturbing and disruptive activities are prohibited from April 1 to August 31 for northern goshawk and April 1 to September 15 for burrowing owl. See the *Special Status Species – Wildlife* section for more discussion on ferruginous hawks, northern goshawks, and burrowing owl. The protection distance and/or period for nests can be adjusted based on site-specific and species-specific information. Alternative D uses a larger buffer and/or more specific nesting dates, and therefore would result in greater beneficial impacts to raptors than alternatives A and C. Alternative B would result in greater beneficial impacts than Alternative D for the same reasons.

Alternative D does not allow new fence construction in identified big game migration corridors unless a fence is identified as critical to the success of a comprehensive grazing management plan. It is unknown where and how much fence would be constructed in migration corridors under Alternative D. Existing fences would be removed in identified corridors as opportunities arise, with the goal of no net gain of fence. Within big game migration corridors, Alternative D would result in fewer adverse impacts than alternatives A and C, and slightly more adverse impacts than Alternative B. Outside of migration corridors, existing fences would also be modified or removed, on a case-by-case basis, to address habitat fragmentation and movement concerns. This action would result in the same impact outside big game migration corridors as alternatives A and C, and a less beneficial impact than Alternative B.

To prevent habitat loss and/or modification, Alternative D, on a case-by-case basis and in cooperation with adjacent landowners and/or state and county governments, avoids authorizing new road development in big game crucial winter range and parturition habitat and closes and reclaims redundant roads and applies Required Design Features to reduce road density and wildlife habitat fragmentation. These actions would result in impacts the same as Alternative A,

greater beneficial impacts than Alternative C, and fewer beneficial impacts than Alternative B. In these same sensitive habitats, Alternative D allows livestock water development projects in big game crucial winter range and parturition areas only if the projects are critical to the success of a comprehensive grazing management plan and impacts to habitat can be mitigated. While improving range health would be a benefit, water development projects would likely increase forage harvest, therefore Alternative D would result in greater beneficial impacts than alternatives A and C, and slightly fewer beneficial impacts than Alternative B.

Alternative D considers forage requirements to meet big game herd objectives when making forage allocations in the planning area to ensure adequate forage is available for wildlife. Alternative D would result in slightly greater beneficial impacts than Alternative A, much greater beneficial impacts than Alternative C, and fewer beneficial impacts than Alternative B. On a case-by-case basis, Alternative D manages vegetation on crucial winter range or parturition areas to benefit the species that requires the range and extends seasonal protections to mule deer winter range. This action, when undertaken, would result in the same impacts to wildlife and wildlife habitat as Alternative A, less beneficial impacts than Alternative B and more beneficial impacts than Alternative C.

4.4.6.3.5.2. Resources

Lands with Wilderness Characteristics

Alternative D manages 4,954 acres of lands with wilderness characteristics as non-WSA lands with wilderness characteristics, slightly fewer acres than Alternative B. Alternative D closes non-WSA lands with wilderness characteristics to motorized travel and limits mechanized travel to designated routes, which would beneficially impact wildlife but to a lesser extent than Alternative B which prohibits both motorized and mechanized travel in the area. Alternative D would result in greater beneficial impacts to wildlife than alternatives A and C, which do not manage non-WSA lands with wilderness characteristics and allow motorized travel on all existing roads and trails in lands with wilderness characteristics. Non-WSA lands with wilderness characteristics within the Whiskey Mountain ACEC are subject to the ACEC prescriptions under Alternative D, which would beneficially impact wildlife.

Fire and Fuels

Under Alternative D, there would be approximately 500 acres of prescribed fire and 500 acres of mechanical treatment conducted each year to address rangeland fuel and fire concerns. Alternative D allows the use of prescribed fire (and the resultant risks of unintended consequences) on 200 more acres per year than alternatives A and C and 1,500 fewer acres per year than Alternative B. Alternative D management allows the full range of suppression tactics based on the resources at risk to address wildland fire, including the use of heavy equipment. This action would have beneficial impacts on wildlife because long-term adverse impacts to sensitive habitats could be prevented with the selection of the appropriate suppression tactic. Alternative D could increase the risk of adverse impacts to wildlife habitat from the use of heavy equipment in suppression efforts.

Vegetation

Alternative D manages forests and woodlands using a full range of silviculture practices in response to forest/woodland health conditions, wildlife habitat needs, and the demand for forest products. Treatment of forest insect and disease outbreaks and the implementation of forest replanting is managed on a case-by-case basis under Alternative D. Alternative D allows

clear-cuts, with other resource values and silviculture objectives determining the sizes and locations of clear-cuts. This management, which is almost the same as under Alternative A, would result in both short-term adverse and long-term beneficial impacts to wildlife.

Approximately 600 acres per year of short-term disturbance are anticipated from forest and woodland management (mechanical treatments and forest product sale areas) over the planning period under Alternative D. Treatments would result in both beneficial and adverse impacts to wildlife, depending on the species and the sizes of treatment patches.

Under Alternative D, forest management plans would be developed for the Green Mountain Primary Forest Resource Area and as funding permits for the South Pass and Dubois Primary Forest Resource Areas to address the sale of commercial and over-the-counter forest products, enhancement of forest health conditions, and the management of pine beetle infestations. Alternative D prohibits commercial forest product sales that could adversely impact the availability of wildlife habitat and increase noise and human presence in the Lander Slope and Red Canyon areas, unless the sales are needed to address human health and safety issues or improve forest health. Alternative D would result in fewer adverse impacts to wildlife habitat than alternatives A and C, and slightly fewer beneficial impacts than Alternative B.

Grasslands and shrublands are managed to achieve the vegetation attributes described in the NRCS Ecological Site Descriptions, the same management as under Alternative A. Alternative D would result in greater beneficial impacts from managing for a balance of herbaceous and woody vegetation than Alternative C, but not as much as Alternative B, which focuses on managing plant communities specifically for wildlife. Alternative D utilizes vegetative treatments to alter plant community composition to achieve rangeland health objectives. Alternative D would result in fewer adverse impacts to wildlife than Alternative C, which uses treatments to facilitate livestock grazing management that could conflict with wildlife habitat objectives. Overall, Alternative D would result in slightly fewer beneficial impacts to wildlife from grassland/shrubland management actions than Alternative B, almost the same beneficial impacts as Alternative A, and more adverse impacts than Alternative C.

Alternative D prohibits surface-disturbing activities within 500 feet of water and riparian-wetland areas outside of DDAs, which would result in impacts the same as Alternative A, slightly fewer adverse impacts than Alternative C, and much more beneficial impacts than Alternative B. Inside DDAs, Alternative D allows surface-disturbing activities closer than 500 feet if equivalent riparian-wetland protection could be achieved. This management would beneficially impact wildlife by protecting vital riparian-wetlands and adjacent upland habitats from loss, degradation, or fragmentation, although not as much as under Alternative B, which prohibits surface disturbance within a wider buffer around all riparian-wetland areas. Alternative D uses all tools, including range improvement projects, travel management strategies, and lease stipulations to improve riparian-wetland areas and move them toward PFC. Healthy and diverse riparian-wetland habitats would have beneficial impacts on wildlife, but could adversely impact wildlife by increasing fencing and livestock grazing levels associated with water developments. Alternative D would result in slightly more adverse impacts to wildlife than Alternative A, much more adverse impacts than Alternative B, and greater beneficial impacts than Alternative C.

Wildlife

Alternative D manages lands from Hudson Atlantic City with protections for wildlife and other values including viewshed and cultural resources. Oil and gas leasing is subject to an NSO, and

the area is closed for withdrawal from locatable mineral entry as well as other protections. This will benefit the wildlife in the area but with more adverse impacts than Alternative B.

Fish and Special Status Species

Similar to alternatives A and C, on a case-by-case basis, Alternative D allows BLM projects that remove or deplete water from fish-bearing streams unless the action would result in the loss of a sustainable fish population. Because Alternative D does not allow projects that would completely de-water a stream, it would result in slightly fewer adverse impacts to wildlife than alternatives A and C, but more adverse impacts than Alternative B, which does not allow water-depleting projects.

Alternative D opens the designated greater sage-grouse Core Area to oil and gas leasing subject to thresholds for project locations and acres of disturbance. Limiting the amount of disturbance in the greater sage-grouse Core Area would result in beneficial impacts to other wildlife occupying the same lands. Alternative D would result in fewer beneficial impacts than Alternative B and fewer adverse impacts than alternatives A and C. Greater sage-grouse lek buffers under Alternative D are the same as under Alternative B for the Core Area and the same as under alternatives A and C outside of the Core Area. Alternatives B and D would protect more wildlife habitat in the Core Area in the long term; Alternative D would protect fewer acres outside the Core Area than Alternative B. Alternative D applies a seasonal nesting TLS to all suitable nesting habitat in the greater sage-grouse Core Area, which would protect more acres of habitat than all the other alternatives and result in beneficial impacts to nesting neotropical migrants and raptors utilizing these same acres.

Alternative D allows livestock water developments in greater sage-grouse nesting habitat so long as they would be compatible with, and contribute to, improved greater sage-grouse habitat. Alternative D would result in greater beneficial impacts to other wildlife species that use these same habitats than alternatives A and C, but fewer than Alternative B.

Wild Horses

Like alternatives B and C, Alternative D establishes scenic loops for viewing wild horses in the planning area. Alternative D would result in a slightly greater risk of adverse impacts to wildlife from increased vehicle use and human presence related to viewing activities than Alternative A. Alternative D considers impacts to wild horses when authorizing new fencing projects, and fences would be removed or modified as opportunities arise to facilitate movement between wild horse herds. Not allowing new fences and removing/modifying existing fences would beneficially impact wildlife by reducing hazards to wildlife movement. Alternative D would result in greater beneficial impacts than alternatives A and C and fewer beneficial impacts than Alternative B.

Cultural and Paleontological Resources

The area of protection surrounding cultural and paleontological resources under Alternative D is much the same as the area of protection under Alternative A, and Alternative D protects more acres than Alternative C. Alternative D protects fewer acres of wildlife habitat associated with cultural and paleontological sites than Alternative B, particularly related to mineral exploration and development, and therefore would result in fewer beneficial impacts to wildlife than Alternative B.

4.4.6.3.5.3. Resource Uses

Minerals

Alternative D allows for locatable mineral entry on 2,351,399 acres of mineral estate (98 of the planning area). Adverse impacts to wildlife from habitat loss, modification, and/or fragmentation as a result of exploration and development activity would occur on 1 percent fewer acres than Alternative A, 2 percent fewer acres than Alternative C, and 56 percent more acres than Alternative B. Alternative D pursues continuation of the existing locatable mineral withdrawals protecting bighorn sheep and elk crucial winter range and parturition habitat in the Whiskey Mountain and East Fork ACECs. Like Alternative B, Alternative D pursues withdrawal of 3,314 additional acres in the expanded portion of the East Fork ACEC. In order to protect multiple resources, extensive areas are withdrawn from locatable mineral entry, which benefits wildlife using those areas. Withdrawing the area from locatable mineral entry would provide long-term protection of crucial winter range needed to maintain mule deer, moose, elk, bighorn sheep, and greater sage-grouse populations. This larger withdrawal includes a withdrawal for 3,897 acres in the Johnny Behind the Rocks RMZ, which would prevent the loss of wildlife habitat and beneficially impact species using the area. Alternative D would result in greater beneficial impacts to wildlife than alternatives A and C and more adverse impacts than Alternative B.

Alternative D opens a total of 2,112,285 acres to geothermal leasing and opens 2,642,527 acres to oil and gas leasing, 1 percent fewer acres than Alternative A and 2 percent fewer acres than Alternative C. Alternative D opens 76 percent more acres to leasing than Alternative B, which opens the fewest acres to mineral leasing and potential development. Alternative D makes available fewer acres of crucial winter range and parturition habitat to exploration and development than alternatives A and C but more acres than Alternative B. It is anticipated that approximately 724 acres would be disturbed each year through oil and gas development activities under Alternative D, and 375 of those acres would be disturbed for the long term. Alternative D would result in less wildlife habitat and habitat connectivity loss and fragmentation would occur from new lease development than alternatives A and C and more than Alternative B. Alternative D closes the entire Dubois area to oil and gas leasing; therefore, no habitat loss and fragmentation from lease development activities. Alternative D would have nearly the same beneficial impacts to wildlife in all statutory categories as Alternative B and greater beneficial impacts than alternatives A and C.

Alternative D's management of the Beaver Rim area has more beneficial impacts to wildlife than alternatives A and C through its application of an MLP. This is, however, less beneficial than Alternative B which closes the area to oil and gas leasing to protect greater sage-grouse.

Alternative D extends seasonal protections for big game crucial winter range, elk, and mule deer winter range, and raptor nesting habitat, and extends seasonal protections for special status species (greater sage-grouse and mountain plover) to activities deemed detrimental to wildlife associated with the O&M of developed projects on lands that lie outside DDAs. Appendix I (p. 1535) lists activities subject to seasonal protections. Alternative D does not apply seasonal protections to these same activities inside DDAs. Alternative D would result in greater beneficial impacts to wildlife during the sensitive winter and nesting periods than alternatives A and C and less than Alternative B, which applies seasonal protections to O&M activities on all lands.

Under Alternative D, lands closed to mineral leasing or subject to NSO are also closed to geophysical activities. Lands open to leasing are open to geophysical activities and subject to

motorized travel limitations and restrictions on surface-disturbing and disruptive activities for the area. Closing habitats to geophysical activities would prevent adverse impacts from cross-country motorized travel and wildlife displacement. Restricting geophysical activities during sensitive times such as the breeding, nesting, and winter periods would prevent abandonment or loss of nests or young, which would result in short-term beneficial impacts to wildlife. Alternative D closes more wildlife habitat to geophysical activities than alternatives A and C and less than Alternative B.

Alternative D opens 37 percent fewer acres to phosphate leasing than Alternative A, 39 percent fewer acres than Alternative C, and 66 percent more acres than Alternative B. Closing lands to phosphate leasing would beneficially impact wildlife by providing long-term protection of habitat. Under Alternative D, elk and mule deer crucial winter range in the Lander Front-Hudson-Atlantic City area and north of the Lysite DDA to phosphate leasing, which would benefit all wildlife, including shrubland-obligates. Alternative D would result in greater beneficial impacts to wildlife than alternatives A and C, because Alternative D closes more wildlife habitat to phosphate leasing; Alternative D opens more acres to phosphate leasing than Alternative B, but only a small amount, so it would have somewhat more adverse impacts to wildlife.

Alternative D opens 1,853,090 surface acres to mineral materials disposals, many more acres than Alternative B, but fewer acres than alternatives A and C, which means less wildlife habitat, including sensitive or limited habitats, could be lost, modified, or fragmented from development activities. Alternative D would result in greater beneficial impacts than alternatives A and C, but more adverse impacts than Alternative B.

Lands

Alternative D identifies 8,073 acres of lands available for disposal by sale, exchange, or other methods, with an additional 6,665 acres available with restrictions on post-disposal use. Alternative D increases the land identified for disposal based on recommendations by the public and to protect human health and safety. There would be less risk of adverse impacts from the loss or alteration of wildlife habitat under alternatives B, C, and A than under Alternative D, because Alternative D makes more lands available for disposal.

Renewable Energy

Alternative D opens 224,289 acres (9 percent of the planning area) to wind-energy development. Alternative D would result in a greater risk of adverse impacts to wildlife from habitat loss, fragmentation, and avoidance, particularly in sensitive or limited habitats, than Alternative B, which opens only 27 percent of the planning area. However, Alternative D would result in fewer adverse impacts from wind-energy development than alternatives A and C, which opens 88 percent and 95 percent of the planning area, respectively.

ROWs and Corridors

Similar to the mineral and other realty management actions discussed above, Alternative D opens fewer acres to ROWs than alternatives A and C and more acres than Alternative B. Alternative D excludes 35 percent of the planning area to ROWs and designates avoids 44 percent as ROW avoidance areas. ROW exclusion areas encompass 246,606 acres of big game crucial winter range and parturition habitat under Alternative D, and ROW avoidance areas encompass 620,624 acres of big game crucial winter range and parturition areas. Alternative D would result in greater

beneficial impacts to wildlife from excluding or avoiding more lands than alternatives A and C, and more adverse impacts from closing fewer lands than Alternative B.

Alternative D's corridor designation is more similar to Alternative C than to alternatives A and B and would thus have the same adverse and beneficial impacts as Alternative C although to a lesser extent. Fewer corridors would result in less habitat fragmentation particularly since all designated corridors are located in areas when some disturbance exists. However, to the extent that additional disturbances occur as new ROWs are authorized, the amount of habitat loss increases and reduces the likelihood of successful reclamation, which is an adverse impact to wildlife. Similar impacts result from BLM's policy to require that new ROWs be co-located with existing disturbance.

Livestock Grazing Management

Alternative D opens approximately 97 percent of the planning area to grazing, almost the same as the other alternatives. Alternative D closes 7,566 more acres than alternatives A and C and 5,273 fewer acres than Alternative B. The majority of the lands in the expanded portion of the East Fork ACEC and an allotment pasture in the Whiskey Mountain ACEC are closed to eliminate forage competition with wintering elk and bighorn sheep as well as the need to construct additional livestock control fencing.

Alternative D livestock management actions would disturb approximately 42 acres each year during construction and/or development of range improvements. Alternative D allows fewer range improvement projects overall than alternatives A and C, but allows for the construction of more riparian-wetland protection fencing than Alternative A. Adverse impacts to wildlife from the construction of additional fences would be greater under Alternative D than under alternatives A and B and less than under Alternative C. Fences and cattleguards installed for livestock management are removed or modified on a case-by-case basis. Type E fencing will be required for any new or modified highway ROW fence except in those areas bordering domestic sheep allotments or in areas where another fence standard is preferable. This management action would result in almost the same impacts as all the other alternatives.

Alternative D does not set utilization levels but determines this on a site-specific basis and allows new range infrastructure when a Comprehensive Grazing Strategy is in place. Like Alternative C, where higher plant utilization is subsequently authorized, the potential for forage competition between wildlife and livestock would increase; Alternative B reduces that potential.

Like Alternative B, Alternative D prohibits the placement of salt or supplements within ½ mile of riparian-wetland areas and within 0.6 mile of greater sage-grouse leks. This action would prevent increased plant utilization and vegetation trampling in these key habitats, which would result in beneficial impacts to wildlife in all statutory categories. Alternative D would result in greater beneficial impacts to wildlife than alternatives A and C, which prohibit supplements only within ¼ mile of riparian-wetland areas.

Overall, livestock grazing under Alternative D would result in more beneficial impacts to wildlife and their habitats than alternatives A and C and more adverse impacts than Alternative B.

Recreation and Travel Management

Alternative D impacts to wildlife from recreation management actions would be the same as Alternative B, except that SRMAs and distinct ERMAs would constitute fewer acres under Alternative D. Management prescriptions that reduce or eliminate surface-disturbing activities

(i.e., NSO for mineral leasing and locatable mineral withdrawal) in the Johnny Behind the Rocks Area and the Dubois Mill Site would provide long-term protection of wildlife habitat. Several SRMAs are in the Lander Slope ACEC and would be managed according to the ACEC prescriptions; this also would beneficially impact wildlife by limiting surface-disturbing activities. Alternative D would result in greater beneficial impacts to wildlife than alternatives A and C and fewer beneficial impacts than Alternative B.

Alternative D limits motorized travel on more acres than alternatives A and C and on fewer acres than Alternative B. Alternative D opens 92 percent of the planning area to existing roads and trails, opens 6 percent to designated roads and trails, and closes 1 percent to motorized and mechanized travel. Areas closed would result in the greatest beneficial impacts to wildlife by eliminating disturbance or displacement from vehicle use and providing long-term protection from habitat loss and fragmentation. Most of the areas closed to motorized travel are open to mechanized travel under Alternative D. These areas would result in slightly fewer beneficial impacts to wildlife than the areas closed to all travel.

Alternative D subjects more acres to seasonal travel limitations than alternatives A and C. The increase in acres occurs primarily in the East Fork ACEC. Dates for seasonal travel limitations in the Whiskey Mountain and East Fork areas are adjusted to match seasonal closure dates on adjacent WGFD lands. Seasonal travel limitations would protect wintering bighorn sheep and elk from stress and disturbance during the critical winter months. Using consistent closing and opening dates across the area would benefit the public and should help with compliance and enforcement of the closures.

Overall trail and travel management actions under Alternative D would result in fewer adverse impacts to wildlife than alternatives A and C and fewer beneficial impacts than Alternative B.

4.4.6.3.5.4. Special Designations

The NTMC limits the amount of surface disturbance that will occur, including requiring the use of designated corridors, which beneficially impacts wildlife and their habitat.

Alternative D designates eight ACECs totaling 243,838 acres (10 percent of the planning area), 5 percent more of the planning area than Alternative A, 10 percent more of the planning area than Alternative C, and 52 percent less of the planning area than Alternative B. Management would result in direct beneficial impacts to wildlife in the long term through protections from habitat loss or fragmentation by (1) closing lands to mineral leasing, (2) extending existing or pursuing new locatable mineral entry withdrawals, (3) closing or limiting motorized vehicle use, (4) excluding major utility systems, ROWs, and wind-energy development, and (5) prohibiting other surface-disturbing activities not compatible with retaining or enhancing the areas' values. The East Fork and Green Mountain ACECs are larger under Alternative D than under Alternative A, increasing the amount of crucial winter range and parturition habitat covered by ACEC prescriptions. Alternative D does not designate the Dubois Badlands area as an ACEC and incorporates the 200 non-contiguous acres to the east of the badlands into the East Fork ACEC. This would not result in additional adverse impacts to wildlife because management under BLM Manual 6330, *Management of Wilderness Study Areas* would still protect wildlife habitat in the Dubois Badlands WSA. Alternative D closes crucial elk and bighorn sheep winter range and parturition habitat in the East Fork ACEC and part of the Whiskey Mountain ACEC to livestock grazing to eliminate forage competition between wildlife and livestock. Alternative D management of mineral and realty actions in the Whiskey Mountain and East Fork ACECs is the

same as alternatives A and B, and are the most restrictive possible. Alternative D designates the Twin Creek ACEC, which is a much smaller portion of the Government Draw/Upper Sweetwater Sage-Grouse ACEC designated under Alternative B. To prevent adverse impacts to wildlife habitat, oil and gas leasing in the Twin Creek ACEC would be subject to an NSO stipulation, the ACEC would be closed to phosphate leasing and mineral materials disposals, recommended for withdrawal from locatable mineral entry, and avoided for major ROWs outside the designated corridor. The Beaver Rim, Lander Slope, and Red Canyon ACECs contain the same number of acres under Alternative D as Alternative A, although Alternative D has slightly more restrictive prescriptions regarding surfacing-disturbing activities that would have a beneficial impact on wildlife. Withdrawing the Lander Slope, Twin Creek, and Red Canyon ACECs from locatable mineral exploration and development would provide long-term protection of big game crucial winter range.

Alternative D includes more protections along NHTs and the CDNST than Alternative A except for the part of the CDNST in the Crooks Gap area. Additional constraints for surface-disturbing activities to protect the integrity and setting of trails would have a beneficial impact on wildlife habitat. Alternative D would result in greater beneficial impacts to wildlife from trail protections than alternatives A and C and fewer beneficial impacts than Alternative B.

Alternative D recommends NWSRS-eligible waterway segment on Warm Springs Creek Segment 1, Baldwin Creek, and the Sweetwater River as suitable for inclusion in the NWSRS and manages those segments in accordance with the Lander Slope ACEC and Sweetwater Canyon WSA prescriptions, respectively; this management constrains mineral and realty developments. Alternative D includes more protections from surface-disturbing activities than Alternative A because Alternative D increases protections in the Lander Slope ACEC and Sweetwater Canyon WSA. Alternative D also would result in greater beneficial impacts than Alternative C, but more adverse impacts than Alternative B.

Alternative D management actions would result in greater beneficial impacts to wildlife and wildlife habitat than alternatives A and C and less beneficial impacts than Alternative B. Although Alternative D does not close the expanded Green Mountain ACEC to oil and gas leasing, the most important parturition areas are NSO, which beneficially impacts the elk.

4.4.7. Special Status Species – Plants

For purposes of this analysis, special status plant species addressed in this section currently include 12 BLM sensitive plant species known to occur in the planning area, three federally listed plant species that occur or for which there is potential habitat, and one federally listed plant species that occurs downstream along the Platte River and could be affected by actions in the planning area. The implementation of certain management actions could impact special status plants species, depending on the alternative. This section describes the direct, indirect, short-term, and long-term impacts to special status plants under each alternative and also whether those impacts would be adverse or beneficial.

Typically, management actions or resource uses that contribute to a decrease in abundance or distribution of a special status plant species are considered adverse. Conversely, management actions or measures that protect a plant species from disturbance, improve habitat, or lead to increased population or viability are considered beneficial.

For purposes of this analysis, direct impacts are damage to or loss of individual plants, loss of habitat or habitat quality, loss of pollinators, and loss of soil seed banks. Examples of direct impacts include surface-disturbing activities, herbivory, trampling, fire, plant collection, OHV use, or geophysical operations. Indirect impacts include the loss of suitable habitat for future colonization. Conversely, an action that aids in the protection of suitable habitat is an indirect beneficial impact.

4.4.7.1. Summary of Impacts

Activities that disturb soil and vegetation communities would directly impact special status plants. Alternative B provides the greatest protection from surface-disturbing activities because it allows the fewest acres of surface disturbance, requires surveys before authorizing activities that would prevent plant loss, and establishes limits on habitat loss, modification, or fragmentation. Conversely, Alternative C has the greatest potential to result in adverse impacts to special status plants because it allows the most acres of surface disturbance and does not establish habitat loss limits except as required to protect ESA-listed species. Alternative D is similar in many respects to Alternative A, but Alternative D includes management actions to minimize habitat loss and fragmentation not included under Alternative A and increases protections in areas important for other resources, particularly wildlife, special status wildlife species, cultural resources, and special designation areas that also protects special status plants.

4.4.7.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Surface-disturbing activities in special status plant communities will adversely impact special status plant species. Impacts to special status plants and their habitats will be more adverse than impacts to common plant species.
- Where resources overlap, management actions associated with protecting wildlife habitats and cultural resources directly benefit special status plant species.
- Establishing management actions that preclude or restrict development, including those specifically focused on conserving special status plant species, are assumed to benefit special status plant species where populations overlap with management action boundaries.
- Because neither the locations of all special status plant species in the planning area nor the locations of potential actions under the different alternatives are not known, this impact analysis is based on the amount of vegetation and soil disturbed, the potential for spread of INNS, and the level of restrictions placed on BLM actions that would protect special status plant species.
- The total amount of new surface disturbance allowed under an alternative is a good index of potential impacts to special status plants. Success of reclamation measures prescribed as a condition of development is unknown, and could underestimate the potential impact of surface disturbance on special status plant populations.
- Minimizing surface disturbance and restoring or reestablishing native vegetation reduces adverse impacts to special status plants. The sooner vegetation is reestablished, the greater the benefit to special status plant species.
- As more monitoring and survey data become available, additional populations of existing special status plants could be found.
- The BLM will continue to manage plant species listed on the BLM Wyoming State Director's Sensitive Species List in accordance with BLM Manuals 6840, 1740, and 1745. Over the

planning period, plant species could be added or removed from the BLM Sensitive Species list as additional data are collected and evaluated.

- The USFWS has jurisdiction over the management of threatened and endangered plant species. Actions that could impact ESA-listed species are subject to appropriate ESA Section 7 consultation with the USFWS.
- Over the planning period, the USFWS could list or delist plant species as threatened and endangered as additional data are collected and evaluated. Most species delisted or downgraded from proposed or candidate status will be included on the BLM sensitive species list.

4.4.7.3. Detailed Analysis of Alternatives

Management actions and resource uses that could adversely impact special status plant species and their habitats include all surface-disturbing activities, concentrated grazing by livestock, wild horses, or native ungulates, control of INNS, OHV use, geophysical exploration, fire management, and water-depleting activities, especially those involving the Platte River watershed.

Conversely, resource uses prescribed under the alternatives that could result in adverse impacts to special status plant species could be limited by management actions necessary to protect these plant species.

4.4.7.3.1. Impacts Common to All Alternatives

Although the types of impacts to special status plant species under the alternatives would be similar, the intensity of impacts would vary by alternative. Impacts that result in a decline in abundance or distribution of special status plant species can generally be divided into two broad categories: (1) impacts that cause direct loss of plants through surface disturbance, geophysical exploration, trampling, herbivory, fire, or INNS treatment and (2) impacts that cause indirect loss of plants through alteration of habitat by fragmentation, soil compaction and erosion, alteration of hydrologic regimes, loss of pollinators, and introduction or proliferation of INNS. Direct impacts typically are short-term, whereas indirect impacts can be short-term or long-term.

Under all alternatives, actions that could impact any federally listed plant species will require consultation and coordination with the USFWS to ensure compliance with the terms of Statewide Programmatic Section 7 consultations (conservation measures, letters of concurrence, biological assessments, and biological opinions) and to develop and implement protective measures. These measures specifically include a locatable mineral withdrawal and fire suppression pre-planning to protect desert yellowhead critical habitat from disturbance and applying a NSO stipulation to mineral leasing activities to protect the two known desert yellowhead populations.

Water can adversely impact certain special status plant species that occur in riparian-wetland habitats if it is associated with flooding or excessive sedimentation. Such conditions could cause direct plant loss from established plants being uprooted or water and silt covering plants, reducing photosynthesis. Conversely, actions that improve water quality or reduce the chances of flooding are beneficial to riparian-wetland plant communities.

Direct plant mortality and habitat loss can occur from surface-disturbing activities, including those related to mineral and realty actions. Geophysical activities that utilize vibroseis buggies can crush plants and result in plant mortality. Surface-disturbing activities also can indirectly impact special status plants by contributing to soil erosion and transporting INNS into plant habitats.

Due to the patchy distribution of most special status plant populations, surface disturbance can result in habitat fragmentation, isolating populations and preventing cross-pollination needed to maintain the species.

Forest management actions would directly impact limber pine, a BLM sensitive species. The presence of forest insects, particularly the pine beetle, and disease threatens limber pine populations in the planning area. Silviculture practices that lead to large-scale removal of diseased trees can increase soil erosion and allow INNS to move into these areas. However, without treatment, large populations of limber pine could be lost until forest regeneration takes place.

The spread of INNS can adversely impact special status plants to a greater degree than general plants due to the limited size and distribution of these species. INNS such as tamarisk and Russian olive can occupy sites that might be suitable for Ute ladies'-tresses and persistent sepal yellowcress. Management that addresses activities that can spread INNS would result in beneficial impacts to special status plant populations. INNS can be transported onto or within BLM-administered public lands through livestock fecal material. This transport can be reduced by requiring that livestock be held off public lands until INNS seeds are expelled ("livestock flushing"); the requirement for livestock flushing varies by alternative. Treatments for the control of INNS can result in beneficial and adverse impacts to special status plants. If carefully performed, treatments that reduce INNS could increase the potential for special status plants to reestablish in areas previously lost to INNS. However, the use of non-specific herbicides could affect growth or reproduction of special status plants. In isolated cases, herbicide treatment could result in direct plant mortality.

Livestock grazing can adversely and beneficially impact special status plants, depending on grazing intensity, timing of grazing, and range conditions. Livestock grazing can reduce competition between all plant species occupying the site, but also can cause direct mortality through trampling, herbivory, and general site degradation (e.g., soil erosion and compaction). Wild horse grazing could result in similar impacts, but those impacts would be limited to HMAs. Because wild horse numbers do not vary among the alternatives, potential impacts would be the same under all alternatives.

Travel management can adversely impact special status plants if motorized travel is allowed in areas with these species. Vehicles can disturb soil, remove vegetation, and create dust that can adversely impact plant growth and reproduction, or facilitate the spread of INNS.

Management in special designation areas, such as ACECs, WSAs, and along NHTs, ultimately protects special status plants by avoiding or prohibiting surface-disturbing activities in these areas. These designations could increase public use of these areas, which would result in an increased potential for disturbance and the spread of INNS.

Impacts to special status plant species from air quality, geologic resources, and cave and karst resources management does not vary by alternative. No lands identified for disposal support known threatened and endangered plants. Before disposal, identified lands will be evaluated for the presence of threatened and endangered plants, and if they are present, the BLM will not dispose of the lands. It is not known whether BLM sensitive plants occur on lands identified for disposal; however, a survey will be performed before any disposal activity and if threatened and endangered plants are present, appropriate mitigation will be applied to protect the species which may include not completing the disposal action. Acquired lands that contain special status plants will be a beneficial impact as plants will be subject to BLM management that considers appropriate protection when determining uses of the lands.

4.4.7.3.2. Alternative A

4.4.7.3.2.1. Program Management

Under Alternative A, mitigation will be applied to authorized activities, including travel management, to protect special status plant populations on a case-by-case basis. Mitigation will provide some protection for plants and could include moving project locations, closing roads, or applying a protective buffer to prevent surface-disturbing activities around plant populations. Mitigation of potential impacts to threatened and endangered plants will be coordinated with the USFWS as part of the consultation process.

Alternative A establishes acceptable limits for habitat loss, modification, or loss of function for special status plants on a case-by-case basis. These limits would have a beneficial impacts as limits would protect against substantial declines in plant populations that could contribute to the need to list BLM sensitive species under ESA.

Alternative A chemical treatments and range improvement projects in habitats for BLM sensitive plant species could adversely impact individual plants and plant communities, particularly where plant survey data are lacking. These actions could cause direct plant mortality, fragment populations, and/or alter the associated plant community due to chemical spraying or construction activities. Many of these plant species exist only in communities that contain a specific suite of plant species. Therefore, there could be indirect impacts from changes to the associated plant community.

4.4.7.3.2.2. Resources

Soil erosion and fugitive dust from disturbed areas such as roads, mineral and realty developments, and heavily grazed areas could cover special status plants and reduce photosynthesis. Soil erosion or compaction can adversely impact special status plants by depriving them of essential nutrients, organic matter, or water. Moreover, many special status plant species are rare because they are associated with rare soils or habitat conditions. If these conditions are lost or altered, it might not be possible for that species to continue to survive in the same location even with the best efforts at site reclamation. Conservation measures that prevent soil erosion or compaction diminish the adverse impacts to special status plants. Under Alternative A, cumulative short-term surface disturbance in the planning area would be expected to be approximately 52,591 acres and long-term surface disturbance is anticipated to be 12,439 acres during the planning period.

Alternative A manages forest insect and disease outbreaks in limber pine stands on a case-by-case basis and uses a variety of silviculture techniques (e.g., clear-cuts, selective cutting, and thinning) to treat forest health conditions. Aggressive treatment methods would likely be the most successful at reducing the spread of disease and insect infestations in limber pine stands. These same treatments could adversely impact other special status plants occurring in adjacent landscapes by increasing soil erosion. Forests could be replanted, including planting of limber pine seedlings, if timely natural regeneration does not occur following timber sale, forest treatment, or wildfire.

Wildfire, and to some degree, prescribed fires, could result in adverse and beneficial impacts to special status plants, depending on intensity. Approximately 800 acres per year of treatments to reduce fuels and manage vegetation would be expected under Alternative A. Of these acres, approximately 37 percent would be treated with prescribed fire, which poses a greater risk of unintended adverse impacts than mechanical treatments. In situations where the fire is intense,

temperatures could be high enough to destroy both the plants and the soil fertility upon which they depend. However, in low-intensity, lower temperature fires, special status plants might be only top-killed and could resprout with greater vigor. Low-intensity fuels reduction burning also could be beneficial by preventing the loss of special status plant communities from more landscape-level wildfires. Vegetative treatments utilizing mechanical methods are much easier to control than prescribed fire because equipment can be directed at specific areas and away from special status plants.

The introduction or proliferation of INNS results in very adverse impacts to special status plant species. Typically, INNS are able to outcompete native plants, whether they are special status or common, and establish themselves in habitats that might otherwise be suitable for colonization by special status species. In so doing, they limit the abundance and distribution of special status plants. Under Alternative A, activities that contribute to the spread of INNS will be managed on a case-by-case basis. Management actions could include requiring that construction equipment previously used in areas with INNS be washed before being used in new areas. Alternative A does not require livestock flushing. Special status plants in areas where INNS are not addressed will be adversely impacted.

Management actions that establish additional protections for wildlife and special status wildlife species and their habitats would beneficially impact special status plant communities. Alternative A prohibits surface-disturbing activities in a ¼-mile buffer around greater sage-grouse leks. This buffer would protect special status plants on approximately 16,283 acres from activities that could remove or damage plants. Alternative A closes redundant roads and allows range improvements (fences and water developments) and new roads in big game crucial winter range on a case-by-case basis. Where applied, closing roads and not allowing new roads and range improvements would beneficially impact special status plants by protecting habitat from construction and vehicle disturbance.

Alternative A management actions that protect cultural, paleontological, or visual resources from disturbance would beneficially impact special status plant communities that occupy the same site. Various levels of protection could be applied to a proposed project, depending on the relative importance of the resources found which would also protect special status plant habitat.

4.4.7.3.2.3. Resource Uses

Exploration (including geophysical operations) and development of locatable and leasable mineral resources and mineral material disposals would only result in adverse impacts by directly removing individual plants or entire communities in the short term or removing or fragmenting potential habitat in the long term. As previously stated, reclamation efforts are not likely to reestablish the necessary conditions for a rare plant community. Under Alternative A, activities associated with mineral resource development would be expected to produce approximately 21,234 acres of short-term disturbance and 9,895 acres of long-term disturbance on BLM-administered lands during the planning period.

Alternative A adverse impacts to special status plants and their habitats from wind-energy development, ROWs, and utility corridors would be essentially the same as impacts from mineral exploration and development activities. All of these uses involve some level of surface disturbance that could directly remove plants and their habitat, or fragment the remaining habitat as to limit the abundance and distribution of these species. In addition to these short-term impacts, such disturbances would add to the production of fugitive dust and its associated long-term

impacts. Alternative A opens 2,113,512 acres (88 percent of the planning area) to wind-energy development and 2,188,294 acres (91 percent of the planning area) to ROWs. Alternative A designates one ROW/utility corridor in the planning area.

Livestock grazing can produce adverse and beneficial impacts to special status plant species. Range improvement projects in habitats for BLM sensitive species can remove plants or fragment habitats through construction activities, structure placement, or concentrated trampling. If livestock are allowed to concentrate, as would occur around watering locations or supplement sites, plants could be lost by heavy grazing use or trampling. Moreover, trampling and high plant utilization could result in soil compaction or erosion, making the site unsuitable for potential habitat in the long term and contributing to the establishment of INNS. Conversely, beneficial impacts to special status plant species could result if livestock grazing removes competing vegetation that allows special status plants to thrive. Alternative A allows for livestock grazing on 2,324,934 acres in the planning area.

Recreation management could result in a variety of impacts, both adverse and beneficial, to special status plants and their habitats. Areas surrounding developed recreation sites or areas that receive high recreational use such as mountain biking, hiking, and OHV use can adversely impact special status plant habitats by crushing or killing plants or facilitating INNS movement and establishment. Unauthorized establishment of trails, whether by hikers or OHV users, also can result in soil erosion and compaction and the generation of fugitive dust. Recreation areas that limit motorized travel or constrain mineral and realty actions would result in beneficial impacts to special status plants. Under Alternative A, most of the intensive recreation areas in the planning area do not have special management prescriptions that limit surface-disturbing activities.

Much like recreation management, travel management decisions can adversely and beneficially impact special status plants and their habitats. Roads and trails that bisect special status plant habitats can cause population declines. Conversely, proper trails and travel management can be used to designate roads and trails that will avoid special status plant populations. Alternative A closes 5,923 acres (0.25 percent of the planning area) to motorized travel, which would beneficially impact special status plants in those areas. In addition, Alternative A designates open roads and trails on 163,075 acres (7 percent of the planning area), which would reduce the number of roads and the potential for adverse impacts from vehicle travel. Alternative A limits motorized travel on approximately 93 percent of the planning area to existing roads and trails; this could contribute to special status plant loss and habitat fragmentation.

4.4.7.3.2.4. Special Designations

Areas designated for special management under Alternative A, such as ACECs, Congressionally Designated Trails, WSRs, and WSAs, would beneficially impact special status plant species and their habitats to the extent that special management provides added protection from disturbance. Two existing ACECs, Red Canyon and Beaver Rim, include special status plants as part of their relevance and importance criteria for designation, although other ACECs support special status plants. Travel management and mineral and realty actions in special designation areas are subject to greater restrictions than surrounding lands. This would result in long-term beneficial impacts by protecting existing plant communities and protecting potential future communities in suitable, undisturbed habitat. Under Alternative A, a total of 169,229 acres are so designated.

4.4.7.3.3. Alternative B

4.4.7.3.3.1. Program Management

Alternative B establishes acceptable limits for habitat loss, modification, or loss of function for special status plants. Limits will be used to preclude substantial changes in habitat that would contribute to the need to list BLM sensitive species under the ESA. Alternative B closes areas containing special status plant populations to motorized or mechanized travel and applies an NSO stipulation to development of mineral leases. In addition, Alternative B excludes areas with special status plant populations from major ROWs. Closing populations to habitat disturbance from mineral and realty actions and vehicle travel would result in long-term beneficial impacts to individual plants or plant populations.

Alternative B prohibits chemical vegetative treatments within $\frac{1}{4}$ mile of BLM sensitive plant species except when needed to protect or enhance their habitats. Buffers may be enlarged on a site-specific and species-specific basis. Alternative B does not allow chemical treatments to alter plant community composition, such as reducing sagebrush; however, it does allow the treatment of weeds that are threatening the existence of BLM sensitive plants. These actions would protect special status plants from the potential adverse impacts of chemical spraying.

Alternative B prohibits range improvement projects within $\frac{1}{2}$ mile of BLM sensitive plants to prevent loss or disturbance, unless those projects would benefit the affected plant species. This buffer would protect plants from soil loss and the impacts from livestock concentration and trailing associated with water developments and fences.

Before surface-disturbing activities are authorized, Alternative B requires potential habitat in the project area to be surveyed for BLM sensitive plants. Required surveys would have a beneficial impact by preventing the loss or fragmentation of habitats on and around the project site or the permanent placement of facilities within plant communities. Alternative B allows surface-disturbing activities if protective measures can be implemented to mitigate or eliminate adverse impacts.

4.4.7.3.3.2. Resources

Impacts to special status plant species from sources such as fugitive dust, soil erosion or compaction, and excess runoff or sedimentation of water resources are typically products of surface disturbance. Under Alternative B, cumulative short-term surface disturbance for the planning period would be expected to be approximately 74,689 acres, or approximately 30 percent more acres than under Alternative A. Anticipated long-term surface disturbance will be 7,502 acres, or approximately 40 percent fewer acres than Alternative A.

Restricting motorized and mechanized vehicle travel on 5,490 acres of non-WSA lands with wilderness characteristics in the Little Red Creek Complex would reduce the risk of disturbing special status plants in that area. Alternative B would result in greater beneficial impacts to special status plants than Alternative A, which does not specifically manage these lands.

Alternative B treatment of forest insect and disease outbreaks in limber pine stands will focus in WUI areas and around developed campgrounds to address human safety concerns. Limiting treatment to these areas would likely result in the additional loss of limber pine stands in the planning area and facilitate the spread of disease and insect infestations into unaffected stands.

Alternative B vegetative treatments by prescribed burning and mechanical means would increase substantially over Alternative A. Approximately 2,500 acres of treatments are estimated per year, more than triple the number of acres under Alternative A. Of these treatment acres, approximately 40 percent of the acres would be treated using prescribed fire. With the increase in acres treated by prescribed fire under Alternative B, there would be a greater risk that more acres could experience higher temperature fires that could kill special status plants and affect soil fertility. Assuming that these treatments were carefully planned and implemented, there could be beneficial impacts to special status plant communities through reducing the risk of wildfire, which would likely result in more adverse impacts than beneficial impacts.

Compared to Alternative A, Alternative B increases protections for wildlife and special status wildlife species and their habitats, which would increase the protection of special status plant communities. Alternative B increases the size of greater sage-grouse lek buffers, which would protect 77,127 more acres from surface-disturbing activities than Alternative A. Alternative B closes redundant roads and prohibits range improvements and new roads in big game crucial winter range (647,231 acres) which will reduce adverse impacts from soil loss or fragmenting habitats associated with road development. Alternative B adverse impacts from soil erosion, fugitive dust, and habitat fragmentation would be less than under Alternative A. Alternative B is more protective, and therefore would result in greater beneficial impacts to special status plants than Alternative A, which addresses these issues only on a case-by-case basis.

Alternative B places more emphasis on reducing or managing activities that facilitate the spread of INNS. This includes such techniques such as requiring livestock flushing and stricter controls on authorized activities to prevent INNS spread from one area to another. Unlike Alternative A, Alternative B would treat annual brome species throughout the planning area instead of in specific areas. These additional efforts would likely reduce impacts to special status plant species from INNS establishment and spread more than management under Alternative A.

Compared to Alternative A, Alternative B substantially expands protections for cultural, paleontological, and visual resources to include entire landscapes or viewsheds around important resources. These expanded protections from surface disturbance would beneficially impact special status plant communities that occupy the same sites. Compared to Alternative A, Alternative B increases surface use restrictions for VRM in the planning area because Alternative B designates more acres to VRM Class II than Alternative A. Alternative B would result in greater beneficial impacts to special status plants than Alternative A.

4.4.7.3.3.3. Resource Uses

Alternative B increases constraints on exploration for, or development of, locatable or leasable minerals and mineral materials disposals for the purpose of protecting other resource values, including special status plant communities. Over the planning period, Alternative B would be expected to produce approximately 16,549 acres of short-term disturbance on BLM-administered lands and 7,378 acres of long-term disturbance, 22 percent and 25 percent fewer acres respectively, than Alternative A. Alternative B makes fewer acres available for exploration and development, thus reducing the potential for surface disturbance and result in greater beneficial impacts to special status plants and their habitats than Alternative A.

Alternative B closes much of the planning area to wind-energy development, leaving only 41,372 acres open. Alternative B closes 91 percent more acres to wind-energy development than Alternative A, which would reduce the risk of adverse impacts from plant and/or population

losses to special status plants. In addition, Alternative B opens fewer acres to ROWs and restricts major ROWs to designated corridors. Alternative B would provide more protection from surface disturbance that could adversely impact special status plant species than Alternative A.

Although Alternative B manages 2,312,095 acres as open to livestock grazing, or approximately the same number of acres as Alternative A, Alternative B requires light (21 to 40 percent) plant utilization, while Alternative A allows a higher plant utilization level on a case-by-case basis. Alternative B also prescribes livestock grazing management primarily without the use of infrastructure or range improvements. Where projects are authorized, range improvements would be prohibited within ½ mile of BLM sensitive plants to prevent loss or disturbance, unless those range improvements would benefit the affected plant species. This buffer would protect plants from the impacts of livestock concentrations and trailing associated with water developments and fences. Alternative B would reduce the likelihood of adverse impacts from project construction, livestock trampling, heavy grazing utilization, and the introduction of INNS; this management would result in greater beneficial impacts to special status plants than Alternative A.

Alternative B expands the recreation program to include numerous new recreation management areas to facilitate various types of recreation use. Alternative B decreases acreage of the Lander General ERMA by 536,770 acres to provide more specific management in SRMAs and other ERMAs. SRMAs and distinct ERMAs will have management prescriptions to enhance recreation values, including restricting surface uses from mineral and realty actions, which would ultimately result in beneficial impacts to special status plants in these areas. Plant communities in areas receiving high recreation use could be adversely impacted from activities that could result in loss or damage of plants (biking, hiking, etc.) although it is expected that these adverse impacts would be very localized. Alternative B would result in greater beneficial impacts to special status plants from increased protections than Alternative A.

Compared to Alternative A, Alternative B increases the number of acres closed to motorized travel to 71,761 acres (3 percent of the planning area). Alternative B designates open roads and trails on 193,704 acres (8 percent of the planning area). Alternative B would result in greater beneficial impacts to special status plants by reducing the potential for soil erosion, plant removal, and habitat fragmentation from motorized vehicles.

4.4.7.3.3.4. Special Designations

In addition to the protections afforded special status plants through special management area designations under Alternative A, Alternative B designates several new ACECs and expands the protections for existing special designation areas. Although most of these ACECs contain habitat for special status plants that contribute to the areas' values, special status plants are not the primary reason for the designations. Increased protections from plant disturbance and loss related to travel management and mineral and realty actions would beneficially impact special status plant populations and habitat in these special management areas. Alternative B includes 1,325,818 more acres of special designation than Alternative A, substantially increasing the acres of protections for special status plants.

4.4.7.3.4. Alternative C

4.4.7.3.4.1. Program Management

Alternative C establishes acceptable limits for habitat loss, modification, or loss of function only as required by the USFWS for threatened and endangered species. Alternative C addresses cumulative habitat losses for BLM sensitive plant species on a case-by-case basis, which could lead to reduced habitat availability and population declines. Approximately 160,065 acres of cumulative short-term surface disturbance would be expected to occur in the planning area during the planning period, approximately 115 percent more than under Alternative B and 204 percent increase over Alternative A. Cumulative long-term soil disturbance would be expected to be 60,631 acres, or 400 percent more than Alternative A and 700 percent more than Alternative B. Alternative C would result in a greater risk of actions that would contribute to listing of BLM sensitive species under the ESA than alternatives A and B. Alternative C allows motorized travel in special status plant habitat on existing roads and trails, and allows surface-disturbing activities unless they would result in loss of the special status plant population. Allowing surface disturbance from mineral, realty, and vehicle travel activities in these habitats would increase the potential for overall species declines that could contribute to the need to list the species.

Similar to Alternative A, Alternative C allows chemical vegetative treatments in BLM sensitive plant habitat unless the treatment would cause direct plant mortality. Unlike Alternative B, Alternative C does not address adverse impacts from treatments to the associated plant community where these plants occur, which could lead to habitat modifications such that the area could no longer support the sensitive species.

Alternative C does not require complete inventories for BLM sensitive plants prior to authorizing activities. If plants are known to occur in the project area, appropriate mitigation will be applied on a case-by-case basis. Authorizing activities in areas for which there is no plant distribution information could result in the loss of individual plants or entire plant populations. Alternative C would result in a greater potential to adversely impact BLM sensitive plants than alternatives A and B.

4.4.7.3.4.2. Resources

Approximately 160,065 acres of cumulative short-term surface disturbance would be expected to occur in the planning area under Alternative C, approximately 115 percent more than under alternatives A and 200 percent increase over Alternative B. Cumulative long-term soil disturbance would be expected to be 60,631 acres, or 400 percent more than Alternative A and 600 percent more than Alternative B. Increased surface disturbance can lead to plant loss, soil erosion or compaction, and/or excessive runoff into riparian-wetland habitats. Adverse impacts to special status plants from surface disturbance would be greater under Alternative C than under alternatives A and B.

Like Alternative A, Alternative C does not apply special management to lands with wilderness characteristics in the Little Red Creek Complex. Therefore the alternative affords no additional protection for special status plant species from potential disturbance caused by vehicle travel. Alternative C would result in fewer beneficial impacts to special status plants than Alternative B, which closes these lands to motorized and mechanized travel.

Similar to Alternative A, Alternative C employs a full range of silviculture methods to address forest health goals and treat insect and disease outbreaks in limber pine stands. Whereas Alternative A utilizes treatments on a case-by-case basis, Alternative C aggressively treats infestations to reduce limber pine loss and prevent the insect and disease spread into unaffected areas. Alternative C would result in greater beneficial impacts to these special status plant species than alternatives A and B.

Alternative C annual vegetative treatments by prescribed burning and mechanical methods will occur on the same number of acres as Alternative A and 1,700 fewer acres than Alternative B. The proportion of prescribed fire treatment to mechanical treatment is also the same as Alternative A. There would be less risk of adverse impacts to special status plants from prescribed fire under Alternative C than under Alternative B; however, there would also be a reduction in the potential for beneficial impacts that can occur from reducing wildfires.

Alternative C INNS treatment is the same as Alternative A. This approach would be expected to produce the same level of beneficial impacts to special status plants as under Alternative A.

Alternative C protects greater sage-grouse leks with a ¼-mile buffer, which is the same number of acres of associated special status plant habitat protected as Alternative A and 17 percent of the total acres protected under Alternative B. Alternative C does not close redundant roads and allows range improvements and new roads in big game crucial winter range; this could result in associated special status plant losses or population fragmentation. Alternative C would result in more adverse impacts to special status plant species than Alternative A and much more adverse impacts than Alternative B.

Under Alternative C, the levels of surface use protections for cultural, paleontological, and visual resources are the same or less than under Alternative A and much less than under Alternative B. Areas closed to surface-disturbing activities under Alternative B are open under Alternative C, which would provide less protection to special status plant populations. Alternative C VRM classifications are also less restrictive of surface-disturbing activities, because Alternative C designates a larger portion of the planning area as VRM Class IV.

4.4.7.3.4.3. Resource Uses

Alternative C eases constraints for the purpose of protecting other resource values, including special status plant communities, on exploration and development of locatable and leasable minerals and mineral material disposals. Alternative C does not pursue withdrawals from locatable mineral exploration and allows existing withdrawals subject to expiration to expire. Fewer restrictions on minerals exploration and development would increase the likelihood of more surface disturbance and increase the likelihood of disturbance to special status plants and their habitats. More acres are open to surface-disturbing activities under Alternative C than under the other alternatives; therefore, Alternative C would be expected to result in more long-term surface disturbance in the planning area than alternatives A and B. Actions associated with these activities on BLM-administered lands would be expected to produce approximately 21,302 acres of short-term disturbance and 9,932 acres of long-term disturbance during the planning period. Short-term and long-term disturbance acres under Alternative C would be approximately the same as under Alternative A, and 22 percent and 25 percent more acres, respectively, than under Alternative B.

Alternative C opens 2,284,235 acres (95 percent of the planning area) to wind-energy development, which is approximately 8 percent more acres than Alternative A and 93 percent more acres than Alternative B. Similarly, Alternative C opens more lands to ROWs (94 percent of the planning area) and manages less land as ROW exclusion or avoidance areas (147,053 and 11,714 acres, respectively) than alternatives A and B. Alternative C designates utility corridors on 660,908 acres, 27 percent more than Alternative B. Alternative C opens more lands to wind energy and ROW development than alternatives A and B, and would result in a greater risk of surface-disturbing activities that could adversely impact special status plants. Alternative C would result in more adverse impacts to special status plant species than alternatives A and B.

Alternative C allows livestock grazing on approximately the same number of acres as Alternative A, but allows moderate (41 to 60 percent) utilization while Alternative A establishes utilization levels on a case-by-case basis. Alternative C also prescribes a more intensive use of infrastructure or range improvements to manage livestock. The provisions under Alternative C would tend to increase the likelihood of adverse impacts (e.g., trampling and introduction of INNS) and increase the likelihood of over-utilization of special status plants. Alternative C allows range improvement projects in BLM sensitive plant habitats on a case-by-case basis. Project impacts that are not properly mitigated could result in plant removal and habitat fragmentation. Alternative C impacts would be the same as impacts under Alternative A and less beneficial than impacts under Alternative B, which utilizes project buffers to protect plants.

Potential adverse impacts to special status plants from recreation management would increase under Alternative C. Although the number of total acres in specific (not Lander General) SRMAs or ERMAs is greater (332,055 acres) under Alternative C, restrictions on motorized travel are essentially the same or less than under alternatives A and B.

Travel management under Alternative C is similar to management under Alternative A. Alternative C closes 451 fewer acres to motorized travel than Alternative A and 66,289 fewer acres than Alternative B. Alternative C designates open roads and trails on 50,776 acres (2 percent of the planning area), which is a decrease of 5 percent from Alternative A and a decrease of 6 percent from Alternative B. Alternative C would result in a greater potential for adverse impacts to special status plants than alternatives A and B by increasing the potential for plant loss and habitat fragmentation.

4.4.7.3.4.4. Special Designations

As opposed to the protections afforded special status plant habitats by special management designations under alternatives A and B, Alternative C does not designate any new ACECs or the ones identified in the 1987 RMP. Special status plants in ACECs established in 1987 would not be subject to special management that limits surface-disturbing activities that can cause plant loss or habitat fragmentation. Travel management and mineral and realty actions are subject to the basic level of restrictions, except in WSAs. Fewer protections from surface disturbance under Alternative C would increase the likelihood of adverse impacts to special status plants and their habitats in these areas.

4.4.7.3.5. Alternative D

4.4.7.3.5.1. Program Management

Alternative D establishes acceptable limits for habitat loss, modification, or loss of function for priority special status plants. Priority plants will be identified based on the amount of habitat present and how threatened the habitat is from activities occurring in the planning area. Controlling the amount of habitat loss and fragmentation that can occur from surface-disturbing activities would have a beneficial long-term impact on these species. Like Alternative A, Alternative D applies protective mitigation measures on a case-by-case basis to authorized activities and travel management actions in known special status plant populations to prevent habitat loss and plant mortality. Adverse impacts would occur from projects that are not adequately mitigated. Alternative D closes critical habitat for the desert yellowhead to motorized and mechanized travel, which would result in a greater beneficial impact than Alternative A. Alternative D has more limits on surface disturbance than Alternative A, but far fewer than Alternative B. Alternative D would result in greater beneficial impacts than Alternative C, which includes less restrictive protections for special status plants, and fewer beneficial impacts than Alternative B, which establishes habitat loss thresholds for all special status plant species and closes habitat to mineral, realty, and vehicle travel.

Alternative D allows chemical vegetative treatments in BLM sensitive plant populations so long as they would benefit the population. In most cases, chemical applications will be limited to the treatment of weeds or INNS that could crowd out BLM sensitive plant species in the plant community.

Alternative D requires on a case-by-case basis that surveys for BLM sensitive plant species be performed prior to authorizing activities. This action is the same as under Alternative A. Where surveys are required, this management would avoid adverse impacts in surveyed areas; however, for unsurveyed areas or areas for which there is no other useful information, plants or populations could be destroyed. Alternative D would result in greater beneficial impacts to special status plant species than Alternative C and fewer beneficial impacts than Alternative B.

4.4.7.3.5.2. Resources

Under Alternative D, cumulative short-term soil disturbance during the planning period would be expected to be approximately 53,894 acres, or slightly more than Alternative A but less than alternatives B and D. Cumulative long-term soil disturbance would be expected to be approximately 11,453 acres. Alternative D would result in much greater beneficial impacts than Alternative C in protecting special status plant habitats, fewer beneficial impacts than Alternative B, and almost the same beneficial impacts as Alternative A.

Alternative D closes non-WSA lands with wilderness characteristics in the Little Red Creek Complex to motorized travel and opens designated routes to mechanized travel. This would eliminate disturbance from motorized vehicles and reduce the impacts of mechanized travel because not all routes will be designated. Beneficial impacts to special status plants under Alternative D would be almost the same as under Alternative B and greater than under alternatives A and C.

To maintain forest health that can affect limber pine populations, Alternative D allows a full range of silviculture practices to treat disease and insect outbreaks on a case-by-case basis. Beneficial

impacts to limber pine would result where treatments are conducted, but the level of beneficial impact would depend on how widespread the infestation is within the forest stand and the effectiveness of the treatment method. Forest stands not treated could experience a catastrophic loss of limber pine trees. Alternative D impacts would be very similar to impacts under alternatives A and C and more beneficial than under Alternative B, which does not aggressively address disease and insect outbreaks.

Approximately 1,000 acres of vegetative treatments will be performed each year by prescribed burning and mechanical methods under Alternative D. This is 200 more acres per year than alternatives A and C and 1,500 fewer acres per year than Alternative B. Of these 1,000 acres, 50 percent would be expected to be treated using prescribed fire. Alternative D includes the highest percentage of prescribed fire treatment acres of all the alternatives, and therefore would result in the greatest potential for adverse impacts from high-temperature fires. Mechanical treatments may have beneficial impacts by stimulating growth of special status plants or adverse impacts by removing plants or damaging habitats. The type and severity of impacts would be dependent on the plant species and the mechanical method utilized.

Under Alternative D, management of INNS is the same as Alternative B and less aggressive at treating the spread of INNS than alternatives A and C. Alternative D could require livestock flushing before livestock are allowed to graze on BLM-administered lands to prevent spreading ingested INNS seeds. Alternative D also allows for the adjustment of terms for any authorized activity believed to contribute to the spread of INNS. These additional management actions, together with ongoing control methods, would be more beneficial to special status plant species than management under alternatives A and C.

Alternative D protects greater sage-grouse leks from surface-disturbing activities with a 0.6-mile buffer in the Core Area and ¼-mile buffer outside the Core Area. This combination of buffer distances represents 102,212 acres of special status plant habitat also protected. Acres protected under Alternative D are 3.6 percent more than under Alternative A, 0.4 percent more than under Alternative B, and 3.6 percent more than under Alternative C. Alternative D management of redundant roads and new road development in big game crucial winter range is the same as Alternative A, which addresses these issues on a case-by-case basis. Alternative D allows range improvements in big game crucial winter range when they are part of a grazing management strategy and project impacts could be mitigated. Alternative D would result in fewer beneficial impacts to special status plant species than Alternative B and more beneficial impacts than alternatives A and C.

Surface use protections for cultural, paleontological, and visual resources under Alternative D are more restrictive than under Alternative A, much more restrictive than under Alternative C, and less restrictive than under Alternative B. Closing sites to surface-disturbing activities or implementing protective buffers around the sites would result in greater beneficial impacts to special status plant habitat. Alternative D designates more acres as VRM Class II than alternatives A and C, which means these areas would be subject to greater restrictions on surface-disturbing activities, and therefore providing greater protection for special status plants.

4.4.7.3.5.3. Resource Uses

Compared to alternatives A and C, Alternative D opens fewer acres to mineral exploration and development activities that could result in special status plant loss or habitat degradation. Closing lands to surface-disturbing activities reduces the risk of individual plants or entire communities

being destroyed. Alternative D increases constraints on exploration and development of locatable and leasable minerals and mineral material disposals for the purpose of protecting other resource values, including special status plant communities. Actions associated with these activities on BLM-administered lands during the planning period would be expected to produce approximately 20,302 acres of short-term disturbance, which would be 5 percent less than Alternative A, 23 percent more than Alternative B, and 5 percent less than Alternative C. Long-term disturbance would be approximately 9,395 acres, which would be 5 percent less than Alternative A, 21 percent more than Alternative B, and 5 percent less than Alternative C. Alternative D applies Required Design Features to reduce adverse impacts associated with mineral development which will benefit special status plants.

Management of the Beaver Rim MLP area has special management that would be further protective of special status plants.

Alternative D opens 224,289 acres (9 percent of the planning area) to wind-energy development, which is substantially fewer acres than alternatives A and C and more acres than Alternative B. Similarly, Alternative D opens 22 percent of the planning area to ROWs and manages more acres as ROW exclusion or avoidance areas (954,322 acres and 1,215,599 acres, respectively) than alternatives A and C. Alternative D designates utility corridors on 103,646 acres, or a decrease of approximately 25 percent from Alternative C and an increase of approximately 2 percent over Alternative B. Alternative D would result in less risk of potential surface disturbance from wind energy and ROW development that could adversely impact special status plant habitats than alternatives A and C and a greater risk than Alternative B.

Alternative D allows livestock grazing on 2,317,368 acres (97 percent of the planning area), which is 7,566 fewer acres than Alternative A, 7,566 fewer acres than Alternative C, and 5,273 more acres than Alternative B. However, like Alternative C, Alternative D prescribes a more intensive use of infrastructure and allows for moderate (41 to 60 percent) utilization when combined with a Comprehensive Grazing Strategy. Alternative D allows range improvement projects in BLM sensitive plant habitat with buffers of sufficient size to ensure protection from grazing impacts, however impacts from increased grazing utilization may occur outside the buffered area. Impacts from these actions would be slightly more beneficial than management under alternatives A and C and less beneficial than management under Alternative B. Alternative D would result in more beneficial impacts to special status plants than alternatives A and C, but more adverse impacts than Alternative B, which requires lighter utilization levels and uses fewer range improvements to manage livestock.

Alternative D impacts to special status plants from recreation management would be the same as under Alternative B, except that SRMAs would constitute 13,409 fewer acres and distinct ERMAs would constitute 576,229 fewer acres under Alternative D. Mineral, realty, and travel management in these areas will be more constrained than under alternatives A and C, which would have beneficial impacts on special status plant habitats by reducing surface-disturbing activities that could result in plant loss and habitat fragmentation. Alternative D would result in greater beneficial impacts to special status plants than alternatives A and C and fewer adverse impacts than Alternative B.

Travel management under Alternative D closes 26,357 acres (1 percent of the planning area) to motorized travel, an increase over alternatives A and C of 20,434 and 20,885 acres, respectively, and a decrease of 45,404 acres from Alternative B. Alternative D designates open roads and trails on 154,772 acres (6 percent of the planning area), a decrease of 1 percent from Alternative A

and 2 percent from Alternative B, but an increase of 4 percent over Alternative C. Alternative D would result in less potential for adverse impacts to special status plants from plant loss and habitat fragmentation than alternatives A and C and a greater potential than Alternative B. Under all alternatives, most of the planning area will be open to existing roads and trails and impacts would be the same as described for Alternative A.

4.4.7.3.5.4. Special Designations

Alternative D designates 646,543 acres for special management, including ACECs, Congressionally Designated Trails, WSRs, and WSAs. None of these areas are designated specifically for the protection of special status plants, but special management that limits surface disturbance would have beneficial impacts on plants occupying the same area. Alternative D retains or expands ACEC protections for several of the areas designated under Alternative A. Constraints on resource uses related to mineral, realty, and travel management authorizations to protect the resource(s) for which the areas were designated would also protect special status plant habitats. Alternative D is less restrictive than Alternative B, but more restrictive than Alternative A. Alternative D would decrease the likelihood of disturbance to special status plant habitat that could occur under Alternative C, which does not designate any ACECs.

4.4.8. Special Status Species – Fish

The special status fish species addressed in this section include Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*), a BLM sensitive species found in the planning area in the headwaters of the Wind River, and pallid sturgeon (*Scaphirhynchus albus*), a federally listed species found in downstream riverine habitats of the Platte River system. The sturgeon is considered in this analysis because its habitat could be affected by water depletions in the Sweetwater River watershed that flows into the Platte River system.

This analysis briefly considers impacts to sauger (*Stizostedion canadense*) and burbot (*Lota lota*). Neither of these species is on the BLM sensitive species list; however, the WGFD considers these species of special concern and actions on BLM-administered lands could impact these species in a few localized areas. Actions that alter water quality or quantity in or upstream of the Wind River, Popo Agie River, and Boysen Reservoir could impact sauger. Actions that alter water quality or quantity in or upstream of Torrey Creek, the Wind River (particularly near Jakey's Fork), the Popo Agie River, or Boysen Reservoir could impact burbot.

4.4.8.1. Summary of Impacts

Direct impacts to special status fish and their habitats result from activities that generate soil erosion and can increase sediment into waterbodies that support these species. Both the amount of vegetative cover along stream banks, which helps regulate water temperatures, and vehicles in the stream channel can directly impact habitat. Alternative B provides the greatest protection from surface-disturbing activities and would result in the greatest beneficial impacts to special status fish species. Alternative C provides the least amount of protection and would result in the greatest potential for adverse impacts to special status fish. Alternative D is similar in many respects to Alternative A, but Alternative D increases protection in areas important for other resources, particularly in special designation areas.

Adverse impacts to pallid sturgeon from actions that could result in potential water depletions in the Platte River system from oil and gas development and range improvement projects are expected to be the greatest in Alternative C, followed by alternatives A then D, with Alternative B having the least amount of potential.

4.4.8.2. Methods and Assumptions

As described in the *Fish and Wildlife Resources – Fish* section, management actions or resource uses that contribute to a decrease in abundance or distribution of special status fish species are considered adverse. Conversely, management actions or measures that protect these fish species from disturbance, improve habitat, or lead to increased population or viability are considered beneficial.

For purposes of this analysis, direct impacts are those that cause damage, loss, or decline in special status fish populations or loss of habitat or habitat quality. Direct impacts can occur from recreational use, toxicity from chemical contamination, or sedimentation. Indirect impacts can include the loss of suitable habitat for future occupation or reproduction. Conversely, an action that aides in the protection of suitable habitat can be also considered an indirect beneficial impact.

This analysis considers short-term impacts to special status fish species as those that contribute to a decline in abundance or distribution within 5 years of an activity or management action, and long-term impacts as those that do not manifest themselves until more than 5 years after an activity or management action.

Methods and assumptions used in this impact analysis include the following:

- Impacts to special status fish species and their habitats will be more important than impacts to common species.
- Activities that cause substantial disturbance to soils and vegetation can adversely impact water quality and quantity, which adversely impacts special status fish habitats.
- Surface disturbances accelerate runoff and sediment delivery to stream channels, which alters streamflows and reduces habitat quality for special status fish.
- Increased sedimentation can adversely impact special status fish species in the planning area; therefore, this analysis focuses on the degree of surface disturbance anticipated to occur under each alternative.
- For Platte River System species, the area evaluated includes the portion of the planning area hydrologically connected and drained by the Sweetwater River, and areas of the Platte River System downstream of the planning area.
- Water consumption in the Sweetwater watershed could adversely affect surface water quantity in the larger Platte River System. Water depletion analyses are based on the assumption that all water used for drilling and completion of wells, and evaporation from reservoirs and water tanks within the Sweetwater watershed contribute to surface flows of the Platte River or its tributaries.
- The numbers of projected oil and gas wells within the Sweetwater watershed varies by alternative and are estimated based on the potential for oil and gas development within the watershed. Water depletions are calculated using an average of 2 acre-feet per well.
- The addition, timing, and temperature of CBNG produced water will be controlled to prevent adverse impacts to special status fish and/or aquatic life.
- Each livestock well or spring maintains an average of two stock troughs approximately 10 feet in diameter (79 square feet) each, for a per-project surface area of 157 square feet.

- Livestock pits and reservoirs average approximately 1 acre in surface area. Each livestock well or spring maintains an average of two stock troughs approximately 10 feet in diameter (79 square feet) each, for a per-project surface area of 157 square feet.
- In cooperation with the WGFD, the BLM will continue to manage fish species listed on the BLM Wyoming State Director's Sensitive Species List in accordance with BLM Manual 6840. During the planning period, fish species could be added to or removed from the BLM sensitive species list as additional data are collected and evaluated.
- The USFWS has jurisdiction over the management of threatened and endangered fish species. Actions that could affect ESA-listed species will be subject to appropriate ESA Section 7 consultation with the USFWS.
- During the planning period, the USFWS could list or delist fish species as threatened and endangered as additional data are collected and evaluated. Most species delisted or downgraded from proposed or candidate status will be included on the BLM sensitive species list.

4.4.8.3. Detailed Analysis of Alternatives

Management actions and resource uses that could impact special status fish species and their habitats include all surface-disturbing activities, grazing by livestock, wild horses, or native ungulates, chemical or hydrocarbon contamination of water resources, OHV use, fire management, and activities that deplete water supplies.

Conversely, resource uses prescribed under the alternatives that impact special status fish could, in turn, be limited by management actions that protect these special status fish species.

Special status fish occur in very limited areas in the planning area, specifically in the Dubois area and in Beaver Creek, which flows into the Little Wind River on the WRIR. Impacts to special status fish from management actions are almost the same as non-special status fish species and are not repeated here. See the *Fish and Wildlife Resources – Fish* section for the description of beneficial and adverse impacts by alternative.

4.4.8.3.1. Impacts Common to All Alternatives

Although the types of impacts to special status fish species under the alternatives would be similar, the intensity of impacts would be expected to vary by alternative. Impacts that result in a decline in abundance or distribution of special status fish species can generally be divided into two broad categories: (1) impacts associated with a change in water quality and (2) impacts associated with a change in water quantity. For this analysis, water quality is defined in terms of sediment loading, water temperature, and water chemistry. Water quantity is assumed to be average flows under natural conditions.

Development of oil and gas wells can impact surface and groundwater quantity through water use associated with well drilling and completion, as well as through surface discharge of produced water from oil and gas wells. Surface discharge of produced water that would substantially alter temperature and/or turbidity of receiving waters could adversely impact the survival and reproductive potential of sauger in some systems. Any such alteration in water quality would be most critical during the May through June spawning and incubation period. The amount of water used for drilling and completion of wells, including water for dust abatement and other post-drilling activities, varies by the depth of the well. Water used for well construction and completion is assumed to reduce the amount of water available for use in the Platte River

downstream of the planning area. The volume of produced water from oil and gas wells impacting surface and groundwater quantity depends on the amount of water discharged into surface waters, reinjected, or discharged into impoundments. The contribution of produced water from CBNG wells specifically, is anticipated to be negligible compared to the total projected water depletions.

Projected development of range improvement projects including water impoundments (reservoirs and pits), springs, and wells are anticipated to deplete water in the Sweetwater watershed that is part of the Platte River system. The size of impoundment, spring, and well development is the same in all alternatives, but the number of developments would vary by alternative. Reservoir evaporative loss calculations are based on 45 inches annual pan evaporation, average pan coefficient of .70, and annual average precipitation of 12.1 inches for the Sweetwater watershed. Potential water depletion for fire and fuels management is not included in depletion calculations due to the non-predictive nature of unplanned fire.

An integrated management approach will be used to achieve special status fish habitat objectives. In cooperation with partners, strategies will be developed and implemented to prevent the introduction and spread of aquatic invasive species, which can severely impact habitat by reducing food sources for fish and reducing oxygen levels in the water. Movement of water from one drainage to another will be avoided to prevent the transfer of aquatic invasive species and disease.

Road crossings of streams will be designed and located to minimize impacts to special status fish movement. Where feasible, existing road crossings identified as restricting fish passage will be modified to facilitate passage.

Impacts to special status fish species and habitat from air quality, geologic resources, cave and karst resources, and VRM would not vary by alternative. Wild-horse herds do not overlap areas supporting special status fish species and therefore would not cause any impacts to these species.

No lands identified for disposal contain special status fish habitat and there would be impacts under any of the alternatives. Any lands acquired that contain special status fish habitat would be a beneficial impact.

4.4.8.3.2. Alternative A

Impacts from management actions under Alternative A are almost identical to Alternative A impacts described for non-special status fish species. Specific to special status fish, activities that contribute sediment to waterbodies that support Yellowstone cutthroat trout, burbot, and sauger are authorized on a case-by-case basis. Excess sediment can suffocate fish eggs or impair production of macroinvertebrates needed by mature fish, therefore special status fish occupying areas where surface-disturbing activities and associated sedimentation are not authorized would be beneficially impacted.

It is estimated that approximately 148 conventional oil and gas wells, 107 CBNG wells, 15 reservoirs and pits, 15 springs, and 25 water wells could be potentially developed in the Sweetwater watershed during the 20 year planning period. These actions would result in approximately 516 acre-feet of water being depleted under Alternative A during the life of the plan that would affect downstream pallid sturgeon populations in the Platte River.

Fire retardant will not be aerially applied within 300 feet of waterbodies that support Yellowstone cutthroat trout, burbot, and sauger. Due to the difficulty in judging distance from the air and the possibility of chemical drift, there would be a risk of retardant getting into the water. The

potential for adverse impacts would depend on the kinds and amounts of chemical used and the length of time of exposure.

4.4.8.3.3. Alternative B

Impacts from management actions under Alternative B are almost identical to Alternative B impacts described for non-special status fish species. Alternative B includes more restrictive management prescriptions than Alternative A for surface-disturbing activities in the Dubois area, the location of most of the habitat for special status fish in the planning area. Activities that contribute sediment to waterbodies containing Yellowstone cutthroat trout, burbot, and sauger are prohibited.

It is estimated that approximately 37 conventional oil and gas wells, 20 CBNG wells could be potentially developed in the Sweetwater watershed during the 20 year planning period. These actions would result in approximately 114 acre-feet of water being depleted under Alternative B during the life of the plan that would affect downstream pallid sturgeon populations in the Platte River. New range improvement water projects would not be developed in Alternative B therefore there would be no associated water depletion concerns. Not authorizing new range improvements that result in a water depletion in the Sweetwater watershed would beneficially impact pallid sturgeon downstream of the planning area.

Alternative B does not allow aerial or hand use of fire retardant within ¼ mile of waterbodies that support Yellowstone cutthroat trout, burbot, and sauger. Alternative B provides a greater distance of protection than Alternative A and would reduce the risk of chemical drift or leach into the water.

4.4.8.3.4. Alternative C

Impacts from management actions under Alternative C would be almost identical to Alternative C impacts described for non-special status fish species. Alternative C opens the Dubois area to mineral and realty development outside the WSAs, and includes the least restrictive prescriptions in special status fish habitats. Alternative C allows activities that result in soil erosion and sedimentation of waterbodies supporting Yellowstone cutthroat trout, burbot, and sauger unless excess sediment would cause fish mortality. Alternative C would result in more adverse impacts to special status fish than alternatives A and B.

It is estimated that approximately 153 conventional oil and gas wells, 111 CBNG wells, 15 reservoirs and pits, 18 springs, and 28 water wells could be potentially developed in the Sweetwater watershed during the 20 year planning period. These actions would result in approximately 535 acre-feet of water being depleted under Alternative C during the life of the plan that would affect downstream pallid sturgeon populations in the Platte River. Alternative C would result in more adverse impacts to pallid sturgeon downstream of the planning area than alternatives A and B.

Under Alternative C, fire retardant will not be aerially applied within 300 feet of waterbodies that support Yellowstone cutthroat trout, burbot, and sauger to prevent adverse impacts to these special status fish species. This action is the same as Alternative A and provides less protection than Alternative B.

4.4.8.3.5. Alternative D

Impacts to special status fish from management actions under Alternative D are almost identical to those impacts described for non-special status fish species identified in the *Fish and Wildlife Resources – Fish* section. Alternative D allows actions that result in the removal or depletion of water in fish-bearing streams, including in the Platte River System, unless the action would result in the loss of a sustainable fish population. Alternative D avoids activities that contribute sediment to waterbodies supporting Yellowstone cutthroat trout, burbot, and sauger unless additional sediment would not harm the species.

It is estimated that approximately 133 conventional oil and gas wells, 95 CBNG wells, 15 reservoirs and pits, 15 springs, and 25 water wells could be potentially developed in the Sweetwater watershed during the 20 year planning period. These actions would result in approximately 462 acre-feet of water being depleted under Alternative D during the life of the plan that would affect downstream pallid sturgeon populations in the Platte River. Alternative D would result in more adverse impacts to pallid sturgeon downstream of the planning area than Alternative B and less than alternatives A and C.

Fire retardant will not be aerially applied within 500 feet of waterbodies that support Yellowstone cutthroat trout, burbot, and sauger, increasing the distance by 200 feet over alternatives A and C and decreasing the distance by 820 feet from Alternative B.

Overall, Alternative D would result in fewer beneficial impacts to special status fish than Alternative B and greater beneficial impacts than alternatives A and C.

4.4.9. Special Status Species – Wildlife

Direct impacts to special status wildlife species result from the direct loss of important habitat or a key habitat feature such as a nest site or lek area, or from animal mortality. Special status wildlife species can also be directly disturbed by human activities, potentially causing them to abandon a nest, lek, or home range. Disturbance during sensitive periods (e.g., winter and breeding) leads to lower recruitment rates and higher mortalities, resulting in adverse impacts to the species. Direct impacts to special status wildlife species would also include mortality from such activities as vehicles, fence entanglements, or drowning.

Habitat loss and fragmentation result in adverse impacts to special status wildlife species. Habitat loss generally results in direct impacts to the individual or population immediately affected. The impacts of habitat fragmentation, however, operate indirectly through mechanisms such as population isolation (Saunders et al. 1991); edge effects, such as increased nest predation and parasitism (Paton 1994; Faaborg et al. 1995); INNS encroachment; and disruption of migration patterns.

Indirect impacts to special status wildlife species occur by changing habitat characteristics or quality, which can ultimately result in changes in migration patterns, habitat use, carrying capacity, and long-term population viability. Indirect impacts to habitats for special status wildlife species can also occur when specific actions change the habitat in a way that makes it unsuitable for future habitation. Disturbance impacts can range from short-term displacement and shifts in activities to long-term abandonment of home range (Miller et al. 1998; Yarmoloy et al. 1988; Connelly et al. 2000).

For purposes of this analysis, short-term impacts (up to 5 years) to special status wildlife species are activities to which an individual or species immediately respond, but do not impact species population viability. Long-term impacts (more than 5 years) are those that cause an individual or species to permanently abandon an area or that alter species population viability and survival. An example of beneficial long-term impacts is restoration of habitat structure or health, or enhancement of forage base to improve populations of special status wildlife species over time.

4.4.9.1. Summary of Impacts

Authorized activities that disturb soil and remove vegetation and result in habitat loss, modification, or fragmentation impact special status wildlife species. Actions that affect breeding and birthing activities, cause direct mortality, or cause animals undue stress or energy expenditures also impact special status wildlife species. Alternative B provides the greatest protection from surface-disturbing activities and therefore would result in the greatest beneficial impacts to special status wildlife species and their habitats. Conversely, Alternative C is the least restrictive of surface-disturbing activities and provides the least amount of protection; therefore, Alternative C would result in the greatest potential for adverse impacts to special status wildlife species. Alternative D is similar in many respects to Alternative A, but Alternative D increases protection in areas important to special status and non-special status wildlife species, particularly in special designation areas.

4.4.9.2. Methods and Assumptions

Surface-disturbing activities and other actions that remove vegetation, disturb soil, and change habitat characteristics alter habitat quality and indirectly impact special status wildlife species. Indirect impacts also result from actions that can alter habitats to make them unsuitable for future habitation by special status wildlife species.

Methods and assumptions used in this impact analysis include the following:

- Impacts to special status wildlife species are based primarily on potential impacts to BLM-managed habitats.
- Ground-disturbing activities could lead to modification (beneficial or adverse) of habitat and/or loss or gain of individuals, depending on the amount of area disturbed, the species affected, and the location of the disturbance.
- Changes in habitat quality could lead to direct impacts and could cumulatively impact species survival.
- Impacts to special status wildlife species and their habitats are more important than impacts to common wildlife species.
- Precise quantitative estimates of impacts generally are not possible because the exact locations of future actions are unknown, population data for special status wildlife species are often lacking, or habitat types affected by surface-disturbing activities cannot be predicted.
- Actions that impact one species result in similar impacts to other species using the same habitats or areas.
- Measures to protect one species generally will result in long-term beneficial impacts to other species within that habitat.
- The more acreage of habitat protected, the greater the beneficial impact to the targeted species.
- Prohibiting surface disturbance or occupancy is more restrictive and provides more protection for special status wildlife species than avoiding surface disturbance or occupancy.
- Disturbance during sensitive periods adversely impacts special status wildlife species.

- Short- and long-term surface disturbance are assumed to occur in vegetation types in proportion to the availability of these vegetation types in the planning area. Impact acreage for vegetation types are not absolute, but serve as a relative comparison among alternatives.
- Removal of sagebrush habitat will result in long-term adverse impacts to sagebrush-obligate species.
- Management of sagebrush habitats follows the BLM National Sage-Grouse Habitat Conservation Strategy (BLM 2004a). Using these guidelines, greater sage-grouse serve as an indicator species for other sagebrush-obligate species.
- “Prohibiting” non-beneficial ground disturbance and disruptive activities in greater sage-grouse habitats provides a higher level of protection for greater sage-grouse than “avoiding” these activities.
- Fencing can be an obstacle and/or potential hazard to special status wildlife species.
- Changing or altering livestock grazing patterns could beneficially or adversely impact special status wildlife species habitat and its use.
- Mitigation success depends on specific protective measures and past results, and assumes that mitigation would be properly implemented.
- Public interest in special status species will likely increase due to concerns about loss of habitat from development activities that supports these species.
- No direct impacts to habitats for special status wildlife species downstream along the Platte River from activities in the planning area are expected. Changes in water quantity in the planning area will be the primary indirect impact of resource management actions on Platte River species.
- In cooperation with the WGFD, the BLM will continue to manage species on the BLM Wyoming State Director’s Sensitive Species List in accordance with BLM Manual 6840. During the planning period, species could be added or removed from the list as more data are collected and evaluated.
- During the planning period, the USFWS could list or delist special status wildlife species as threatened and endangered as more data are collected and evaluated. Most species delisted or downgraded from proposed or candidate status will be included on the BLM sensitive species list.
- The greater sage-grouse Core Area is equivalent to the Wyoming Sage-Grouse Implementation Team’s (SGIT) greater sage-grouse core population areas established by the Wyoming Governor.
- The current trends and issues affecting greater sage-grouse populations and habitat described in the WAFWA 2004 publication "Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats" describe the primary resource concerns in the planning area.
- The impoundment of water in oil and gas activities or as part of range improvement projects could increase breeding habitat for mosquitoes that carry WNV that is fatal to greater sage-grouse.

4.4.9.3. Detailed Analysis of Alternatives

Potential impacts to special status wildlife species would be similar under all alternatives, however, the intensity of impacts would vary by alternative. Impacts to special status wildlife species from program management; other resources, including vegetation, fire, wild horses, and cultural; and resource uses such as minerals, ROWs, recreation and travel management, and livestock grazing; and special designations, including ACECs, historic and scenic trails, and WSAs are described under individual alternatives. The *Fish and Wildlife Resources – Wildlife* section in Chapter 3 describes the various WGFD statutory wildlife categories into which special

status wildlife species in the planning area fit, including trophy game, predatory animals, game birds, migratory game birds, and nongame species, including raptors, neotropical migrants, mammals, and amphibians. Because impacts occur in habitats that can be occupied by animals belonging to multiple statutory categories, impacts are addressed either by specific species, by the habitat type they occupy, or collectively, where appropriate. Special status wildlife species typically occur in grassland/shrubland, forest/woodland, or riparian-wetland habitats.

4.4.9.3.1. Impacts Common to All Alternatives

Potential impacts to special status wildlife species under each alternative would be similar to the impacts described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. Adverse impacts to special status species and their habitats are usually of more concern than impacts to general wildlife because of the limited nature of their numbers, habitat, or unique threats. Special status wildlife species mortality, habitat loss, fragmentation, or modification, and/or population declines can contribute to BLM sensitive species becoming listed under the ESA, and ESA-listed species becoming more imperiled.

Special status wildlife species habitats would be lost, degraded, fragmented, reclaimed, protected, and enhanced by management actions and allowable uses under all alternatives, although the intensity of impacts would vary by alternative. As the acreage of surface disturbance and human activity level increase, the quality and quantity of special status wildlife species habitats would likely be reduced. Areas with numerous access roads and surface disturbances could result in loss of available habitat and avoidance of the area, disrupt use patterns, and alter or eliminate corridors that link crucial habitats. Because the precise location of surface disturbance under the alternatives is not known and because special status wildlife species can utilize more than one vegetation type, the degree of impact from surface disturbance is anticipated to be directly related to the amount of surface disturbance. Long-term surface disturbance could continue, even following reclamation. Although reclamation restores some habitats and reduces the acreage of long-term surface disturbance, the locations of permanent facilities (e.g., roads and well pads) adjacent to reclaimed areas can reduce the utility of the reclaimed habitat. For example, the higher the density of permanent facilities in an area, the more a habitat is fragmented, and the more adverse are anticipated impacts to special status wildlife species.

Both direct and indirect beneficial impacts to special status wildlife species would result from implementing restrictions that conserve different habitat types or from implementing seasonal protections from surface-disturbing and disruptive activities. Refer to Appendix T (p. 1641) for the anticipated acres of short-term and long-term surface disturbance from BLM actions over the planning period.

Resources

Under all alternatives, impacts to special status wildlife species from air quality, geologic resources, water resources, and visual resources management would not vary by alternative. Management that limits adverse impacts to these resources would result in a secondary beneficial impact to special status wildlife species. Management that changes water quantity in the Sweetwater River watershed may directly impact special status wildlife species occupying aquatic and/or riparian-wetland habitats in Nebraska. See the resource-specific sections of this chapter for further description of impacts from management actions by alternative. There are no alternative-specific management actions for cave and karst resources. To the extent that

management is directed at protecting these resources, once identified, there would be a secondary beneficial impact to Townsend's big-eared bats and their habitat.

Soil

Under all alternatives, management actions that limit soil disturbance would have a beneficial impact on special status wildlife species. Actions that disturb soil and remove vegetation would adversely impact special status wildlife species unless the disturbance was conducted in conjunction with vegetative treatments designed to enhance habitat for a specific species. Surface disturbance is avoided on steep slopes, with the degree of slope varying by alternative. Avoiding disturbance on slopes would result in a secondary beneficial impact to special status wildlife by limiting the amount of habitat available for surface-disturbing activities. Disturbances in special status wildlife species habitats considered limited in the planning area (i.e., Townsend's big eared bat, peregrine falcon, mountain plover, pygmy rabbit, and Canada lynx) would result in more adverse impacts than disturbances in more abundant habitats. Depending on the intensity of the disturbance, time of year of disturbance, and the health condition of special status wildlife species using the habitats, reductions in habitat quality could result in short-term and long-term impacts. The longer reclamation takes to restore disturbed areas to usable habitat, the greater the adverse impact to special status wildlife species.

Lands with Wilderness Characteristics

Lands with wilderness characteristics support and have unfragmented habitats for grassland/shrubland, forest/woodland, and riparian-wetland obligate special status birds, mammals, and amphibians. These lands are located in the Dubois area and do not support suitable habitat for black-footed ferret, white-tailed prairie dog, pygmy rabbit, or swift fox; therefore, management actions for the identified lands would not impact those species.

Fire and Fuels

Fire can result in both direct and indirect and beneficial and adverse impacts to special status wildlife species and their habitats. Generally, the impacts to habitat are much greater than the impacts to resident animals. Short-term adverse impacts to resident species from fire include displacement, disruption of reproductive activities, and occasionally mortality. In general, fire adversely impacts special status wildlife species in forest/woodland habitats for a longer time than species in grassland/shrubland habitats because of the time it takes the site to return to predisturbance conditions. Loss of mature timber stands would result in long-term adverse impacts to Canada lynx, grizzly bear, northern goshawk, and long-eared myotis. Fire can impact birds when it occurs during the nesting season, killing chicks and destroying nests. Raptors such as ferruginous hawks, northern goshawk, and peregrine falcon can benefit from fire due to increased populations of small mammals and birds in response to vegetative changes after fire. In the short term, fire can reduce cover and habitat available for prey species.

Using fire as a habitat management tool in grassland/shrubland habitats could adversely impact special status wildlife species if desirable shrub and perennial grass stands were converted to annual grasses. Sagebrush requires a long time to achieve the size and height needed for nesting and security cover, particularly in low-precipitation areas. Greater sage-grouse, sagebrush-obligate songbirds, and pygmy rabbits generally would be the species most affected, either beneficially or adversely, by habitat modifications in grassland/shrubland habitats. Removing native vegetation with fire could open sites to INNS, which has little benefit to wildlife either as forage or cover. Fire that removes most of the sagebrush from the ecosystem could

remove suitable habitat for greater sage-grouse and sagebrush-obligate neotropical migrants in the long term, but impacts would depend on the severity, size, and location of the fire. Fire also could beneficially impact sagebrush-obligate species because it can improve the age class diversity of sagebrush plants and increase the density and species composition of the herbaceous plant understory. Fuels treatment would help minimize the size of wildfires and adverse impacts to special status wildlife species, particularly in greater sage-grouse habitats.

Vegetation

Forest management actions to meet forest health objectives could result in habitat loss and fragmentation, displacement of animals, disturbance from noise, and increased vehicle traffic, as described in the *Fish and Wildlife Resources – Wildlife* section. Forest management activities impact grizzly bear, gray wolf, Canada lynx, northern goshawk, and long-eared myotis the most because these species require a timber overstory for seasonal habitats. Timber management activities could remove forest cover needed for foraging and denning habitat of snowshoe hare, the main prey of Canada lynx, which could affect Canada lynx. Snowshoe hares can reach their highest densities in young, dense coniferous or coniferous-deciduous forests, or mature forests with a dense understory of shrubs, aspen, and/or conifers. Human activities such as timber harvest and thinning projects can be compatible with Canada lynx if they mimic natural disturbances, such as wildfire, and if these activities provide a mix of Canada lynx habitat components (Ruggiero et al. 1994, Ruediger et al. 2000). Northern goshawks typically occupy large tracts of old-growth coniferous forests with dense canopy cover, although they can occupy a variety of forest habitat types (Reynolds et al. 2008, Squires and Ruggiero 1996). Timber management actions that thin or alter suitable habitat could adversely impact the availability of nesting habitat, although some studies have shown that northern goshawks select territories in areas previously logged or thinned (Clough 2000, Reynolds et al. 2008). The Dubois and Green Mountain areas contain timber stands having size and structural characteristics for suitable nesting habitat. In addition, these areas provide other habitat components for northern goshawks to establish territories (Reynolds et al. 1992, 2006, and Kennedy 2003). Timber harvest activities could result in an increase in roads and access into Canada lynx, grizzly bear, and northern goshawk habitats that could result in additional habitat loss or disturbance conflicts. Mitigation measures associated with roads could reduce or eliminate adverse impacts to these special status species (Reynolds et al. 2008).

Management actions that promote a diverse mix of grasslands and shrublands would also promote a natural landscape and healthy special status wildlife species habitats. Reducing impacts to vegetation resources from surface disturbance would reduce adverse impacts to special status wildlife species habitats. Maintenance of contiguous habitat blocks, and the corridors between them, would have a beneficial impact on species that have large home ranges and depend on large areas of habitat to carry out their life history requirements (i.e., grizzly bear, gray wolf, Canada lynx, greater sage-grouse, raptors, and neotropical migrants). Corridors between habitat blocks are important for seasonal movements and to minimize conflicts with human activities such as hiking, fishing, and camping. Successful reclamation of surface disturbance is necessary to establish connectivity within previously fragmented habitats and to achieve and maintain ecosystem function.

Management focuses on maintaining sagebrush and understory diversity in greater sage-grouse and other sagebrush-obligate species' habitats unless vegetative treatments are needed to achieve habitat objectives. Similar to greater sage-grouse, Brewer's sparrow, sage sparrow, sage thrasher, loggerhead shrike, and pygmy rabbit depend on sagebrush habitats. Except for pygmy rabbit, these species could occupy other shrubland habitats, particularly during the non-breeding season.

Because greater sage-grouse is one of the largest and most visible special status bird species, they are typically used as an indicator species for other sagebrush-obligate birds and small mammals; therefore, management actions that protect greater sage-grouse habitat generally would have beneficial impacts on all sagebrush-obligate species.

Management of riparian-wetland areas to meet PFC and the Wyoming Standards for Healthy Rangelands would improve habitat conditions for a multitude of special status wildlife species, including trumpeter swan, bald eagle, white-faced ibis, long-billed curlew, yellow-billed cuckoo, greater sage-grouse, and amphibians (northern leopard frog, great basin spadefoot toad, boreal toad, and spotted frog). Actions that improve riparian-wetland PFC would improve habitats for special status wildlife species, especially via increases in the quantity and quality of riparian-wetland vegetation and insects. Management actions that maintain seeps, springs, wet meadows, and riparian-wetland vegetation in a functional and diverse condition would have beneficial impacts on all special status wildlife species, and greater sage-grouse in particular. Under all alternatives, riparian-wetland areas are protected from surface-disturbing activities, which would also have a beneficial impact on special status amphibians and their habitats.

Invasive Species and Pest Management

Impacts from the establishment and spread of INNS and the various treatment methods would be the same as identified in the *Fish and Wildlife Resources – Wildlife* section. Annual and perennial INNS occur primarily in grassland/shrubland and riparian-wetland habitats on public lands. INNS would impact special status wildlife species such as greater sage-grouse, sage thrasher, Brewer's sparrow, white-faced ibis, and amphibians the most because those species spend most of their time in these habitats. Cheatgrass is the most widespread INNS in the planning area and has the greatest potential to adversely impact greater sage-grouse habitats. Broad-spectrum insecticides are discouraged in greater sage-grouse brood-rearing areas to reduce the adverse impacts to non-targeted insects important for young grouse from such treatments. All alternatives identify and prioritize areas for treatment and manage activities that contribute to the establishment of weed infestations, ultimately benefitting special status wildlife species habitats. Impacts to special status wildlife from the presence of INNS or control methods would not vary by alternative.

Fish, Wildlife, and Special Status Species

In general, impacts to special status wildlife from surface disturbance would parallel the impacts to general wildlife. Actions that constrain surface-disturbing activities to protect fish, special status fish, and special status plants also would have a beneficial impact on habitats for special status wildlife. Amphibians and neotropical migrants are the species most likely to benefit from management actions that protect fish and special status fish, whereas actions that protect special status plants would result in beneficial impacts to wildlife in all statutory categories.

All alternatives, except Alternative C, require surfacing-disturbing activities and facilities to have the smallest footprint possible to minimize the impacts of habitat loss and fragmentation. Implementing, where appropriate, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures in existing state programmatic biological opinions for the bald eagle, Canada lynx, gray wolf, black-footed ferret, and grizzly bear would minimize and mitigate adverse impacts from resource uses and activities. Actions that could affect federally listed wildlife species require consultation and coordination with the USFWS. Due to the number of special status wildlife species that have habitats in the Dubois area, lands in that area are a priority for management actions that beneficially impact these species.

A TLS is used to protect breeding and nesting special status wildlife, including raptors, mountain plover, and greater sage-grouse from surface-disturbing and disruptive activities. Under all alternatives, surface-disturbing and disruptive activities are prohibited within ¼ mile of mountain plover breeding and nesting habitat from April 10 to July 10 unless surveys indicate the absence of birds. A TLS is applied within 1 mile of an active bald eagle nest during the period February 1 to August 15 to protect nesting eagles. Occupied greater sage-grouse leks are protected from surfacing-disturbing activities year-round, and the distance of protection from leks varies by alternative. In addition, identified winter concentration areas for greater sage-grouse are protected from surface-disturbing and disruptive activities from December 1 to March 14. Dates could be modified if data indicates a change is necessary to better protect nesting greater sage-grouse. Seasonal nesting limitations for raptors, mountain plover, and greater sage-grouse would have beneficial impacts on other special status birds nesting in the same area. All stipulations are subject to exception, modification, or waiver if conditions warrant and the BLM subsequently grants an exception, modification, or waiver.

Approximately 1,678,035 acres (70 percent of the planning area) are identified as greater sage-grouse Core Area; therefore, management actions that conserve, protect, and maintain habitat for greater sage-grouse are a priority in this area. Numerous management actions common to all alternatives from the BLM National Sage-Grouse Habitat Conservation Strategy would result in beneficial impacts to this species (BLM 2004a). Actions that maintain sagebrush and understory diversity in seasonal habitats, manage riparian-wetland habitats in a functional and diverse condition, and reduce infrastructure that can cause greater sage-grouse mortality (i.e., fences) or give predators an advantage (i.e., perching structures) would result in beneficial impacts to special status wildlife. Impacts to special status wildlife would be minimized through appropriate placement of facilities and projects and maintaining connectivity between large blocks of undisturbed habitat. Conservation of sagebrush habitat would not only result in beneficial impacts to greater sage-grouse, but also other sagebrush-obligate species such as the sage thrasher and sage sparrow.

Most of the planning area has been block-cleared by the USFWS for black-footed ferrets based on negative findings in previous surveys. Surface-disturbing activities could affect the suitability of large white-tailed prairie dog complexes to be considered as potential black-footed ferret reintroduction sites in block-cleared areas. Outside block-cleared areas, surveys for black-footed ferrets are performed prior to authorizing surface-disturbing activities. Surface-disturbing activities could result in beneficial impacts to white-tailed prairie dogs because they often move into disturbed sites that have suitable grass communities nearby.

Management actions that protect general wildlife species during sensitive periods would also have beneficial impacts on special status wildlife. All alternatives apply a TLS seasonally to protect other nesting raptors and in big game crucial winter range. Applying these stipulations also would protect other special status wildlife using these habitats at the same time.

Wild Horses

Wild horses compete directly for water, forage, and habitat and wild horse management would result in direct adverse impacts to the availability of forage and cover in grassland/shrubland and riparian-wetland habitats for special status wildlife and their prey. Grazing could reduce upland and riparian-wetland vegetative cover and structure, and forage quality and quantity, thereby reducing the suitability of these habitats for special status wildlife. Impacts to white-tailed prairie dogs, mountain plovers, and black-footed ferrets would be minor because habitats for these species

contain little forage for wild horses; therefore, horses are not expected to spend much time in these habitats. A total of 537,825 acres of the greater sage-grouse Core Area overlaps wild horse herd areas, which constitutes 30 percent of the Core Area on public land in the planning area. Wild horse actions would not impact grizzly bear, Canada lynx, trumpeter swan, and peregrine falcon because habitats for these special status wildlife species do not overlap with wild horse HMAs.

Cultural and Paleontological

Management actions for cultural and paleontological resources would indirectly protect special status wildlife habitat by restricting surface-disturbing activities, thus minimizing vegetation loss. The amount of habitat protected is commensurate with the number of acres protected for these resources. Authorized excavation of sites and cultural and paleontological inventories would cause localized, short-term disruption at the excavation sites. However, these actions are subject to the same seasonal and surface use restrictions required for resource uses. Adverse impacts from cultural and paleontological surface disturbance would be expected in relatively small areas and would not vary among the alternatives.

Resource Uses

Minerals

Impacts to special status wildlife from mineral exploration, development, and transport would be the same as impacts described in the *Fish and Wildlife Resources – Wildlife* section. There would be no beneficial impacts to special status wildlife associated with locatable mineral, leasable mineral, and mineral materials disposal activities. Primary adverse impacts would be the short-term and long-term loss and fragmentation of habitat, animal displacement and/or mortality, and the disruption of corridors that link seasonal ranges. Under all alternatives, 3,432 acres are withdrawn from locatable mineral entry in the East Fork area. These acres were withdrawn pre-FLPMA, therefore the withdrawal is not subject to expiration. This withdrawal would benefit special status wildlife using the lands. It is anticipated that approximately 183 acres of long-term disturbance would occur each year from locatable mineral activities and another 183 acres of long-term disturbance would occur from mineral materials disposal activities under all alternatives. Geothermal and oil and gas development utilize the same extraction methods; therefore, impacts from the development of these resources would be similar. The number of acres with long-term impacts from disturbance would vary by alternative for oil and gas leasing activities; no additional disturbance would be expected from geothermal leasing activities under any of the alternatives because of the lack of identified commercially viable resources in the planning area.

Most concentrated oil and gas development is expected to occur in areas with high to moderate development potential in the Lysite and Beaver Creek areas and in the area south of Jeffrey City. Development activities would impact greater sage-grouse, mountain plover, white-tailed prairie dog, ferruginous hawk, burrowing owl, pygmy rabbit, dwarf shrew, and neotropical migrants. The Lysite and Beaver Creek areas are outside the greater sage-grouse Core Area, but the area south of Jeffrey City is in the Core Area due to the high density of greater sage-grouse leks. The rest of the planning area has low, very low, or no potential for oil and gas development, including CBNG. It is expected that oil and gas development in areas outside those with high and moderate potential would consist of wildcat operations and small isolated fields, and that there would be no large-scale development in those areas.

Adverse impacts from habitat loss, fragmentation, and modification can lead to population declines for specific species. Areas with intensive development, either from one or a combination of minerals extraction methods, could make surrounding undisturbed habitats unusable due to noise, human activity, roads, etc. Management actions that minimize surface-disturbing and disruptive activities in special status wildlife habitats would result in the fewest adverse impacts. Mineral extraction methods would determine the degree of adverse impacts to special status wildlife and associated habitat. Impacts would include displacement and disturbance of animals, removal of vegetation, and loss of habitat. The level of impacts would depend on the size of the exploration and/or development area and the importance of the altered habitat to the species. Because of the length of time it takes sagebrush to establish on sites that have been disturbed, all acres disturbed and reclaimed would be considered long-term disturbance impacts to sagebrush-obligate special status wildlife.

Mineral development and associated ROWs are expected to be the greatest single contributor to the disturbance of special status wildlife habitat in the planning area. Beyond initial exploration (including geophysical activities), land clearing, and aboveground facility construction, continued human disturbance to special status wildlife could occur from activities such as equipment maintenance and site operations, which are especially disruptive during sensitive times (wintering, breeding, and nesting). The management of disruptive activities during O&M activities varies by alternative.

Mosquitoes can breed in condensate pits used for drilling activities and evaporation ponds built for produced water. Mosquitoes carrying the WNV can transmit the disease to greater sage-grouse, which results in the death of the bird.

Geophysical activities to identify oil and gas reserves can result in short-term disturbance and habitat modification impacts to special status wildlife. See the *Fish and Wildlife Resources – Wildlife* section for a description of impacts associated with seismic operations. Impacts from seismic operations would not vary by alternative; however, the number of acres open to geophysical activities does vary by alternative.

The development of phosphate leases would require stripping of the overburden to access the phosphate deposit, which would result in long-term, and likely permanent, loss of habitat for special status wildlife. Approximately 60,374 acres of federal mineral estate have been identified as having phosphate potential in the planning area, with deposits found predominantly along the Lander Slope, in the Sheep and Schoettlin Mountain areas, and near the Sweetwater River. These areas support many special status wildlife species, including sagebrush- and riparian-wetland-obligate birds, mammals, and amphibians. All alternatives prohibit phosphate leasing within 500 feet of riparian-wetland habitats, which would result in beneficial impacts to species utilizing these habitats. There are currently no phosphate leases in the planning area.

Lands

Land acquisitions, pursuit of easements, and tenure adjustments would improve management of the public lands overall; impacts to special status wildlife would be project specific and would vary depending on the type of tenure action. Lands containing important special status wildlife habitats are considered when making land tenure adjustments in the planning area. The acquisition of lands would have a direct beneficial impact to all species of wildlife associated with that habitat because lands under BLM control will not be available for subdivision and are subject to management decisions that consider impacts to all wildlife. Land exchange and acquisition could provide opportunities to make a more manageable land pattern that could be administered

to benefit special status wildlife. Disposing of lands could result in the long-term loss of habitat, depending on how the new owner uses the lands. Lands with habitats for ESA-listed species are not available for disposal.

Renewable Energy

It is expected that wind-energy development would not occur universally across the planning area and would occur only in areas identified as having high potential for wind-energy development. Potential wind-energy development would include site development, utility corridors, and access routes and would result in direct adverse impacts to special status wildlife and their habitats. Due to the large footprints they create, wind-energy developments can cause habitat loss and fragmentation, wildlife avoidance of the area, and increased human activity which would result in long-term adverse impacts. Turbines and associated powerlines may adversely impact special status birds and bats because they can be struck by the turbine blades or suffer internal injuries and mortality from rapid air pressure changes. There would be no direct beneficial impacts to special status wildlife from wind-energy development.

ROWs and Corridors

Impacts to special status wildlife from ROWs and corridors would be the same as described in the *Fish and Wildlife Resources – Wildlife* section. Concentration of aboveground and belowground utilities in corridors would result in barriers, either physical or psychological, to special status wildlife movement. Increased traffic along these routes could increase the risk of vehicle-related wildlife mortality. Facilities that produce continual noise can affect the breeding vocalizations of greater sage-grouse. Continuous noise from industrial facilities, such as compressor stations, close to active greater sage-grouse leks would interfere with male greater sage-grouse strutting behavior which could reduce the reproductive success of greater sage-grouse using these leks.

Livestock Grazing Management

All alternatives allow livestock grazing across most of the planning area, which would result in direct competition with special status wildlife for forage and habitat. The development of livestock grazing systems would provide the opportunity to improve or maintain range conditions that support special status wildlife. Management of BLM-administered lands to meet Wyoming Standards for Healthy Rangelands (Appendix J (p. 1537)) would result in actions that could balance the impacts of grazing while sustaining special status wildlife and their habitat. Failure to implement proper livestock grazing management could degrade habitats if removal of vegetation is excessive, soil disturbance and compaction, and the transport of INNS. Livestock allowed to concentrate in riparian-wetland areas could adversely affect habitat for special status wildlife by removing hiding cover and degrading water quality and quantity. Livestock grazing managed for light utilization and authorized outside sensitive periods would reduce or eliminate potential conflicts and be the most beneficial for special status wildlife and their habitats. High utilization levels in riparian-wetland and upland habitats would reduce available forage and cover for special status wildlife and could cause a decline in plant diversity, which could result in a decline in the number of species the area can support.

Although there is little evidence linking grazing practices to population levels of greater sage-grouse (Connelly and Braun 1997), the impacts of grazing on greater sage-grouse habitat have been studied. Several authors have noted that grazing by livestock could reduce the suitability of breeding, nesting, and brood-rearing habitat, adversely affecting greater sage-grouse populations (Dobkin 1995, Connelly and Braun 1997, Beck and Mitchell 2000).

Placement of new water sources or salt or mineral supplements in greater sage-grouse breeding and nesting habitat could degrade habitat quality by increasing forage utilization and reducing cover needed to conceal nests and chicks. Livestock grazing in fall or early spring would likely remove the residual herbaceous understory and reduce its vertical structure, which would reduce the visual security for upland nesting special status birds such as greater sage-grouse, sage thrasher, and Brewer's sparrow. Inadequate security cover could lead to increased predation and subsequent lower nesting success. Under all alternatives, forage utilization levels are established in greater sage-grouse nesting habitat to ensure the availability of adequate nesting cover.

Livestock range improvement projects, such as fences and water developments designed to alter grazing distribution and expand use into areas under-utilized by livestock, will both adversely and beneficially impact special status wildlife. Fences could benefit wildlife habitat by controlling or eliminating livestock grazing in areas important to wildlife, increasing vegetative cover and forage availability. Areas that receive less livestock use are often favored by special status wildlife due to ample forage and cover, reduced competition for resources, and limited human disturbance associated with grazing management activities. Range improvements modify natural livestock movement patterns and could lead to increased plant harvest in breeding, nesting, and winter habitats essential for special status wildlife. Projects can also alter grazing distribution to increase nesting cover in areas that previously received high utilization levels. Livestock fences create travel barriers to grizzly bear and gray wolf and impalement hazards to birds. Management actions that consider placement and visibility of fences in relation to special status wildlife seasonal habitats and movement patterns would beneficially impact the species. Under all alternatives, fence markers would be required on new wire fences constructed in greater sage-grouse habitat to reduce the potential for injury or death from collision with fence wires.

Water developments maintained throughout the year can be beneficial to special status wildlife in areas where other water sources are limited. Well-designed reservoirs and associated riparian-wetland vegetation could create nesting, feeding, and brood-rearing habitat for migratory birds. Water troughs provide water in very arid areas, but also can pose a drowning hazard to birds trying to access water. Under all alternatives, escape ramps will be required in all stock water troughs and tanks to reduce the potential for drowning by birds and small mammals. Associated windmills and/or power poles provide hunting perches for raptors, which could result in predation of special status wildlife such as greater sage-grouse and mountain plover. Similar to pits and ponds used in mineral development activities, shallow or stagnant livestock water can produce mosquitoes that carry the WNV. Mosquitoes carrying the WNV can transmit the disease to greater sage-grouse, and if exposed, the bird would die. Water developments increase livestock use in areas that could have been used predominantly by wildlife. Wildlife tend to depend on areas where there is little livestock use because they do not have to compete for forage and cover resources. Increasing livestock use in these areas could lead to increased plant utilization, resulting in decreased forage and cover and dispersal of special status wildlife. Livestock use around water sources could also alter vegetative diversity, potentially reducing habitat quality for many species of special status wildlife.

Recreation and Travel

Impacts to special status wildlife from recreation and travel management actions would be the same as described in the *Fish and Wildlife Resources – Wildlife* section. Recreation activities during sensitive periods (breeding, nesting, birthing, wintering, and hibernating) could disrupt special status wildlife behavior and cause the expenditure of energy reserves, resulting in adverse impacts to the individual or the local population. OHV use can cause short-term displacement

and long-term habitat loss and fragmentation, including expanding human presence into formerly remote areas. Impacts would increase if frequent OHV use occurs during critical periods for special status wildlife, potentially leading to decreased health, death to individuals, or overall population declines. Areas closed to motorized vehicle use would beneficially impact special status wildlife by eliminating habitat loss caused by roads and reducing disturbance or mortality from vehicles. Special status wildlife use in and around developed recreation sites is typically limited because wildlife generally avoid areas with human activity/presence. Lands managed for primitive recreation experiences protect the natural environment, and therefore also would beneficially impact special status wildlife.

Special Designations

Special designation areas that have restrictions on surface-disturbing activities and resource uses that adversely impact special status wildlife would result in long-term beneficial impacts to the species. ACEC designations would result in beneficial impacts to special status wildlife species by restricting surface-disturbing activities and certain resource uses, such as mineral development, ROW development, and motorized vehicle use. Each ACEC has its own set of prescriptions for how lands are managed. The only prescription that automatically comes with the ACEC designation is the requirement that a Plan of Operations be completed before locatable mineral exploration or development can occur, regardless of acreage. This requirement allows the BLM an opportunity to identify and address potential impacts to wildlife with the mining proponent; however, the 1872 General Mining Law gives preference to the mining proponent over the protection of wildlife habitat. Special status wildlife habitat adjacent to NHTs is also protected from development; however, the distance from the NHTs that the protection would extend varies among the alternatives. The *Special Designations* section of this chapter provides further analysis for each special designation by alternative. Eight WSAs, encompassing 55,338 acres, are managed for naturalness, outstanding opportunities for solitude, and primitive and unconfined recreation under BLM Manual 6330, *Management of Wilderness Study Areas*. Impacts to special status wildlife would not vary by alternative, except for road and trail closure areas, which are discussed in the *Comprehensive Trails and Travel Management* section of this chapter. Habitats in WSAs are protected from surface-disturbing activities in the long term, and short-term disruptive activities are minimized. Approximately 21 miles of NWSRS-eligible waterway segments along Baldwin Creek and the Sweetwater River provide habitat for special status wildlife occupying riparian-wetland, grassland/shrubland, and forest/woodland plant communities. These special designations provide multiple beneficial impacts by restricting activities and resource uses that degrade habitat and disturb special status species wildlife.

4.4.9.3.2. Alternative A

4.4.9.3.2.1. Program Management

Alternative A requires surveys on a case-by-case basis to determine the presence or absence of BLM sensitive species prior to authorizing actions on public land. If species are present, mitigation measures are required to protect the species and limit adverse impacts to their habitats. The requirement for surveys is based on the availability of suitable habitat in the project area. Surveys for nongame neotropical migrants, mammals, and amphibians are generally not required before authorizing surface-disturbing activities, whereas surveys for special status raptors, greater sage-grouse, white-tailed prairie dog, and pygmy rabbit are generally required. In all cases, surveys are required for threatened and endangered species in suitable habitat. Information

collected during surveys will help in determining appropriate mitigation measures to protect species during sensitive periods (winter, mating, nesting, hibernation), protect limited habitats, and contribute to species occurrence knowledge in the planning area for future authorizations. Alternative A establishes limits of acceptable habitat loss on a case-by-case basis to reduce declines in special status wildlife populations. These management actions would beneficially impact special status wildlife.

Alternative A applies a TLS to prohibit surface-disturbing activities within $\frac{3}{4}$ mile of active peregrine falcon, northern goshawk, burrowing owl, and ferruginous hawk nests from February 1 to July 31. This date range would adequately protect nesting and fledging ferruginous hawks and peregrine falcons because they typically finish these activities between those dates. Ferruginous hawks tend to be more sensitive to disturbance, and a $\frac{3}{4}$ -mile buffer might not be adequate to prevent nesting birds from abandoning eggs or chicks. Northern goshawks and burrowing owls usually initiate nests later in spring; therefore, their chicks generally do not fledge until after July 31. Alternative A would result in long-term adverse impacts to northern goshawks and burrowing owls because the date range would not be long enough to encompass chick fledging. Protective buffers would help minimize, but would not completely prevent, impacts to raptors because most species are mobile beyond these buffers. Impacts from habitat degradation and loss would be commensurate with the amount of surface disturbance. Areas expected to experience a large amount of surface disturbance are associated with intensive oil and gas development and uranium mining in the Lysite, Gas Hills, Beaver Creek, and south of Jeffrey City areas.

Alternative A includes a number of management actions directed specifically at protecting greater sage-grouse and their habitat. Surface-disturbing and disruptive activities are prohibited on or within $\frac{1}{4}$ mile of occupied greater sage-grouse leks. Greater sage-grouse have a high fidelity to breeding areas; therefore, protecting leks and surrounding nesting habitat would ensure long-term availability of these sites for greater sage-grouse and for other sagebrush-obligate neotropical migrants. Disruptive activities occurring on or near leks can cause greater sage-grouse to leave the lek and can result in lower reproduction rates and subsequent population declines for that particular area. Alternative A will avoid disruptive human or noise activities within $\frac{1}{4}$ mile of the perimeter of occupied leks between 8 p.m. and 8 a.m. from March 1 to May 15 on a case-by-case basis. Disruptive activities include actions such as non-emergency project maintenance, road blading, project staking, and resource inventories. Alternative A avoids surface-disturbing and disruptive activities in greater sage-grouse nesting habitat within 2 miles of occupied leks from February 1 to July 31. This action would result in short-term beneficial impacts to nesting birds, but would not protect habitats in the long term because Alternative A allows surface-disturbing activities in this same area outside the nesting season. This action would provide long-term protection of 16,283 acres of lek habitat and short-term protection of 794,452 acres of nesting habitat on public surface. Alternative A does not establish disturbance densities or cumulative surface disturbance thresholds in greater sage-grouse breeding, nesting, and brood-rearing habitat, which could adversely impact the ability to maintain existing populations.

On a case-by-case basis, Alternative A requires equipment or techniques that reduce the noise decibel output to be installed on facilities such as compressor stations to minimize the impacts of noise to breeding and nesting greater sage-grouse. Noise levels that interfere with greater sage-grouse vocalizations can adversely impact the reproductive success of males. This management action, if applied, would beneficially impact greater sage-grouse using leks close to noise sources. High-profile structures that can be used by raptors as hunting perches are prohibited within greater sage-grouse nesting habitats on a case-by-case basis. Greater sage-grouse are susceptible to predation during breeding and nesting periods and structures that give raptors a

hunting advantage could contribute to a population decline. In addition to greater sage-grouse, overhead structures can increase raptor predation on white-tailed prairie dogs, mountain plovers, and pygmy rabbits. Alternative A allows, on a case-by-case basis, overhead powerlines in greater sage-grouse, white-tailed prairie dog, mountain plover, and pygmy rabbit habitats. To reduce predation opportunities, Alternative A requires on a case-by-case basis that anti-perching devices be installed on overhead powerlines and that low voltage powerlines be buried. Reducing noise and predation opportunities would beneficially impact special status wildlife.

Alternative A avoids surface-disturbing activities in occupied pygmy rabbit and white-tailed prairie dog colonies when possible. Pygmy rabbits typically spend most of their time within approximately 100 feet of their burrows; therefore, projects should be able to avoid these habitats in most cases. Surface disturbance in white-tailed prairie dog colonies can adversely and beneficially impact the species and black-footed ferrets can also live in these colonies. Blading and trenching activities could cause animal displacement from the area, loss of burrow habitat, or animal death. These actions also would disturb soil, which could facilitate additional burrow development because white-tailed prairie dogs will utilize the softer disturbed ground to dig new burrows and pathways.

To protect special status bats, Alternative A avoids surface-disturbing and disruptive activities at or near known bat maternity roosts and hibernation areas on a case-by-case basis. These habitats are typically found in old mining shafts and adits in the South Pass and Bridger Mountain Range areas, in dilapidated buildings, and in trees throughout the planning area. To birth their young, bats require warm, safe places close to good insect foraging areas and they hibernate in areas where they are less likely to be disturbed by light, noise, and predators. Disturbance during the hibernation period can cause bats to use up fat reserves needed to survive the winter months. Disturbance of maternity roosts, hibernacula, or adjacent foraging habitats can result in localized bat population declines.

As travel corridors for special status wildlife are identified, Alternative A manages surface disturbance and the placement of facilities to minimize adverse impacts to movement on a case-by-case basis. Movement corridors are necessary for special status wildlife to access seasonal habitats and to maintain genetic diversity within the population. Telemetry data collected indicates species such as Canada lynx, grizzly bear, and greater sage-grouse tend to utilize the same areas each year to move between seasonal habitats. Lynx Analysis Units (LAUs) have been established to identify important transition ranges with Canada lynx habitats occurring on adjacent USFS lands. Preserving these corridors would result in long-term beneficial impacts to special status wildlife.

Many special status wildlife species occupy lands in the Dubois area, although some species might not have been documented on BLM lands. Grizzly bear, gray wolf, Canada lynx, bald eagle, trumpeter swan, northern goshawk, white-faced ibis, spotted bat, and BLM sensitive amphibians occupy the area, and much of their individual habitats overlap. Alternative A closes the Whiskey Mountain and East Fork ACECs and the Whiskey Mountain and Dubois Badlands WSAs to most surface-disturbing activities, which would beneficially impact special status wildlife. The remainder of the Dubois area is open to surface-disturbing and disruptive activities and managed with standard stipulations, such as seasonal raptor nesting protections and riparian-wetland area avoidance. Standard stipulations would not protect most special status wildlife habitats from long-term loss or fragmentation resulting from authorized resource uses and could lead to localized population declines.

4.4.9.3.2.2. Resources

Lands with Wilderness Characteristics

Alternative A does not specifically manage lands with wilderness characteristics to protect those characteristics. Most of the identified lands with wilderness characteristics are in the Whiskey Mountain ACEC and are managed in accordance with ACEC prescriptions. Lands outside the ACEC are not subject to special management.

Fire and Fuels

Under Alternative A, it is anticipated that 300 acres per year would be treated through the use of prescribed fire and 500 acres would be treated using mechanical treatment methods to address fire and fuels concerns. Prescribed fire and mechanical treatments would beneficially and adversely impact special status wildlife. Fire that removes all timber and shrubs in habitats would result in long-term adverse impacts due to the length of time it takes for new timber or shrubs to grow. Fire that thins or creates mosaics in forest/woodland and grassland/shrubland habitats would likely beneficially impact special status wildlife that require a greater degree of plant diversity. Mechanical treatments can be performed with a greater degree of control than fire treatments; therefore, adverse impacts from mechanical treatments will likely be minor. Targeting mechanical treatments for habitat improvement would beneficially impact special status wildlife using the area.

Alternative A allows full suppression strategies, including surface-disturbing activities, for wildland fires on a case-by-case basis. Full fire suppression would beneficially impact special status wildlife by limiting the short-term and long-term loss of available habitat; however, suppression that includes the use of heavy equipment that removes topsoil can result in long-term loss of habitat. Vehicles and equipment that disturb soil can allow INNS to establish or spread on disturbed sites, which would reduce overall habitat quality. There would be fewer adverse impacts from surface disturbance if post-fire vegetative seeding was conducted and reclamation was successful. Fire suppression activities (e.g., vehicles, heavy equipment, pedestrians, and aircraft) could displace species sensitive to disturbance, such as roosting or nesting birds. Fire suppression activities could harm populations of amphibians if toxic fire-fighting chemicals are applied in riparian-wetland areas.

Vegetation

Alternative A manages forests and woodlands in response to forest health, demand for forest products, and habitat needs for special status wildlife using a variety of silviculture practices. Alternative A limits clear-cuts to 25 or fewer acres and prohibits them within 100 feet of riparian-wetland areas. Timber harvests that remove all the trees within a cut block can result in long-term loss of habitat for northern goshawk and Canada lynx, and short-term disturbance impacts from noise, displacement, and increased human presence. Prohibiting disturbance in riparian-wetland areas would result in a long-term beneficial impact to special status amphibians.

Alternative A manages forest insect and disease outbreaks on a case-by-case basis and forest/woodland areas prescribes planting in areas of product sales, vegetative treatments, or fire if natural regeneration does not occur. Timber stands lost from insects and disease would result in long-term adverse impacts to special status wildlife that depend on forest habitats. Treatment activities would result in short-term adverse impacts to special status wildlife; however, treatments also would result in long-term beneficial impacts by improving the overall quality of the habitat.

Alternative A manages grassland and shrubland habitats to achieve the vegetation attributes described in the NRCS Ecological Site Descriptions. This action could beneficially impact special status wildlife because site descriptions include a mixture of grasses, forbs, and shrubs that should provide adequate forage and security and thermal cover needed by most species. Ecological Site Descriptions typically prescribe a higher percentage of grasses in the plant community, which could adversely impact shrub-obligate species if shrub density declines. On a case-by-case basis, Alternative A allows soil and vegetative treatments used to increase rangeland forage production. Treatments focused on increasing herbaceous production and decreasing the amount of sagebrush in plant communities would adversely impact special status wildlife if treatments do not maintain a balance of herbaceous and woody species.

Alternative A prohibits surface-disturbing activities within 500 feet of water and riparian-wetland areas, which would conserve special status wildlife habitat and provide protection from impacts that can degrade these areas. Surface disturbance that generates additional sediment or changes the hydrologic function of the area can impact habitat quality and quantity for special status wildlife in the long term. The BLM will manage riparian-wetland areas to meet PFC and will utilize various site-specific management actions, such as upland water developments and riparian-wetland area pasture or exclusion fences, to move areas toward PFC where needed. Management actions such as developing water in upland habitats and building exclusion fences to eliminate concentrated grazing use in riparian-wetland areas could adversely and beneficially impact special status wildlife. Reducing grazing in riparian-wetland areas would increase grazing utilization in upland habitats used by greater sage-grouse; this could reduce standing herbaceous cover needed to conceal nests and chicks. Fences also could lead to altered movement patterns and could be a hazard to some species of birds flying to and from seasonal or foraging habitats. Prohibiting surface disturbance near riparian-wetland areas and utilizing tools to reduce grazing use would be expected to ultimately result in a riparian-wetland system with increased vegetation and structural diversity, which would lead to an increase in the abundance and diversity of special status wildlife the area can support.

Wild Horses

Impacts from wild horse management under Alternative A would be the same as described under *Impacts Common to All Alternatives* above. Alternative A does not specifically establish travel loops to facilitate wild horse viewing, and requires that fencing decisions for HMAs consider wild horse movement and genetic diversity. Limiting or modifying fences in HMAs would beneficially impact special status wildlife movement in the same area.

Cultural and Paleontological Resources

Alternative A protects cultural and paleontological resources in the Warm Springs Canyon Flume area, around sacred sites and TCPs, and in the Beaver Rim and Bison Basin areas from surface-disturbing activities. Management actions that prevent surface disturbance and subsequent habitat loss in these areas may result in beneficial impacts to special status wildlife species using these areas.

4.4.9.3.2.3. Resource Uses

Minerals

Alternative A manages most (99 percent) of the planning area as open to locatable mineral exploration and development; mining activities would adversely impact special status wildlife

and their habitats. There is little opportunity under the 1872 General Mining Law to prevent or mitigate adverse impacts to special status wildlife other than ESA-listed species. Mining activities would result in the loss, fragmentation, and modification of predominantly grassland/shrubland and forest/woodland habitats, loss of nests and young, death of less mobile animals, and wildlife displacement and disturbance from equipment noise, vehicles, and human presence. The amount of habitat lost, fragmented, or altered would depend on the scale of the mining activity. Areas open to locatable mineral entry include 1,720,190 acres of the greater sage-grouse Core Area, which could result in short- and long-term adverse impacts to greater sage-grouse breeding, nesting, brood-rearing, and winter habitat by removing and fragmenting habitats and increasing human presence during sensitive periods. Development of large uranium deposits south of Jeffrey City would result in the loss of habitat for greater sage-grouse from surface disturbance and fragmentation.

Alternative A withdraws a total of 23,114 acres of federal mineral estate, and most withdrawals are subject to expiration after 20 years. Alternative A pursues existing withdrawals for extension at the end of the withdrawal period. Withdrawn acres are scattered throughout the planning area; however, most acres are associated with the Whiskey Mountain and East Fork ACECs. Lands within these ACECs provide habitat for a number of special status wildlife species, in addition to bighorn sheep and elk, and protecting this habitat from locatable mineral exploration and development would result in long-term beneficial impacts to the maintenance of populations of bald eagle, northern goshawk, Canada lynx, grizzly bear, gray wolf, and BLM-sensitive neotropical migrants. A total of 3,893 withdrawn acres are in the greater sage-grouse Core Area and 4,472 withdrawn acres are in LAUs. Withdrawn acres would result in long-term beneficial impacts to special status wildlife by preventing habitat loss and fragmentation from mining activities.

Alternative A opens 2,280,345 surface acres to geothermal leasing and opens 2,380,925 surface acres to oil and gas leasing (95 percent and 99 percent of the planning area, respectively). It is anticipated that approximately 770 acres would be disturbed each year through oil and gas development activities, with 400 acres being disturbed for the long term. The disturbance of these acres would adversely impact special status wildlife through the alteration of habitat. It is expected that most of the short-term acre disturbance would likely result in long-term impacts to sagebrush-obligate special status wildlife due to the length of time it takes to reestablish sagebrush on disturbed areas.

Alternative A impacts to special status wildlife from mineral lease exploration and development would be similar to those described for locatable mineral entry, except mineral leases are subject to surface use and timing stipulations for greater sage-grouse, raptors, and mountain plover. Timing limitations would protect these breeding and nesting species in the short term, but surface disturbance outside the stipulated period would result in habitat loss and fragmentation in these same habitats. Surface use stipulations prohibit surface disturbance within $\frac{1}{4}$ mile of occupied greater sage-grouse leks (16,283 acres), which would provide long-term protection on these acres.

Most development is expected to occur in areas with high and moderate potential for oil and gas resources that overlap habitat for greater sage-grouse, mountain plover, ferruginous hawk, burrowing owl, grassland/shrubland neotropical migrants, white-tailed prairie dog, pygmy rabbit, and swift fox. Surface disturbance would likely result in beneficial impacts to white-tailed prairie dogs and mountain plover utilizing adjacent habitats because these species typically inhabit newly disturbed areas. Large-scale development would result in greater levels of habitat loss and fragmentation because there would be more roads, pipelines, well sites, and powerlines

than would be associated with wildcat wells or isolated small fields. Developments could adversely impact linkages between habitat patches needed to ensure connectivity of populations. Large-scale habitat loss and fragmentation, combined with the increased level of human presence, vehicles, and infrastructure, could cause special status wildlife to avoid the area; this would be a long-term adverse impact to special status wildlife.

Alternative A opens almost all the greater sage-grouse Core Area in the planning area to mineral leasing. Of the total acres in the Core Area (1,724,082 acres), Alternative A closes just 25,136 acres to mineral leasing. There is a moderate potential area for oil and gas south of Jeffrey City which, if developed, would result in the loss of habitat for greater sage-grouse, both from surface disturbance and from a high degree of fragmentation, which would likely cause population declines in this part of the Core Area.

Seasonal protections from surface-disturbing and disruptive activities generally do not apply to the O&M activities for oil and gas wells and facilities unless applied as a COA on the permit or unless substantial surface disturbance would occur. Activities such as hydraulic fracturing (“fracking”), powerline reconstruction, range improvement repair, and road maintenance would not be subject to timing limitations to protect special status wildlife unless the action is specifically identified in the project analysis and added to the authorization. These types of activities can cause wildlife stress and disturbance to wildlife during the sensitive nesting period due to the length of time it takes to complete the work, the level of noise generated, and the presence of people and equipment. O&M activities would likely result in short-term adverse impacts related to animal displacement and long-term adverse impacts if the level of activity results in avoidance of the area or the loss of nests or young.

Alternative A open 22,754 acres and closes 4,268 acres to geothermal and oil and gas leasing in LAUs in the Dubois area. Large development projects are not anticipated in the Dubois area; however, there could be exploration drilling. Exploratory drilling operations would result in long-term habitat loss and area avoidance by Canada lynx due to the length of time it would take to return sites to suitable habitat, and the secretive nature of the species.

Alternative A opens the entire planning area to geophysical activities, subject to COAs that could protect special status wildlife. Areas closed to mineral leasing would likely not be authorized for geophysical activities.

Alternative A opens a total of 2,240,104 acres (94 percent of the planning area) to phosphate leasing. It is expected that phosphate leasing and extraction could occur on approximately 42,291 acres identified as having potential for phosphate. Much of the area with phosphate potential overlaps the greater sage-grouse Core Area, and development of phosphate leases would result in long-term, if not permanent, habitat loss for greater sage-grouse and other sagebrush-obligate special status species. Of the total acres closed to phosphate leasing, 102,397 acres are in the Core Area, which is 6 percent of the total acres of the Core Area in the planning area. Leasing is open on 22,038 public surface acres of LAUs that also overlap habitat for grizzly bear, gray wolf, bald eagle, and neotropical migrants, but these lands are not identified as having phosphate potential. Therefore, no impacts to these species would be expected under Alternative A.

Alternative A opens 2,165,196 surface acres (90 percent of the planning area) to mineral materials disposals. Of these acres, 1,587,389 overlap the greater sage-grouse Core Area. Mineral materials disposals typically involve the removal of all surface material; therefore, there would be adverse impacts to special status wildlife using disposal sites, including white-tailed prairie dog and mountain plover (which tend to prefer disturbed sites), from the loss of habitat. Alternative A

closes 229,014 acres to mineral materials disposal, which would result in long-term beneficial impacts to special status wildlife.

Lands

Land acquisition or disposal actions are conducted with the goal that the exchange, acquisition, or disposal will increase public benefits, including special status wildlife resources. Any acquisition of non-federal surface land that includes high value habitat can result in beneficial impacts by allowing for mitigation or restrictions on surface-disturbing and disruptive activities. Any disposal of BLM-administered land that contains high value habitat is typically avoided. Disposal lands could experience increased human presence, which could increase the disturbance to wildlife utilizing the area. All land tenure actions are analyzed site specifically, using a public process, to determine what is in the public interest. Consolidating land ownership through land tenure adjustments increases the manageability of lands and results in contiguous blocks of habitat, which would result in beneficial impacts to special status wildlife. Alternative A identifies 8,573 acres for disposal by sale, exchange, or other methods, and makes available an additional 1,475 acres with restrictions on future use. Restrictions would likely protect special status wildlife because they would ensure lands disposed of are used in a manner compatible with surrounding lands.

Renewable Energy

Alternative A opens 2,113,512 acres (88 percent of the planning area) to wind-energy development, consistent with the Wind Energy Programmatic EIS (BLM 2005a). Erecting wind turbines in special status wildlife habitat would create collision hazards for birds and can cause pulmonary bleeding in bats from air pressure changes near the rotating turbine blades. These impacts would result in the death of the affected animal and could cause localized population declines. Wind-energy facilities could result in permanent habitat loss for special status wildlife because facilities would likely be permanent. The level of impact to local populations of special status wildlife would depend on where the development occurs and which special status wildlife habitats are affected. Alternative A manages wind-energy development in greater sage-grouse habitats on a case-by-case basis. Of the acres open to wind-energy development, 1,584,707 acres overlap the greater sage-grouse Core Area. Development in the Core Area would reduce the suitability of the developed area for greater sage-grouse because this species typically avoids areas with tall structures. Alternative A avoids or excludes wind-energy development on 280,697 acres, which would result in beneficial impacts to special status wildlife using these areas by keeping habitats intact.

ROWs and Corridors

Alternative A opens 2,188,294 acres (91 percent of the planning area) to ROWs, including roads, pipelines, transmission lines, and communications facilities. ROWs would result in habitat loss and fragmentation for special status wildlife and introduce hazards from electrocution, predation, and collision. Surface disturbance from ROW development would likely result in beneficial impacts to mountain plover and white-tailed prairie dog because they tend to move into recently disturbed sites. Open acres include 1,592,835 acres of the greater sage-grouse Core Area; greater sage-grouse likely would avoid ROWs that include aboveground structures, reducing the amount of usable habitat. Aboveground structures can have beneficial impacts to ferruginous hawks because most raptors utilize the structures for nesting platforms and as hunting perches. Alternative A manages 205,916 acres as ROW exclusion areas, of which 131,247 acres primarily along the NHTs are in the Core Area. ROW exclusion areas are closed to major ROW projects but are available for minor ROWs on a case-by-case basis. Large projects result in more surface

disturbance; therefore, excluding major ROWs would reduce the amount of habitat such projects would adversely impact. Alternative A identifies 66,099 acres as ROW avoidance areas, which would offer less protection from habitat loss and fragmentation than exclusion areas; historically, large ROWs in avoidance areas have seldom been authorized. Alternative A does not designate utility corridors and co-locates major ROWs with existing utilities on a case-by-case basis to minimize surface disturbance. Co-locating utility lines would result in long-term beneficial impacts to special status wildlife by eliminating or reducing surface disturbance in intact habitats.

Livestock Grazing Management

Alternative A authorizes livestock grazing on 2,324,934 acres (97 percent of the planning area) of public land suitable for grazing. Livestock grazing is not authorized on 69,276 (3 percent of the planning area), including allotments previously closed (which does not vary by alternative), and lands deemed unsuitable for grazing (e.g., rock outcrops and roads). Most of the closed lands are in the Dubois area and provide habitat for grizzly bear, gray wolf, northern goshawk, bald eagle, and sagebrush neotropical migrants. Closed lands have beneficial impacts on these species by reducing conflicts between special status predators and livestock. Lands open to grazing could reduce habitat quality for some special status wildlife, depending on grazing management, the grazing season of use, plant utilization levels, and the kinds and amounts of infrastructure built to facilitate grazing.

Alternative A adjusts livestock grazing use dates on open allotments in the Dubois area to minimize conflicts with grizzly bears on a case-by-case basis. Livestock are most vulnerable to predation from grizzly bears as bears emerge from hibernation dens between March and May and need to replenish depleted energy reserves. Grizzly bears typically remain in the area until mid to late June, at which time they often move to higher-elevation forested habitats. Encounters with livestock can result in the death or relocation of offending grizzly bears; adjusting livestock grazing dates to later in the season would reduce the potential for such conflicts.

Alternative A establishes livestock forage utilization levels on a case-by-case basis; special status wildlife would benefit where utilization levels consider habitat needs. In areas where utilization levels are excessive, high plant utilization would adversely impact the success of ground-nesting special status birds by reducing plant density and the standing height needed to effectively conceal nests from predators. Alternative A prohibits salt or mineral supplements within $\frac{1}{4}$ mile of riparian-wetland habitats to prevent livestock congregation and plant over-utilization, beneficially impacting special status wildlife species that depend on riparian-wetland areas for water, forage, and hiding cover.

Alternative A allows range improvements in special status wildlife habitats on a case-by-case basis. It is expected that actions under Alternative A would disturb approximately 43 acres during the construction and/or development of approximately two reservoirs, three wells, two spring developments, and 15 miles of fence each year during the planning period. Concentrated livestock use at water developments typically removes vegetation that can facilitate INNS establishment and degrade the overall quality of habitat. New water developments constructed in greater sage-grouse nesting habitat would likely reduce hiding cover by facilitating increased harvest of standing grasses that shield nesting greater sage-grouse and young chicks, and reduce nesting cover needed for the following spring nesting period. New fences would add to the 2,285 miles of existing fence on public lands in the planning area, increasing the overall fragmentation of habitats and increasing the potential for collisions by special status birds. Alternative A modifies or

removes existing fences on a case-by-case basis to facilitate wildlife movement or reduce hazards. Modifying or removing fences would beneficially impact special status birds and large mammals.

Recreation and Travel Management

Adverse impacts to special status wildlife can occur from concentrated recreation along NHTs and the CDNST and in areas surrounding developed recreation sites and campgrounds in the South Pass and Green Mountain areas. Special status wildlife tend to avoid areas with people, pets, and noise, and recreation activities during breeding, nesting, and birthing periods can cause animals to abandon their nests and/or young. Alternative A withdraws lands around developed recreation sites and campgrounds (724 acres) from locatable mineral exploration and development. This action would provide long-term habitat protection of these acres, but would not result in substantial beneficial impacts to special status wildlife because these species do not extensively use these areas. Alternative A does not include special management prescriptions for intensive recreation areas (Johnny Behind the Rocks, The Bus @ Baldwin Creek Area, the Sinks Canyon climbing area, the Dubois Mill Site area, the Sweetwater River WSA, Sweetwater Rocks, and the Coal Mine Draw area), but manages them as a planning area-wide ERMA. Management is directed at protecting resources, which would provide some beneficial impact to special status wildlife habitat by addressing adverse impacts to habitat from mechanized or motorized vehicle use, camping, rock climbing, and hiking.

Alternative A limits motorized travel to existing roads and trails on 2,226,504 acres (93 percent of the planning area). The alternative allows OHV use off existing roads and trails to perform necessary tasks such as retrieving big game kills, repairing range improvements, and performing mineral activities where surface disturbance would total less than 5 acres. Adverse impacts to special status wildlife habitats can occur from vehicles driving off existing roads, killing vegetation and increasing animal displacement and stress. Off-road (i.e., cross-country) use would increase habitat fragmentation and road proliferation because other OHV users tend to follow the same tracks. Alternative A limits motorized travel on approximately 163,075 acres (7 percent of the planning area) to designated roads and trails, primarily in the Whiskey Mountain, Lander Slope, Red Canyon, and Green Mountain ACECs. Designating roads and trails would keep vehicle travel out of sensitive areas, reduce road densities, and limit habitat loss for Canada lynx, grizzly bear, gray wolf, greater sage-grouse, and neotropical migrants. Alternative A closes 5,923 acres (0.2 percent of the planning area) to motorized travel, which would beneficially impact special status wildlife habitats by preventing loss and fragmentation and eliminating vehicle-caused stress to wildlife. A total of 111,002 acres, predominantly on Green Mountain and in the Lander Slope, Red Canyon, and Whiskey Mountain ACECs, are subject to seasonal travel closures during winter and early spring. In addition, Alternative A closes 14,729 acres in the Red Canyon area to over-snow travel, including motorized and nonmotorized use. Seasonal closures would protect special status wildlife from disturbance and the unnecessary expenditure of energy reserves during sensitive winter, breeding, and birthing/nesting periods.

4.4.9.3.2.4. Special Designations

The *Special Designations* section of this chapter describes Alternative A management actions and resulting impacts for ACECs, Congressionally Designated Trails, and WSAs. Alternative A designates nine ACECs totaling 119,622 acres (5 percent of the planning area), which would protect special status wildlife and their associated habitat from many surface-disturbing activities and related disruptive activities. ACEC management includes (1) closing lands or applying NSO stipulations for mineral leasing, (2) requiring a Plan of Operations for locatable mineral

development and maintaining locatable mineral withdrawals in the Whiskey Mountain and East Fork ACECs, (3) prohibiting or limiting motorized vehicle use, and (4) avoiding major ROWs.

Lands in the Whiskey Mountain, East Fork, and Dubois Badlands ACECs provide habitat for Canada lynx, grizzly bear, gray wolf, bald eagle, northern goshawk, burrowing owl, dwarf shrew, spotted bat, neotropical migrants, and amphibians. Greater sage-grouse have been observed in the East Fork ACEC; however, there are no known leks in the ACEC and the area is not in the greater sage-grouse Core Area. The Lander Slope, Red Canyon, Beaver Rim, Green Mountain, South Pass Historic Mining Area, and NHTs ACECs provide habitat for most special status wildlife species except trumpeter swan and grizzly bear, although there have been unofficial reports of grizzly bears on the Lander Slope.

The NHTs have no direct beneficial impact on special status wildlife, however to the extent that management of surface-disturbing and development activities are restricted within approximately ¼ mile on each side of the trails (the ACEC area), special status wildlife habitat is also protected. The ¼-mile buffer will protect approximately 36,386 acres of habitat from surface disturbance. Alternative A does not specifically manage lands adjacent to the CDNST; therefore, there is no direct beneficial impact to special status wildlife.

Alternative A does not specifically manage NWSRS-eligible waterway segments along Baldwin Creek and the Sweetwater River with WSR prescriptions, but manages them in accordance with Lander Slope ACEC and Sweetwater Canyon WSA prescriptions, respectively. ACEC and WSA management that protects the overall stream values and maintains habitat in its present condition would result in beneficial impacts to special status wildlife using habitats adjacent to these waterways.

4.4.9.3.3. Alternative B

4.4.9.3.3.1. Program Management

Alternative B requires surveys to determine the presence or absence of BLM sensitive species in a project area prior to authorizing surface-disturbing and disruptive activities. Alternative B requires surveys and subsequent necessary mitigation for all sensitive species, not just the species routinely surveyed (greater sage-grouse, raptors, and mountain plover). This would reduce or eliminate adverse impacts to special status species and their habitats. Alternative B would result in greater beneficial impacts to BLM sensitive species than Alternative A.

Alternative B establishes limits on the amount of cumulative habitat loss from modification, fragmentation, and loss of function for each special status wildlife species. Limits are identified to ensure that adequate habitat is available for each special status wildlife species to prevent population declines that could contribute to the need for the USFWS to list the species under the ESA. This management action would result in greater beneficial impacts to special status wildlife than Alternative A, which does not specifically establish habitat loss limits.

Alternative B extends the timing limitation buffer around active special status raptor nests to 1.5 miles from the nest site and adjusts dates to reflect the later nesting and fledging periods needed for northern goshawk and burrowing owl. Increasing the buffer size would have a beneficial impact on ferruginous hawks because they are more sensitive to disturbance than most other raptors, and the increased distance should prevent nesting birds from abandoning eggs or chicks. Alternative B applies timing limitations to surface-disturbing and disruptive activities from

April 1 to August 15 to protect northern goshawks, and from April 1 to September 15 to protect burrowing owls. Extending the protection periods and increasing the buffer distance would result in greater beneficial impacts to special status raptors than Alternative A.

Alternative B closes greater sage-grouse habitat in the Core Area to oil and gas and geothermal leasing to provide long-term protection of habitat from development activities. Alternative B allows leasing outside the Core Area. Alternative B would result in much greater beneficial impacts than Alternative A because Alternative B protects greater sage-grouse habitat in approximately 70 percent of the planning area from adverse impacts associated with oil gas and geothermal development activities.

Alternative B prohibits surface-disturbing and disruptive activities within 0.6 mile of occupied or undetermined greater sage-grouse leks. Alternative B protects 93,410 acres of breeding habitat on public surface lands for the long term, which represents almost a 600 percent increase in habitat protected than under Alternative A. In addition, BLM-authorized human activity on this same area is prohibited between 1 hour before sunset to 1 hour after sunrise between March 1 and May 15, unless the activity is specific to inventorying, monitoring, or viewing greater sage-grouse. This action would prevent noise and disruptive activities in and around leks during the breeding season that could interfere with greater sage-grouse breeding and cause a localized population decline. Alternative B avoids surface-disturbing and disruptive activities from February 1 to July 31 within 3 miles of occupied leks, equating to approximately 1,339,609 acres of public surface lands, to protect nesting greater sage-grouse. Alternative B protects 69 percent more acres of nesting habitat in the short term than Alternative A (794,452 acres). Overall, Alternative B would result in greater beneficial impacts to greater sage-grouse breeding and nesting habitats than Alternative A.

Alternative B limits the density of disturbances in identified greater sage-grouse breeding, nesting, and brood-rearing habitat to one disturbance per 640 acres, and manages cumulative surface disturbance to be less than or equal to 2.5 percent of the sagebrush habitat in the same 640 acres. Reducing the number and size of disturbances would reduce habitat loss and fragmentation, maintain habitat connectivity, and ensure large patches of habitat are available for greater sage-grouse. Alternative B would result in greater beneficial impacts than Alternative A, which does not impose such limitations.

To prevent area avoidance by greater sage-grouse, Alternative B prohibits new permanent structures taller than 12 feet within 1 mile of occupied nesting habitat. Alternative B would result in greater long-term beneficial impacts to special status wildlife than Alternative A, which avoids these types of structures on a case-by-case basis.

Alternative B limits noise from facilities to 10 A-weighted decibels above natural ambient noise (approximately 39 A-weighted decibels) when measured at the perimeter of occupied greater sage-grouse leks. This level would likely reduce adverse impacts from noise that can drown out greater sage-grouse vocalizations during the breeding season; however, research is currently ongoing to identify whether 10 A-weighted decibels above ambient noise is the most appropriate noise level to protect breeding greater sage-grouse. Alternative B requires anti-perching devices on all new overhead powerlines in greater sage-grouse, white-tailed prairie dog, mountain plover, and pygmy rabbit habitats to reduce predation from raptors. In addition, the BLM will work with ROW holders to identify conflict areas and get anti-perching devices installed on existing overhead powerlines in these same habitats. White-tailed prairie dogs and pygmy rabbits are typically not as susceptible to predation from raptors using overhead powerlines as greater sage-grouse and mountain plover. Installing anti-perching devices would likely result in beneficial

impacts to greater sage-grouse and mountain plover, whereas the action will likely result in a neutral impact to white-tailed prairie dogs and pygmy rabbits. Where feasible, Alternative B requires that new low-voltage and high-voltage utility lines be buried in greater sage-grouse, white-tailed prairie dog, mountain plover, and pygmy rabbit habitats. This action would result in beneficial and adverse impacts to these species and prevent raptor deaths due to collisions with wires and electrocution. Burying powerlines would reduce raptor predation opportunities on special status wildlife, but could also result in the loss of habitat from trenching activities to bury the lines. Alternative B would result in greater beneficial impacts to special status wildlife from these management actions than Alternative A, except that requiring anti-perching devices in white-tailed prairie dog colonies and pygmy rabbit habitats is the same under both alternatives.

Alternative B prohibits surface-disturbing activities in all white-tailed prairie dog colonies and within 100 meters (approximately 60 feet) of suitable pygmy rabbit habitat. Prohibiting surface disturbance in pygmy rabbit habitat would result in long-term beneficial impacts to the species due to their small home range and the limited amount of suitable habitat in the planning area. Like Alternative A, Alternative B surface disturbance in white-tailed prairie dog colonies could result in adverse and beneficial impacts to the species because activities can result in animal death or displacement, but also can create additional habitat. Alternative B protects white-tailed prairie dog colonies large enough to support black-footed ferret populations from disturbance, which would ensure that potential ferret reintroduction sites are not compromised. Alternative B prohibits surface-disturbing activities that would adversely impact special status bats and their habitat within ¼ mile of identified bat maternity roosts and hibernation areas. Alternative B management that protects pygmy rabbit and bat habitats would result in greater beneficial impacts than management under Alternative A; Alternative B management that protects white-tailed prairie dog colonies would likely result in beneficial impacts the same as Alternative A.

Alternative B identifies traditional migration and travel corridors for special status wildlife as they are identified. Management actions that keep movement corridors between seasonal habitats and foraging areas open and unfragmented, whether corridors are on or adjacent to lands in the planning area, would result in long-term beneficial impacts to special status wildlife.

To protect the large number of special status wildlife species and their habitats, Alternative B closes lands in the Dubois area not in an ACEC or WSA to mineral and realty actions. Alternative B would not result in additional habitat loss or fragmentation from surface disturbance related to mineral extraction or ROW actions, therefore would result in greater long-term beneficial impacts to special status wildlife than Alternative A.

4.4.9.3.3.2. Resources

Lands with Wilderness Characteristics

Alternative B manages approximately 5,490 acres of land with wilderness characteristics as non-WSA lands with wilderness characteristics, and manages them to protect wilderness characteristics. Through overlapping management of the Whiskey Mountain ACEC, most of the area is closed to mineral development, mining, livestock grazing, and excluded from ROW development. The prescriptions would directly conserve special status wildlife, including habitat for grizzly bear, gray wolf, loggerhead shrike, sage thrasher, sage sparrow, Brewer's sparrow, and dwarf shrew. Closing the lands outside of the ACEC to motorized and mechanized travel and managing them to protect wilderness characteristics would result in beneficial impacts to special status wildlife species in these areas. Habitats would not be fragmented by roads,

resulting in long-term beneficial impacts to special status wildlife. Human activity would result in short-term displacement impacts, but it is expected that these lands would not receive high levels of human activity.

Fire and Fuels

Under Alternative B, approximately 1,000 acres of prescribed fire and 1,500 acres of mechanical treatment will be conducted each year to address rangeland fire and fuel concerns. Impacts would be the same as for Alternative A, but will occur on more acres. Alternative B increases the number of acres treated by prescribed fire, which could increase the risk of unanticipated adverse impacts (i.e., hotter fires and escaped fire) to species inhabiting forest/woodland and grassland/shrubland habitats. The beneficial impacts of prescribed fire to wildlife would be the same or greater than Alternative A as more acres would be treated each year. Fire and fuels management will use full suppression to address wildland fire in areas of WUI, with developed recreation sites, with known cultural resources, and with aboveground utilities. Except for areas with known cultural sites that likely support wildlife habitat due to their protected status, full suppression areas have limited habitat value; therefore, impacts to special status wildlife, either adverse or beneficial, would be minor. Impacts from full fire suppression on known cultural sites would have a beneficial impact on special status wildlife, but the degree of benefit would depend on the size of the affected area. Full suppression will not be utilized across much of the planning area under Alternative B, which would increase the risks of landscape-level fires that could cause long-term habitat loss and displacement across large landscapes.

Vegetation

Alternative B manages forests and woodlands to benefit special status wildlife without using traditional silviculture practices, such as clear-cuts, except to address public safety concerns or in areas where forest health goals cannot be met without their use. Like general wildlife, special status wildlife typically avoid forest habitats in WUI areas and campgrounds due to the presence of humans, noise, and pets. Avoiding silviculture practices such as timber sales, selective cutting, and thinning would result in beneficial impacts to special status wildlife in the short term, because forest/woodland species are typically secretive and are easily disturbed by human activities. Not managing disease outbreaks in forest habitats would likely result in the loss of forest habitat, which would be a long-term adverse impact to timber-dependent special status wildlife. Alternative B does not allow forest product sales in the Lander Slope/Red Canyon and South Pass areas unless needed to address public safety or identified for wildlife habitat improvement. The elimination of noise and human presence related to tree or firewood cutting would have a beneficial impact on special status wildlife. Special status wildlife could be adversely impacted if timber gets too dense to allow sunlight to reach the forest floor and prevents the growth of understory plants.

Alternative B manages grasslands and shrublands for biological diversity and to benefit special status wildlife habitats. Many special status wildlife species live entirely within sagebrush-grass habitats, and management that maintains or enhances sagebrush habitats would result in long-term beneficial impacts to these species. Soil and vegetative treatments are used where needed to improve plant diversity, which would have beneficial impacts by creating a mix of grasses, forbs, and shrubs to meet special status species dietary and hiding-cover requirements. Beneficial impacts to wildlife would be slightly greater under Alternative B than under Alternative A, because Alternative B focuses on wildlife and special status species when managing grassland/shrubland habitats.

Alternative B prohibits surface-disturbing activities within ¼ mile of surface water, riparian-wetland areas, playas, and delineated 100-year floodplains, increasing protection on an additional 125,403 acres than Alternative A. Habitats remaining intact and unfragmented would result in direct beneficial impacts to special status wildlife, including amphibians, trumpeter swan, bald eagle, long-billed curlew, yellow-billed cuckoo, white-faced ibis, and greater sage-grouse. Alternative B closes and reclaims roads that degrade riparian-wetland conditions, would improve special status wildlife habitats. Alternative B focuses on changes in livestock grazing management (season of use, livestock numbers, and grazing rotation) rather than constructing range improvements to facilitate riparian-wetland improvement and move areas toward PFC. Having less infrastructure on the landscape that encourages increased livestock use or creates hazards or barriers to movement would result in long-term beneficial impacts.

Wild Horses

Alternative B removes and modifies fences to facilitate movement among wild horse herds, which would have a beneficial impact on special status wildlife movement and reduce the number of collision hazards, primarily for special status birds. Establishing viewing loops for wild horses could lead to increased vehicle traffic and short-term displacement of wildlife using areas adjacent to the roads. It is expected that viewing loops would utilize existing roads and trails and no additional surface disturbance, and subsequent special status wildlife habitat loss, would occur.

Cultural and Paleontological Resources

The area of protection surrounding cultural and paleontological resources increases under Alternative B, which would increase the amount of special status wildlife habitat protected near the sites. Locatable mineral withdrawals are pursued for the Warm Springs Canyon Flume and fossil areas in the Beaver Rim and Bison Basin proposed NNLs, and these areas will be subject to an NSO restriction for mineral leasing. These actions would conserve special status species habitat and result in greater beneficial impacts than Alternative A because more acres are protected from long-term habitat loss and fragmentation.

4.4.9.3.3.3. Resource Uses

Minerals

Alternative B allows locatable mineral entry on 954,776 acres (40 percent) of public surface and 1,167,862 acres (42 percent) of federal mineral estate; impacts from exploration and development activities would be the same as under Alternative A, but would occur on approximately 57 percent fewer acres of special status wildlife habitat. Alternative B pursues locatable mineral withdrawals on approximately 1,632,605 acres (68 percent) of the federal surface and mineral estate in the planning area. Lands with federal mineral estate pursued for withdrawal include 1,395,084 acres of mineral estate in the greater sage-grouse Core Area and 38,286 acres of mineral estate in LAUs. These acres equate to approximately 72 percent of the total federal mineral estate in the Core Area and 54 percent of the total federal mineral estate in LAUs. Management that pursues withdrawals would also have beneficial impacts on other special status wildlife species occupying the same habitats as greater sage-grouse and Canada lynx. Withdrawals would protect habitat from mineral exploration and development activities that result in habitat loss and wildlife displacement.

Alternative B opens a total of 816,619 acres (34 percent) of public surface to geothermal leasing and opens 529,576 acres (22 percent) of public surface to oil and gas leasing. Impacts to special status wildlife from exploration and development activities would be the same as under

Alternative A, but would occur on approximately 60 percent fewer acres of habitat. Alternative B closes the greater sage-grouse Core Area to oil and gas and geothermal leasing, which would result in long-term beneficial impacts to greater sage-grouse in most of the planning area. Alternative B closes approximately 31 percent of lands having high and moderate potential for oil and gas to leasing, which would reduce habitat loss, fragmentation, and connectivity impacts for greater sage-grouse and other special status wildlife caused by large-scale, intensive development activities. Alternative B closes most of the acres in LAUs to mineral leasing and opens only 7 acres; this would result in long-term beneficial impacts to species inhabiting the Dubois area.

Under Alternative B, it is anticipated that approximately 536 acres would be disturbed each year through oil and gas development activities, with 274 acres disturbed in the long term. Alternative B would disturb approximately 31 percent fewer acres than Alternative A, which would result in fewer adverse impacts to special status wildlife and their habitats. Alternative B opens the fewest acres to mineral leasing and potential future development, resulting in the least amount of habitat and habitat connectivity loss and fragmentation, and therefore greater beneficial impacts to special status wildlife.

Alternative B extends seasonal protections for greater sage-grouse, mountain plover, and raptor breeding and nesting sites to O&M of developed projects if the activity is determined to be detrimental to wildlife. Activities such as hydraulic fracturing (called fracking), powerline reconstruction, range improvements, and road maintenance are subject to timing limitations to protect wildlife. These types of activities can cause animal disturbance during the sensitive breeding and nesting period due to the length of time it takes to complete the work, the level of noise generated, and presence of people and equipment. It is expected that the O&M of projects would result in both short-term adverse impacts related to animal displacement and long-term adverse impacts if the level of activity results in area avoidance or loss of nests or young. Alternative B would result in greater short-term beneficial impacts to wildlife than Alternative A, because Alternative B applies seasonal stipulations to disruptive activities associated with O&M of existing projects.

Areas closed to leasing or subject to major constraints are closed to geophysical activities and areas open are subject to the stipulations for surface-disturbing, disruptive activities, and vehicle travel identified for the area. Closing areas will provide long-term protection from adverse impacts caused by cross-country motorized travel, vegetation crushing and possible loss, and wildlife displacement. Restricting geophysical activities during sensitive times such as breeding, nesting, and winter periods will prevent abandonment or loss of nests or young, providing short-term beneficial impacts.

Alternative B opens a total of 464,859 acres (19 percent of the planning area) to phosphate leasing, of which 2,699 acres are in lands identified as having phosphate potential. Of the total acres open, 210,064 acres are in the greater sage-grouse Core Area, which equates to 12 percent of the Core Area in the planning area and approximately 13 percent of the acres open under Alternative A. Alternative B would result in greater beneficial impacts to sagebrush-obligate special status wildlife than Alternative A, because Alternative B closes more grassland/shrubland habitat to leasing, which would prevent permanent habitat loss and fragmentation from phosphate extraction where it occurs. Impacts to Canada lynx from phosphate leasing would be the same as under Alternative A because these habitats do not have potential for phosphate resources. Overall, Alternative B closes more acres of special status wildlife habitat to phosphate leasing and protects more acres in the long term from phosphate development activities; this would result in greater beneficial impacts to special status wildlife than Alternative A.

Alternative B opens approximately 185,266 surface acres (8 percent of the planning area) to mineral materials disposals, of which 85,611 acres overlap the greater sage-grouse Core Area. Alternative B closes 2,208,943 acres to mineral materials disposals, primarily in ACECs. Areas closed provide habitat for special status birds and mammals and closure would prevent habitat loss and fragmentation and result in long-term beneficial impacts. Alternative B would result in greater beneficial impacts to special status wildlife than Alternative A because Alternative B closes more acres to mineral materials disposals.

Lands

Alternative B makes available 5,436 acres for land tenure disposal by sale, exchange, or other methods, and an additional 1,435 acres with restrictions on how lands can be used. Alternative B reduces the amount of land available for land tenure adjustments by 32 percent over Alternative A and keeps more acres in public ownership, subject to management that considers special status wildlife values.

Renewable Energy

Alternative B wind energy management would result in greater beneficial impacts to special status wildlife than Alternative A because Alternative B opens just 41,372 acres (2 percent) of public surface lands in the planning area to development, which is 98 percent less acres than Alternative A. Alternative B would result in substantially less risk of adverse impacts to special status wildlife from loss and fragmentation of habitats and the construction of wind turbines, which can be hazards to birds and bats. Alternative B closes the greater sage-grouse Core Area to wind-energy development, which would beneficially impact the species in most of its range in the planning area.

ROWs and Corridors

Alternative B opens 475,181 acres (20 percent of the planning area) to ROWs, including 218,020 acres of the greater sage-grouse Core Area. Alternative B opens 86 percent fewer acres to ROWs in Core Area than Alternative A. Alternative B would provide long-term habitat protection from major ROWs for all special status wildlife using the excluded areas. Alternative B manages 315,962 acres as ROW avoidance areas, of which 138,616 acres are in the Core Area. It is expected that adverse impacts such as habitat loss and fragmentation and wildlife displacement from ROW projects in avoidance areas would be limited because projects would only be constructed if there is no other feasible site. Alternative B designates three utility corridors encompassing 15,364 acres in the planning area, with corridor widths ranging from 400 feet near NHTs to a minimum of 3,500 feet in the national energy corridor. Concentrating ROWs in corridors would result in beneficial impacts by reducing the amount of new surface disturbance in habitats and limiting the amount of new surface disturbance in previously undisturbed and unfragmented habitats. Alternative B would result in the fewest adverse impacts to special status wildlife compared to other alternatives because it excludes or avoid more acres for ROWs, thus providing long-term protection of habitat.

Livestock Grazing Management

Alternative B opens approximately 2,312,095 acres (97 percent of the planning area) for livestock grazing, 12,839 fewer acres than Alternative A. Alternative B closes more acres in grizzly bear and gray wolf habitats, which would reduce livestock predation impacts from these species.

Closing Sweetwater Canyon to livestock grazing would beneficially impact special status amphibians and birds by eliminating livestock concentration in riparian-wetland habitat that could lead to a decline in habitat quality. Riparian-wetland habitat and adjacent shrubland habitat is used extensively for bird nesting and brood-rearing cover, and eliminating livestock grazing would reduce plant utilization (above big-game plant utilization) that could reduce nesting hiding cover. Closing additional lands in the Dubois area will benefit special status wildlife using those areas. To address potential predation concerns, Alternative B adjusts livestock grazing use dates on all allotments in the Dubois area that overlap times when grizzly bears emerge are likely be in the allotment. In most cases, Alternative B does not allow livestock grazing before June 15, therefore eliminating or reducing the potential for conflicts between grizzly bears and livestock that could result in accidental or illegal take of grizzly bears.

Under Alternative B, livestock grazing levels will not exceed light utilization in areas preferred by livestock, typically riparian-wetland areas, adjacent upland areas, and around salt and mineral supplements and water troughs and developments. Alternative B prohibits salt or mineral supplements within ½ mile of riparian-wetland habitats to prevent livestock congregation at water sources; this increases the protection under Alternative A by ¼ mile. This action would help reduce livestock impacts to riparian-wetland habitats essential for most species of special status wildlife. Alternative B also prohibits the placement of salt or mineral supplements within 0.6 mile of greater sage-grouse leks, which would protect the breeding area and adjacent nesting habitat from livestock trampling and the impacts of heavy plant utilization. Alternative B focuses on the use of livestock grazing management strategies that do not require the construction of additional water sources or fences to maintain, enhance, or achieve rangeland health. It is assumed that no new reservoirs, wells, spring developments, or fences would be constructed during the planning period. Not increasing the number of range improvements that could impede or pose a hazard to movement, increase plant utilization in localized areas, and/or result in habitat loss, fragmentation, and modification would result in beneficial impacts to special status wildlife. As opportunities arise, Alternative B removes or modifies fences built for livestock management to address adverse impacts to special status wildlife movement, which would result in long-term beneficial impacts.

Alternative B prohibits livestock water development projects in greater sage-grouse nesting areas to prevent heavy grazing utilization levels that could adversely impact the availability of adequate nesting cover. This action would provide long-term protection of nesting habitat. To reduce crossing or flight hazards and curtail additional habitat fragmentation, Alternative B does not allow new fences unless they would be necessary to address human or wildlife safety concerns, and removes existing fences where appropriate.

Overall, Alternative B grazing management would result in greater long-term beneficial impacts to special status wildlife than Alternative A.

Recreation and Travel Management

Compared to Alternative A, Alternative B withdraws 1,487 more acres around five interpretive sites from locatable mineral exploration and development. This management action would withdraw and protect the largest number of acres of special status wildlife habitat around recreation sites compared to the other alternatives; however, special status wildlife do not extensively use habitats at or adjacent to interpretative sites due to the increased level of human activity. Alternative B manages as SRMAs the ERMAs listed under Alternative A and excludes the areas from mineral leasing, locatable mineral exploration and development, wind-energy development, and ROWs. This action would result in greater beneficial impacts to special status

wildlife habitat than Alternative A, but could cause wildlife displacement or area avoidance because of an increase in human presence in the SRMAs.

Alternative B limits motorized travel to existing roads and trails on 2,128,741 acres (89 percent of the planning area) and limits motorized travel to designated roads and trails on 193,704 acres (8 percent of the planning area). Alternative B limits motorized travel to designated roads and trails on 30,629 more acres than Alternative A, which would reduce the potential for habitat loss and fragmentation that can result from all the roads and trails being open to motorized vehicle travel. Increasing the number of acres on which motorized travel is limited to designated roads and trails would increase protections for special status wildlife by directing roads and travel away from sensitive habitats.

Alternative B increases the number of acres closed to motorized travel to 71,761 acres, or approximately 3 percent of the planning area. In addition to motorized travel, Alternative B closes those acres to mechanized travel. Closing more areas would result in long-term beneficial impacts to special status wildlife by eliminating habitat loss and fragmentation and wildlife displacement. Alternative B closes all roads and trails in WSAs to motorized and mechanized travel, which would increase the beneficial impact of these areas to special status wildlife. Roads and trails in closure areas would rehabilitate over time, returning the disturbed roads to usable habitat. Alternative B seasonally closes 116,805 acres of habitat, 5,803 more than Alternative A, therefore increasing the amount of area protected during sensitive winter, breeding, and birthing/nesting periods.

4.4.9.3.3.4. Special Designations

See the *Special Designations* section of this chapter for specific management actions regarding ACECs, Congressionally Designated Trails, and WSAs.

Alternative B designates 15 ACECs totaling 1,492,990 acres (62 percent of the planning area). Beneficial impacts to special status wildlife would be similar to impacts under Alternative A, but would occur on 1,373,368 more acres, approximately 12 times the number of acres designated under Alternative A. Alternative B manages ACECs with the most restrictive mineral and realty prescriptions, which would protect special status wildlife habitat in the long term from being lost or fragmented. This management would have direct beneficial impacts on special status wildlife and their associated habitat in the long term by (1) closing lands to mineral leasing, (2) pursuing locatable mineral entry withdrawals, (3) closing or limiting motorized vehicle use, (4) excluding major utility systems, ROWs, and wind-energy development, and (5) prohibiting other surface-disturbing activities not compatible with retaining or enhancing the areas' values. Alternative B designates the Government Draw/Upper Sweetwater Sage-Grouse ACEC (1,246,791 acres) specifically to provide long-term protection to greater sage-grouse and their seasonal habitats and provide an area for the continuation of ongoing and future greater sage-grouse research. This ACEC incorporates 72 percent of the greater sage-grouse Core Area on public lands in the planning area. Alternative B would result in greater beneficial impacts to all sagebrush-obligate special status wildlife and their habitats than Alternative A, because Alternative B designates more acres and increases the level of protection from surface-disturbing and disruptive activities.

Alternative B protects the area within 5 miles either side of NHTs and the CDNST (the designated ACEC) from surface disturbance and facilities, unless projects would not be visible from the trails; this an increase of 4.75 miles over Alternative A for NHTs and 5 miles for the CDNST. This

management would result in direct beneficial impacts to sagebrush-obligate and riparian-wetland special status wildlife because approximately 468,183 (NHT) acres and 259,380 (CDNST) acres would be protected from activities that could result in the loss and fragmentation of habitats. Many of these acres overlap, so the total is less than the sum of the acres for each type of trail.

Alternative B recommends NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS and closes lands within ¼ mile of these waterways to mineral and realty actions and recommends them for withdrawal from locatable mineral entry. Alternative B also closes areas to motorized and mechanized travel and activities that would change the character of the waterways and adjacent areas. Management that reduces or eliminates the potential for habitat loss and fragmentation would beneficially impact special status wildlife. Alternative B increases the level of protection from surface-disturbing activities, and therefore would result in greater beneficial impacts than Alternative A.

4.4.9.3.4. Alternative C

4.4.9.3.4.1. Program Management

Alternative C requires surveys for BLM sensitive species on a case-by-case basis before authorizing actions and requires protective actions when appropriate. This would result in impacts the same as Alternative A and fewer beneficial impacts than Alternative B, because authorized activities could adversely impact some species where information is lacking.

Alternative C addresses habitat loss for special status wildlife on a case-by-case basis and does not establish limits for habitat loss except as required to protect ESA-listed species. Habitat loss not restricted on a cumulative basis could cause population declines not only in localized areas, but also throughout the species range. Alternative C would result more adverse impacts to special status wildlife than alternatives A and B, and almost the same impacts to ESA-listed species as Alternative B.

Alternative C applies a TLS to prohibit surface-disturbing activities within ½ mile of active peregrine falcon, northern goshawk, burrowing owl, and ferruginous hawk nests from February 1 to July 31. This nesting buffer is ¼ mile less than the buffer under Alternative A and 1 mile less than the buffer under Alternative B. Like Alternative A, the date range would adequately protect nesting and fledging ferruginous hawks and peregrine falcons, but would not be long enough to cover nesting and fledging northern goshawks and burrowing owls, therefore Alternative C would result in the same long-term adverse impacts to northern goshawks and burrowing owls as Alternative A. A ½-mile seasonal buffer would not be large enough to protect nesting ferruginous hawks from disturbance activities and would increase the risk of nest or chick abandonment for nesting peregrine falcons, northern goshawks, and burrowing owls. Alternative C would provide less protection for nesting raptors than alternatives A and B and therefore fewer beneficial impacts.

Like Alternative A, Alternative C opens the greater sage-grouse Core Area to oil and gas and geothermal leasing. Alternative C would result in impacts the same as Alternative A and much more adverse impacts than Alternative B, which closes the Core Area to leasing and eliminating the potential for adverse impacts from new development activities. Alternative C prohibits surface-disturbing and disruptive activities in or within ¼ mile of occupied greater sage-grouse leks and avoids surface-disturbing and disruptive activities in nesting habitat within 2 miles of occupied leks from February 1 to July 31. Management and impacts under Alternative C would be the same as under Alternative A, because Alternative C management actions would provide

long-term protection of 16,283 acres of lek habitat and short-term protection for 794,452 acres of greater sage-grouse nesting habitat. Alternatives A and C would protect substantially fewer acres of lek habitat and nesting habitat than Alternative B. Alternative C avoids BLM-authorized human activities within ¼ mile of the perimeter of occupied greater sage-grouse leks between 8 p.m. and 8 a.m. from March 1 to May 15 unless activity is specific to inventorying, monitoring, or viewing greater sage-grouse. Alternative C would result in the same beneficial impacts as Alternative A and fewer beneficial impacts than Alternative B.

Like Alternative A, Alternative C does not limit the density of disturbances or acres of surface disturbance in identified greater sage-grouse breeding, nesting, and brood-rearing habitat. Surface disturbances that are close together could adversely impact the availability and usability of habitats and could decrease localized greater sage-grouse populations. Alternative C would result in more adverse impacts than Alternative B, which establishes disturbance densities, and the same impacts as Alternative A.

Alternative C allows high-profile structures in greater sage-grouse nesting habitats. Increased predation on nesting greater sage-grouse would occur from raptors utilizing tall structures as hunting perches, which could lead to greater sage-grouse population declines in localized areas. Alternative C would result in more adverse impacts from this management action than Alternative A, which allows tall structures on a case-by-case basis, and Alternative B, which prohibits tall structures within 1 mile of occupied greater sage-grouse nesting habitat.

Alternative C limits facilities that generate noise 10 A-weighted decibels above natural ambient noise when measured at the perimeter of occupied greater sage-grouse leks during the period of March 1 to May 15. This management would reduce noise that can affect male greater sage-grouse vocalizations during breeding activities. Alternative C would result in fewer beneficial impacts than Alternative B because Alternative C protects greater sage-grouse from noise impacts only during the breeding season and not during the remainder of the year. Alternative C would result in greater beneficial impacts than Alternative A, which endeavors to reduce, but not specifically limit, facility noise around occupied leks.

Alternative C allows the construction of aboveground utility lines in greater sage-grouse, white-tailed prairie dog, mountain plover, and pygmy rabbit habitats and requires, on a case-by-case basis, that utility lines be buried. Alternative C would result in adverse and beneficial impacts the same as Alternative A and more adverse impacts than Alternative B, which requires that more utility lines be buried to prevent electrocution and eliminate or reduce opportunities for predation by raptors. Alternative C requires anti-perching devices on new overhead powerlines on a case-by-case basis, which would not alleviate predation concerns in areas where devices are not installed. Alternative C would result in impacts the same as Alternative A, and alternatives A and C would result in greater adverse and fewer beneficial impacts than Alternative B, which requires anti-perching devices on all new overhead powerlines and seeks opportunities to retrofit existing powerlines.

Surface-disturbing activities are avoided in white-tailed prairie dog complexes larger than 100 acres on a case-by-case basis. This management will protect larger white-tailed prairie dog colonies that are large enough to potentially support a black-footed ferret population, but will not protect smaller colonies from disturbance that can result in the loss of prairie dogs through mortality or colony abandonment. The majority of white-tailed dog colonies or complexes in the planning area are smaller than 100 acres in size; therefore, there would be adverse impacts to the majority of the colonies in the planning area under Alternative C.

Alternative C allows surface-disturbing activities in occupied pygmy rabbit habitats on a case-by-case basis. Activities that result in loss of habitat would ultimately result in a decline in overall population numbers. Alternative C would result in impacts the same as Alternative A, and alternatives A and C would result in more adverse impacts than Alternative B, which prohibits surface disturbance in occupied pygmy rabbit habitat.

Alternative C allows surface-disturbing and disruptive activities in or adjacent to bat maternity roosts and hibernation areas unless direct bat mortality would occur. Activities can impact insect foraging areas, which would adversely impact food sources needed for nursing special status bats; this could lead to loss of young. Alternative C would result in more adverse impacts to bats than Alternative B, which prohibits disturbance within ¼ mile of maternity roosts and hibernacula, and would result in almost the same impacts as Alternative A, which avoids disturbance on a case-by-case basis.

Alternative C preserves essential migration and travel corridors needed for ESA-protected species, and does not specifically manage corridors for BLM sensitive species. Alternative C would beneficially impact threatened and endangered species, however this management would adversely impact other special status wildlife that require traditional corridors to access seasonal or foraging habitats unless these corridors overlap the corridors for the threatened and endangered species. Alternative C would result in greater beneficial impacts to ESA-listed species than Alternative A and the same beneficial impacts as Alternative B; however, Alternative C would result in more adverse impacts to BLM sensitive species than alternatives A and B.

Alternative C applies standard stipulations to resource uses (i.e., seasonal raptor nesting protection and riparian-wetland avoidance) to protect special status wildlife in the Dubois area, except in the Whiskey Mountain and Dubois Badlands WSAs, which Alternative C manages under BLM Manual 6330, *Management of Wilderness Study Areas*. BLM Manual 6330 offers additional protection to special status wildlife because it closes WSAs to most surface-disturbing activities. Lands in the Whiskey Mountain and East Fork ACECs designated under Alternative A would not receive the same protections under Alternative C; therefore, surface-disturbing and disruptive activities in this areas would adversely impact special status wildlife habitats. Standard stipulations would not prevent the loss or fragmentation of habitats for the concentration of special status species that inhabit the Dubois area. Alternative C would result in greater potential for adverse impacts to special status wildlife throughout the Dubois area than alternatives A and B.

4.4.9.3.4.2. Resources

Lands with Wilderness Characteristics

Alternative C does not specially manage lands with wilderness characteristics in the Little Red Creek Complex which would reduce the quality and quantity of special status wildlife habitat because the alternative opens the entire area to surface-disturbing and disruptive activities. Habitat loss, fragmentation, and avoidance due to development and OHV activities would result in long-term adverse impacts to special status wildlife using the area. Increased human presence related to project development, and O&M of projects would result in short-term displacement impacts, depending on the amount of surface disturbance and the timing of disturbance activities. Alternative C would result in more adverse impacts to special status wildlife than the other alternatives, because Alternative C does not provide the additional habitat protections of ACEC designation and manages all lands with standard timing limitations. Because Alternative B

manages only 5,490 acres as non-WSA lands with wilderness characteristics to protect wilderness character, impacts under Alternative C are only locally important.

Fire and Fuels

Under Alternative C, approximately 300 acres will be treated each year by prescribed fire and 500 acres will be treated using mechanical methods, which is the same as Alternative A. Alternative C will treat less acres using prescribed fire than Alternative B, decreasing the risk of unanticipated adverse impacts to special status wildlife habitats and reducing the beneficial impacts. Alternative C fire and fuels management will use full suppression to address wildland fire across the planning area, including the use of heavy equipment. Impacts to special status wildlife would be the same as under Alternative A. Full suppression could adversely impact wildlife in grassland/shrubland ecosystems that benefit from periodic fire needed to rejuvenate sagebrush and promote plant diversity, but would beneficially impact special status wildlife by reducing the potential for landscape-level wildfires.

Vegetation

Impacts to wildlife from forest management actions under Alternative C would be similar to impacts under Alternative A. The full range of silviculture techniques is used to improve forest health, provide forest products, and address forest insect and disease outbreaks. Managing for forest health and limited forest product sales would beneficially impact special status wildlife in the long term by maintaining healthy and diverse timber stands. Timber sales and cutting practices would adversely impact special status wildlife in the short term by causing displacement due to noise, road travel, and human presence, and in the long term from habitat loss, fragmentation, or alteration.

Alternative C manages grasslands and shrublands to maximize forage production on the ecological site and uses vegetative treatments to change plant community composition so as to facilitate grazing management. In most areas, management would result in an increase in herbaceous vegetation in the plant community and a decrease in shrubs. Treatments focused on increasing grass plant production would beneficially impact special status wildlife that occupy primarily grassland habitats, such as swift fox, Baird's sparrow, and mountain plover. Beneficial impacts would also apply, though to a lesser degree, to burrowing owls, white-tailed prairie dogs, and black-footed ferrets because they are generally found in habitats with a balance of sagebrush and grasses in the plant community. Increasing herbaceous forage would provide additional security cover for nesting and birthing activities for special status birds and mammals. Sagebrush- and other shrub-obligate species, including greater sage-grouse, neotropical migrants, pygmy rabbits, dwarf shrew, swift fox, gray wolf, and ferruginous hawks, would likely experience adverse impacts if there is a substantial loss of shrubs in the plant community that reduces suitable habitat. Alternative C would likely adversely impact shrub-obligate special status wildlife more than alternatives A and B, and would result in beneficial impacts to grass obligate species. There are more sagebrush- or sagebrush-grass-obligate species in the planning area than grass-obligate species; therefore, Alternative C could adversely impact more special status wildlife species in the long term than it would beneficially impact.

Alternative C prohibits surface-disturbing activities within 500 feet of riparian-wetland areas, but allows a lesser distance if riparian-wetland areas would still be adequately protected. More acres would likely be disturbed in special status wildlife habitats adjacent to riparian-wetland areas under Alternative C than under alternatives A and B, which would result in a less beneficial impact. Management needed to improve riparian-wetland areas toward PFC will consist of using

all techniques available, such as construction of range improvements, closing roads that impact the areas, and changing livestock grazing strategies. Like Alternative A, livestock control fences and water developments under Alternative C could result in adverse (e.g., movement barriers, collision/entanglement hazards, and increased plant utilization) and beneficial (e.g., preventing livestock concentration, and riparian-wetland improvements) impacts to special status wildlife. Alternative C has the highest potential to result in adverse impacts to special status wildlife that depend on riparian-wetland areas. Alternative B would result in the greatest beneficial impacts to special status wildlife of all alternatives by increasing the protection distance adjacent to riparian-wetland areas and reducing the number of fences and water developments that could adversely impact special status wildlife and their habitats.

Wild Horses

Alternative C considers impacts to wild horse movement from new fences in HMAs, but does not specifically remove or modify existing fences to facilitate wild horse movement. Alternative C would result in impacts the same as Alternative A and would not provide the beneficial impacts to special status wildlife movement or the reduction in collision hazards from fence removal or modification that Alternative B provides. Like Alternative B, Alternative C establishes wild horse viewing loops and would have the same impacts as Alternative B.

Cultural and Paleontological Resources

Alternative C beneficial impacts to special status wildlife from cultural and paleontological resources protection would be the same as Alternative A and less than Alternative B. Alternative B protects the most acres and increases the level of protection for cultural and paleontological resources of all the alternatives.

4.4.9.3.4.3. Resource Uses

Minerals

Alternative C allows locatable mineral entry on 2,385,576 acres of public surface and 2,800,467 acres of federal mineral estate in the planning area (more than 99 percent); mining could occur on almost the same number of acres of special status wildlife habitat as under Alternative A and 60 percent more acres than under Alternative B. Of the lands recommended for withdrawal, 3,540 acres overlap the greater sage-grouse Core Area and 3,485 acres are in LAUs. The number of acres equates to less than 0.2 percent of Core Area and 13 percent of the total acres of LAUs in the planning area. Alternative C allows existing withdrawals to expire, which would open lands, primarily in the Dubois area, to mineral exploration and development that could result in special status wildlife habitat loss, fragmentation, or modification. Adverse impacts from locatable mineral exploration and development activities under Alternative C would be greater than under Alternative A in the Dubois area and slightly greater than Alternative A throughout the rest of the planning area. Alternative B would result in fewer adverse impacts to special status wildlife than alternatives A and C.

Impacts from geothermal and oil and gas leasing under Alternative B would be similar to impacts under Alternative A. Alternative C opens a total of 2,295,114 public surface acres (96 percent) to geothermal leasing and opens 2,394,132 surface acres (more than 99 percent) open to oil and gas leasing. Alternative C closes 99,096 acres to geothermal leasing and 78 acres to oil and gas leasing. Of the total acres open to mineral leasing, 1,724,004 acres are in the greater sage-grouse Core Area, which is 78 fewer acres than the total amount of Core Area in the planning area.

Alternative C would result in a greater risk of adverse impacts to greater sage-grouse habitats and other sagebrush-obligate special status wildlife utilizing these same habitats if leasing leads to development activities. In LAUs, 27,022 acres are open and no acres are closed to mineral leasing. It is anticipated that approximately 774 acres would be disturbed each year under Alternative C through oil and gas development activities, with 402 acres being disturbed in the long term. Alternative C will result in almost the same impact from acres of disturbance as Alternative A and approximately 31 percent more acres disturbed than Alternative B, which would result in more adverse impacts to special status wildlife and their habitats. Alternative B opens the fewest acres to mineral leasing and potential future development, which would result in the least amount of habitat and habitat connectivity loss and fragmentation, therefore greater beneficial impacts to special status wildlife. Overall, Alternative C would result in more adverse impacts to special status wildlife than Alternative B and the same impact as Alternative A.

Alternative C does not include seasonal protections for greater sage-grouse, mountain plover, and raptor nesting during O&M of developed projects. Activities that cause nesting greater sage-grouse and other special status birds to abandon their nests or chicks can adversely impact local populations. Alternative C would result in more adverse impacts than Alternative B, that applies seasonal protections during O&M activities, and the same impact as Alternative A in areas where seasonal protections are not specifically identified during project analysis.

Alternative C impacts from geophysical activities would be the same as impacts under Alternative A. Alternative C would result in more adverse impacts to special status wildlife than Alternative B, because Alternative C opens more acres to geophysical activities that could adversely impact habitats and result in nest abandonment or chick/young mortality.

Alternative C opens a total of 2,272,359 public surface acres (95 percent) to phosphate leasing. Of the total acres open, 1,633,304 acres are in the greater sage-grouse Core Area and 26,405 acres are in LAUs. Alternative C opens 96 percent of the acres with phosphate potential to leasing and development, which is 17 percent more than Alternative A and 13 times more than Alternative B. Alternative C could adversely impact more acres of special status wildlife habitat than alternatives A and B. Alternative C would result in the greatest potential for adverse impacts to special status wildlife and the greatest potential for permanent loss of habitat from mining.

Alternative C opens 2,252,801 acres to mineral materials disposals, of which 1,619,072 acres overlap the greater sage-grouse Core Area. Alternative C closes approximately 141,409 surface acres to mineral materials disposals, primarily in riparian-wetland areas, greater sage-grouse leks, and pre-FLPMA withdrawal areas. Alternative C allows surface disturbance on a more habitat acres than alternatives A and B; therefore, Alternative C would result in the greatest potential for long-term adverse impacts.

Lands

Alternative C makes available 5,436 acres for land tenure disposal by sale, exchange, or other methods, and makes available an additional 1,435 acres with restrictions on future uses. Impacts to special status wildlife from land tenure adjustments would be the same as under Alternative B and less than under Alternative A. Alternatives B and C retain most acres in public ownership and subject to management that considers special status wildlife values when making land use decisions.

Renewable Energy

Alternative C opens 2,284,235 acres (95 percent) of public surface lands in the planning area to wind-energy development. Adverse impacts to special status wildlife from habitat loss/fragmentation and wildlife displacement could occur on a much larger number of acres than under Alternative B and on approximately 8 percent more acres than under Alternative A. Of the acres open to wind-energy development, 1,645,339 acres overlap the greater sage-grouse Core Area, which is 95 percent of the Core Area in the planning area. Alternative C management is the same as Alternative A and would result in a greater risk of adverse impacts to special status wildlife than Alternative B, which closes the greater sage-grouse Core Area to wind-energy development.

ROWs and Corridors

Alternative C opens 2,247,157 acres (94 percent of the planning area) to ROWs, including 1,619,589 acres of the greater sage-grouse Core Area, which is more acres of special status wildlife habitat than under alternatives A and B. Alternative C designates 660,908 acres as ROW corridors located across the planning area except in the Dubois area and having widths up to 3 miles wide. Alternative C excludes ROWs on 147,053 acres, with most of the exclusion acres being primarily along NHTs and in the Sweetwater Rocks, and avoids ROWs on another 11,714 acres. Alternative C opens more acres to ROWs and corridors than the other alternatives and would result in the greatest adverse impacts to special status wildlife.

Livestock Grazing Management

Alternative C manages the same amount of land as open and closed to livestock grazing as Alternative A, and impacts would be the same as under Alternative A. Alternative C would result in fewer beneficial impacts than Alternative B, because Alternative C closes fewer acres to livestock than Alternative B. Alternative C adjusts, on a case-by-case basis, livestock grazing season-of-use dates that overlap the time of year when grizzly bears are likely to be in the area and conflicts could occur. Livestock management under Alternative C is the same as under Alternative A, but would result in fewer beneficial impacts than Alternative B because Alternative C would not always adjust grazing dates; this could allow conflicts between grizzly bears and livestock and result in the removal of offending bears.

Alternative C employs all livestock grazing management strategies, including the use of fences and water developments, to maintain, enhance, or achieve rangeland health. Livestock management actions would disturb approximately 100 acres each year during construction and/or development of range improvements, which would include approximately two reservoirs, six wells, four spring developments, and 49 miles of fence. Alternative C would result in more acres of disturbance and potential habitat loss from range improvements than the other alternatives. Alternative C would increase habitat fragmentation for special status wildlife by allowing 34 additional miles of fence per year than Alternative A and 49 more miles per year than Alternative B.

Under Alternative C, livestock grazing levels will not exceed moderate utilization in areas preferred by livestock. Moderate grazing would increase plant utilization and decrease the amount of forage and cover available for special status wildlife. Alternative C prohibits the placement of salt or mineral supplements within $\frac{1}{4}$ mile of riparian-wetland areas, but places supplements to maximize livestock utilization of the range. Increasing livestock grazing utilization in sensitive special status wildlife habitats would likely result in wildlife displacement, increased plant utilization, and loss of habitat around the supplement locations. Adverse impacts under Alternative C would be greater than under Alternative B and slightly greater than Alternative A. Alternative

C removes or modifies fences to facilitate livestock movement and management, which would not likely beneficially impact special status wildlife movement or reduce collision hazards.

Like Alternative A, Alternative C allows water development projects and new fences in greater sage-grouse nesting habitats on a case-by-case basis. Where projects are constructed, there could be adverse impacts to special status wildlife from increased livestock utilization of herbaceous plants, increased habitat fragmentation, and the introduction of new fence hazards. Alternative C would result in the same adverse impacts as Alternative A and more adverse impacts than Alternative B.

Overall, livestock grazing under Alternative C would result in more adverse impacts to special status wildlife than alternatives A and B because Alternative C allows more range improvements and higher plant utilization levels.

Recreation and Travel Management

Alternative C does not withdraw lands around developed recreation sites, campgrounds, and interpretive sites, and opens lands to locatable mineral exploration and development. Habitat would be lost if mining operations occur in these areas. Alternative C would result in more adverse impacts to special status wildlife than alternatives A and B, although impacts would not be considered substantial due to the limited use of these areas by wildlife. Alternative C recreation management areas would be ERMAs and would not be afforded additional protections from disturbance impacts. Alternative C adverse impacts to special status wildlife would be the same as under Alternative A and greater than under Alternative B.

Alternative C limits motorized travel to existing roads and trails on 2,337,958 acres (98 percent of the planning area), an increase of 5 percent over Alternative A and an increase of 10 percent over Alternative B. Alternative C limits motorized travel to designated roads and trails on 50,776 acres (112,299 fewer acres than Alternative A and 142,928 fewer acres than Alternative B), which could reduce impacts to sensitive habitats for special status wildlife. Alternative C closes 5,472 acres (0.2 percent of the planning area) to motorized and mechanized travel and does not apply any seasonal closures. Alternative C would result in adverse impacts to sensitive habitats and during sensitive times of the year such as winter, breeding, and birthing/nesting periods.

Restrictions to motorized vehicle use decrease under Alternative C, and special status wildlife in a larger percentage of the planning area would experience more adverse impacts from habitat loss/fragmentation and animal disturbance/displacement than under alternatives A and B.

4.4.9.3.4.4. Special Designations

See the *Special Designations* section of this chapter for specific management actions regarding special designations under Alternative C.

Alternative C does not designate ACECs and manages lands using standard stipulations. Alternative C applies a TLS for surface-disturbing activities in greater sage-grouse and raptor nesting habitat, which would result in short-term beneficial impacts. Alternative A applies an NSO restriction for greater sage-grouse leks, which would result in long-term beneficial impacts, although the NSO protection buffer is smaller under Alternative C than under Alternative B. Alternative C does not require Plans of Operation for lands open for locatable mineral exploration, which would result in impacts from habitat loss and animal displacement because there would be

little opportunity to mitigate adverse impacts. Alternative C would have the greatest potential to result in habitat loss and fragmentation and impair connectivity between seasonal habitats.

Alternative C recognizes lands within ¼ mile either side of NHTs and the CDNST as part of the NLCS landscape, and restricts development on the VRM Class I and Class II historic trail segments of the NHTs. Alternative C would result in fewer beneficial impacts to special status wildlife than alternatives A and B along the NHTs and almost the same beneficial impacts as Alternative A along the CDNST.

Alternative C does not recommend NWSRS-eligible waterway segment as suitable for inclusion in the NWSRS. Alternative C manages the Sweetwater River waterway and associated special status wildlife habitat under BLM Manual 6330, *Management of Wilderness Study Areas*, which is the same management as Alternative A and less protective than management under Alternative B. Alternative C manages the Baldwin Creek waterway using standard stipulations that are less protective than Alternative A or Alternative B, which would have ACEC prescriptions, and would result in the greatest potential for adverse impacts to special status wildlife. Overall, Alternative C prescribes the least amount of protection, therefore would result in the most adverse impacts to special status wildlife.

4.4.9.3.5. Alternative D

4.4.9.3.5.1. Program Management

Like alternatives A and C, Alternative D requires, on a case-by-case basis, surveys to determine the presence or absence of BLM sensitive species in suitable habitat prior to authorizing activities. When species are determined to be present, appropriate mitigation is required to protect the species and limit adverse impacts to their habitats. Like alternatives A and C, Alternative D would result in fewer beneficial impacts to special status species than Alternative B; Alternative B requires surveys in all cases and therefore would provide opportunities to mitigate impacts to BLM sensitive species for which there is no existing information.

Alternative D establishes DDAs in the Shoshoni-Lysite area, the Gas Hills, and in the Beaver Creek area to focus on energy development. Surface use and TLSs to protect wildlife and special status wildlife would be applied at the leasing stage but exceptions would be frequently authorized to exempt crucial winter range protection to facilitate development. Exceptions would not be routinely authorized for protections for special status species. Granting exceptions for big game crucial winter range would adversely impact special status wildlife that occupy the same area, such as migratory songbirds, that are not subject to specific timing or surface use stipulations.

Alternative D establishes acceptable limits for habitat loss, modification, fragmentation, and loss of function for special status species on a case-by-case basis and limits for greater sage-grouse in Core Area are established using the identified disturbance thresholds and uses Required Design Features to limit surface disturbance and improve habitat reclamation. This alternative would beneficially impact species identified as being at greater risk from habitat changes that can contribute to localized population declines. There could be uncontrolled habitat loss for species not on the priority list under Alternative D. Alternative D would result in greater beneficial impacts than alternatives A and C, which do not establish limits or apply limits only as required by the USFWS to protect threatened and endangered species. Alternative B establishes limits for all special status wildlife species and would result in greater beneficial impacts than Alternative D.

Alternative D applies a TLS to prohibit surface-disturbing activities within $\frac{3}{4}$ mile of active peregrine falcon, northern goshawk, and burrowing owl nests and within 1 mile of ferruginous hawk nests. The protection dates for peregrine falcon and ferruginous hawk are February 1 to July 31, which are the same dates for most raptor species (see the *Fish and Wildlife Resources – Wildlife* section for more information). The protection dates are April 1 to August 31 for northern goshawk and April 1 to September 15 for burrowing owl. Under all alternatives, bald eagle nests are protected from February 1 to August 15 within 1 mile of the nest. Increasing the protective buffer for ferruginous hawks over that in alternatives A and C would offer greater protection to active nests, because ferruginous hawks tend to be more sensitive to disturbance actions than most other raptor species. The Alternative D TLS dates for northern goshawk and burrowing owl are the same as under Alternative B; however, Alternative D would provide better protection than alternatives A and C because these raptor species typically initiate nests later in spring, thus chicks fledge later in the year.

Alternative D opens the greater sage-grouse Core Area to oil and gas and geothermal leasing. There would be a greater risk of habitat loss and fragmentation resulting from lease development activities under Alternative D than under Alternative B, and the same risk as under alternatives A and C. Alternative D limits disturbances in the Core Area to an average of one oil and gas or mining location per 640 acres and does not allow the cumulative value of existing disturbances to exceed 5 percent of the habitat within those same 640 acres. Alternative D would result in greater beneficial impacts than alternatives A and C, which do not limit the density of disturbances or the cumulative acres of surface disturbance in greater sage-grouse habitat. However, Alternative D would result in more adverse impacts than Alternative B, which limits cumulative surface disturbance to 2.5 percent of the sagebrush habitat in the same 640 acres, half the limit than under Alternative D.

Alternative D prohibits surface-disturbing and disruptive activities on or within 0.6 mile of the perimeter of occupied greater sage-grouse leks in the Core Area and on or within $\frac{1}{4}$ mile outside the Core Area. Alternative D protects 102,212 acres of breeding habitat on public surface lands for the long term, which represents a 3.6 percent increase in habitat protected for the long term over Alternative A, a 3.6 percent increase over Alternative C, and a 0.4 percent increase over Alternative B. The differences reflect that a $\frac{1}{4}$ -mile buffer was used around a single point in alternatives A, B, and C whereas the buffer in Alternative D was calculated around the newly mapped perimeter of the lek. In suitable greater sage-grouse habitat in the Core Area, Alternative D prohibits surface-disturbing and disruptive activities between March 15 and June 30 and extends those protections to locatable mineral exploration under a Notice to protect nesting activities. Outside the Core Area, Alternative D prohibits surface-disturbing and disruptive activities between March 15 and June 30 within 2 miles of the perimeter of occupied greater sage-grouse leks. Alternative D shortens the nesting protection period by 4 weeks at the beginning of the period and by 2 weeks on the end of the period over the February 1 to July 31 dates under alternatives A, B, and C. Delaying the start of the nesting period protection would not likely be an adverse impact on greater sage-grouse because they typically do not initiate nests before mid-March. Cutting 2 weeks off the end of the nesting period could result in adverse impacts because nesting might not be completed before the end of June in higher elevation areas or for birds that re-nest when first-attempt eggs/chicks are lost.

Alternative D prohibits disruptive activities between 6 p.m. and 8 a.m. from March 1 to May 15 on or within an 0.6-mile radius of the perimeter of greater sage-grouse leks in the Core Area and $\frac{1}{4}$ -mile radius outside of the Core Area to protect greater sage-grouse strutting on leks and to protect breeding activities. This management action is similar to the other alternatives (8

p.m. to 8 a.m. from March 1 to May 15), except that the affected time starts 2 hours earlier in the evening. Greater sage-grouse usually arrive at leks approximately 2 hours before sunrise, but when there is a fuller moon phase, they can arrive after sunset and be on the lek all night. Alternative D would beneficially impact greater sage-grouse during these times by prohibiting disruptive activities earlier in the evening.

Alternative D limits noise levels from March 1 to May 15 to 10 A-weighted decibels above natural ambient noise, or the level determined appropriate through scientific findings, when measured at the perimeter of occupied greater sage-grouse leks. This level would likely reduce adverse impacts caused by noise that drowns out greater sage-grouse vocalizations during the breeding season. This alternative also allows for noise sources to be measured and mitigated in other habitats important for greater sage-grouse to minimize impacts to the birds (Patricelli et al. 2012). Alternative D management is similar to Alternative C, slightly less restrictive than Alternative B, and more restrictive than Alternative A.

Alternative D allows new permanent, high-profile structures in greater sage-grouse nesting habitat on a case-by-case basis. The requirement that all new structures will have anti-perching devices installed will deter predation opportunities and provide protection to nesting greater sage-grouse. Raptors use high-profile structures as hunting perches, and cause greater sage-grouse to avoid areas of suitable habitat, resulting in a reduction of usable habitat. In addition to greater sage-grouse, overhead structures can increase raptor predation on white-tailed prairie dogs, mountain plovers, and pygmy rabbits. On a case-by-case basis, Alternative D allows the construction of overhead powerlines in greater sage-grouse, white-tailed prairie dog, mountain plover, and pygmy rabbit habitats and requires the installation of anti-perching devices. Low-voltage powerlines could be required to be buried to reduce predation opportunities. These management actions under Alternative D would result in the same or fewer adverse impacts as Alternative A and the same or more adverse impacts than Alternative B, which prohibits new high-profile structures within 1 mile of greater sage-grouse nesting habitat. Alternative C does not restrict tall structures, and therefore would result in the greatest risk for adverse impacts.

Alternative D prohibits surface-disturbing activities within 200 feet of occupied pygmy rabbit habitats and avoids these same activities in white-tailed prairie dog colonies, where possible. Due to the pygmy rabbit's small home range, this management action would provide long-term protection of their habitat. This distance is not as great as under Alternative B, but would result in more beneficial impacts than alternatives A and C, which do not specifically prohibit activities that can cause habitat loss and animal displacement. Avoiding surface-disturbing activities in white-tailed prairie dog colonies could protect the loss of burrow habitat and the displacement of animals, but surface-disturbing activities could also beneficially impact the species because prairie dogs will utilize disturbed ground to expand their colonies. It is expected that Alternative D would result in almost the same impacts as alternatives A and C, and slightly fewer beneficial impacts than Alternative B.

Alternative D prohibits surface-disturbing and disruptive activities within ¼ mile of known bat maternity roosts and hibernation areas unless it is determined that the action would not adversely impact either the bats or their habitat. Alternative D would result in the same beneficial impacts as Alternative B. Compared to alternatives A and C, alternatives B and D would better protect these sensitive habitats from BLM-authorized activities that could make the habitat unusable or result in localized population declines.

Alternative D could result in the loss of movement corridors special status wildlife need to access seasonal habitats or maintain genetic diversity, because Alternative D protects movement corridors only on a case-by-case basis. Management under Alternative D is the same as management under Alternative A. Both these alternatives would result in a greater risk of adverse impacts than Alternative B, which preserves special status wildlife travel corridors in all cases, but greater beneficial impacts than Alternative C, which preserves corridors only for threatened and endangered species.

To protect habitats for the large number of special status wildlife species that occupy lands in the Dubois area, Alternative D closes lands outside the Whiskey Mountain and East Fork ACECs and the Whiskey Mountain and Dubois Badlands WSAs to most surface-disturbing activities related to mineral and realty actions. Special status wildlife habitats in ACECs and WSAs are managed according to the prescriptions for the respective areas. Alternative D closes the rest of the Dubois area lands to mineral leasing and mineral materials disposals and excludes these lands to major ROWs; however, lands will remain open to locatable mineral development. Exploration and development activities associated with locatable minerals would likely result in adverse impacts to special status wildlife that use affected areas and adjacent lands. Alternative D would result in the same beneficial impact of closing special status wildlife habitat in the Dubois area to most activities that can result in habitat loss and fragmentation as Alternative B, and much greater beneficial impacts than alternatives A and C.

4.4.9.3.5.2. Resources

Lands with Wilderness Characteristics

Alternative D manages 4,954 acres of lands with wilderness characteristics as non-WSA lands with wilderness characteristics, slightly less acreage than is managed under Alternative B. Due to resource protections associated with non-WSA lands with wilderness characteristics management, including closing the area to motorized travel and limiting mechanized travel to designated routes, this management would benefit special status wildlife species in the area. Alternative D would result in greater beneficial impacts than alternatives A and C, which allow motorized travel on all existing roads and trails, but fewer beneficial impacts than Alternative B, which prohibits both motorized and mechanized travel. Under Alternative D, lands in the Whiskey Mountain ACEC are subject to the ACEC prescriptions, which would beneficially impact special status wildlife species occupying the area.

Fire and Fuels

Under Alternative D, approximately 500 acres of prescribed fire and 500 acres of mechanical treatment will be performed each year to address rangeland fire and fuel concerns. Alternative D increases the use of prescribed fire by 200 acres and therefore increases the risks of unintended consequences over alternatives A and C; Alternative D decreases prescribed fire by 500 acres compared Alternative B. Management uses a full range of suppression tactics based on the resources at risk to address wildland fire, including the use of heavy equipment. This could beneficially impact special status wildlife because selection of the appropriate suppression tactic could prevent long-term adverse impacts to sensitive habitats. Alternative D could increase the risk of adverse impacts to special status wildlife habitat from the use of heavy equipment during suppression efforts.

Vegetation

Alternative D manages forests and woodlands to address forest and woodland health conditions, wildlife habitat needs, and the demand for forest products using a full range of silviculture practices. Alternative D manages treatment of forest insect and disease outbreaks and the implementation of forest replanting on a case-by-case basis. Where there are treatments, they would protect the greater forested landscape from catastrophic losses and therefore beneficially impact timber-dependent special status wildlife. Alternative D allows clear-cuts with other resource values and silviculture objectives determining the sizes and locations of the cuts. These actions are almost the same as management actions under Alternative A, and the actions would result in short-term adverse and long-term beneficial impacts to special status wildlife.

Approximately 600 acres of short-term disturbance are anticipated from forest and woodland management (areas of mechanical treatments and forest product sales) over the planning period under Alternative D. Treatments would result in beneficial and adverse impacts to special status wildlife, depending on the species and the sizes of treatment patches.

Forest management plans will be developed for the Green Mountain Primary Forest Resource Area and as funding permits for the South Pass and Dubois Primary Forest Resource Areas to address the sale of commercial and over-the-counter forest products, enhancement of forest health conditions, and the management of pine beetle infestations. Alternative D prohibits commercial forest product sales that could adversely impact the availability of special status wildlife habitat and increase noise and human presence stressors on wildlife species in the Lander Slope and Red Canyon areas unless those actions are necessary to address human health and safety issues or improve forest health. Alternative D would result in fewer adverse impacts to wildlife habitat than alternatives A and C and slightly fewer beneficial impacts than Alternative B.

Like Alternative A, Alternative D manages grasslands and shrublands to achieve the vegetation attributes described in the NRCS Ecological Site Descriptions. Most special status wildlife depend on both shrubs and herbaceous plants to meet their forage and cover needs. Alternative D would result in greater beneficial impacts from managing for a balance of herbaceous and woody vegetation than Alternative C, but not as much as under Alternative B, which focuses on managing plant communities specifically for wildlife. Vegetation treatments will be utilized to alter plant community composition to achieve rangeland health objectives and to meet resource objectives such as maintaining or enhancing greater sage-grouse habitat. Alternative D would result in fewer adverse impacts to special status wildlife than Alternative C, because Alternative C uses treatments to facilitate livestock grazing management that could conflict with wildlife habitat objectives. Overall, Alternative D would result in slightly fewer beneficial impacts from grassland/shrubland management actions than Alternative B, almost the same beneficial impacts as Alternative A, and more adverse impacts than Alternative C.

Alternative D applies seasonal restrictions to both crucial mule deer winter range and mule deer winter range which will benefit special status species located in those areas. This is less beneficial than Alternative B's closure of more areas to mineral activities but more beneficial than Alternative A and C's management which do not apply the winter timing limits.

Alternative D prohibits surface-disturbing activities within 500 feet of water and riparian-wetland areas outside DDAs and closer than 500 feet inside DDAs providing adequate riparian-wetland protection can be achieved with a lesser distance. Protecting riparian-wetland habitats from loss, degradation, or fragmentation would beneficially impact special status wildlife because almost all species depend on these areas to meet their forage and cover requirements. Alternative D would result in fewer beneficial impacts than Alternative B, which prohibits surface disturbance within

a greater distance from all riparian-wetland areas. Alternative D utilizes all tools, including range improvement projects, travel management strategies, and lease stipulations, to improve riparian-wetland areas and move them toward PFC. Healthy and diverse riparian-wetland habitats would beneficially impact special status wildlife; however, an increase in fencing and livestock grazing levels around water developments would adversely impact special status wildlife. Alternative D would result in slightly more adverse impacts than Alternative A, much more adverse impacts than Alternative B, and greater beneficial impacts than Alternative C.

Wild Horses

Like alternatives B and C, Alternative D establishes scenic loops for viewing wild horses in the planning area. Alternative D would result in a slightly greater risk of adverse impacts to special status wildlife from increased vehicle use and human presence related to viewing activities than Alternative A. Alternative D considers impacts to wild horses when authorizing new fencing projects and removes or modifies fences as opportunities arise to facilitate movement between wild horse herds. In areas where new fencing is not allowed or where existing fences are removed or modified, special status wildlife would benefit from the reduction in the number of movement hazards. Alternative D would result in greater beneficial impacts than alternatives A and C and fewer beneficial impacts than Alternative B.

Cultural and Paleontological Resources

The area of protection surrounding cultural and paleontological resources under Alternative D is much the same as under Alternative A except to the extent that extensive areas are withdrawn from locatable mineral entry to protect cultural, wildlife, and viewshed. This is much more beneficial than under Alternative C. Alternative D protects fewer acres of special status wildlife habitat associated with cultural and paleontological sites than Alternative B, particularly related to mineral exploration and development, and would result in fewer beneficial impacts to special status wildlife than Alternative B.

4.4.9.3.5.3. Resource Uses

Minerals

Alternative D allows for locatable mineral entry on 2,351,399 acres (83 percent of the planning area) but withdraws substantially more than Alternative A. Adverse impacts to special status wildlife from habitat loss, modification, and/or fragmentation as a result of exploration and development activity would occur on 0.7 percent fewer acres than Alternative A, 1.5 percent fewer acres than Alternative C, and 57 percent more acres than Alternative B. Alternative D pursues continuation of the existing locatable mineral withdrawals in the Whiskey Mountain and East Fork ACECs, which would beneficially impact special status wildlife using these habitats (bald eagle, northern goshawk, Canada lynx, grizzly bear, gray wolf, and neotropical migrants). Alternative D pursues a withdrawal for lands in the Lander Front-Hudson-Atlantic City area including 4,828 acres in the Johnny Behind the Rocks RMZ that would prevent the loss of special status wildlife habitat and beneficially impact the species using the area. Of all the lands recommended for withdrawal, 320,081 acres overlap the greater sage-grouse Core Area and 6,903 acres are in LAUs. Required Design Features would reduce adverse impacts associated with development in Alternative D would result in greater beneficial impacts to special status wildlife than alternatives A and C, and more adverse impacts than Alternative B.

Alternative D opens a total of 2,112,285 acres to geothermal leasing with standard to major constraints and opens 2,642,527 acres to oil and gas leasing. This is 1.2 percent fewer acres than Alternative A and 1.8 percent fewer acres than Alternative C. Alternative D opens 77 percent more acres to leasing than Alternative B, which opens the fewest acres to mineral leasing and potential future development. As described for Alternative A, most development is expected to occur in areas with high and moderate potential for mineral resources that contain habitat for numerous special status wildlife species; mineral leasing would adversely impacted special status wildlife through habitat loss and fragmentation. New surface disturbance may result in beneficial impacts to white-tailed prairie dogs and mountain plover, so long as activities do not occur during the mountain plover breeding and nesting period. Under Alternative D, it is anticipated that approximately 724 acres would be disturbed each year through oil and gas development activities, and 375 of those acres would be disturbed in the long term. Alternative D makes available 1,678,035 acres of the greater sage-grouse Core Area to exploration and development, which is fewer acres than alternatives A and C but more acres than Alternative B. Alternative D applies disturbance thresholds to disturbance acres in the greater sage-grouse Core Area, as described above under *Program Management*. Alternative D would result in less habitat and habitat connectivity loss and fragmentation from lease development than alternatives A and C and more than Alternative B. Alternative D closes the entire Dubois area to oil and gas leasing and there would be no habitat loss and fragmentation from lease development activities; this action would beneficially impact the large number of special status wildlife in the area.

Alternative D extends seasonal protections for greater sage-grouse, mountain plover, and raptor nesting to activities deemed detrimental to special status wildlife that are connected with the O&M of developed projects on lands outside DDAs and extends seasonal restrictions for greater sage-grouse to Notice level operations in Core Area. Appendix I (p. 1535) lists activities subject to seasonal protections. Alternative D does not apply seasonal protections to these activities inside DDAs. Alternative D would result in greater beneficial impacts to special status wildlife during the sensitive breeding and nesting periods than alternatives A and C and fewer beneficial impacts than Alternative B, which applies seasonal protections to all lands.

Under Alternative D, lands closed to mineral leasing or subject to NSO are also closed to geophysical activities. Lands open to leasing are open to geophysical activities and subject to motorized travel limitations and restrictions on surface-disturbing and disruptive activities for the area. Closing habitats to geophysical activities would prevent adverse impacts from cross-country motorized travel and special status wildlife displacement. Restricting geophysical activities during sensitive times such as breeding, nesting, and winter periods would prevent abandonment or loss of nests or young, resulting in short-term beneficial impacts. Alternative D would have more beneficial impacts than alternatives A and C as it closes more acres of special status wildlife habitat to geophysical activities than alternatives A and C and fewer acres than Alternative B. Special status species in the Beaver Rim MLP area would benefit from the more restrictive management applied there an the limitations on surface disturbance although less than under Alternative B.

Alternative D opens 33 percent fewer acres to phosphate leasing than Alternative A, 38 percent fewer acres than Alternative C, and 48 percent more acres than Alternative B. Closing lands to phosphate leasing would beneficially impact special status wildlife by providing long-term protection of habitat. Alternative D closes 772,952 acres of the greater sage-grouse Core Area and 27,001 acres of LAUs to leasing, which is 88 percent more acres than Alternative A, 88 percent more acres than Alternative C, and 49 percent fewer acres than Alternative B. Alternative D would

result in greater beneficial impacts than alternatives A and C because Alternative D closes more special status wildlife habitat to phosphate leasing, and more adverse impacts than Alternative B.

Alternative D opens 1,620,497 surface acres to mineral materials disposal, of which 1,085,273 acres overlap the greater sage-grouse Core Area. Alternative D opens 87 percent more acres than Alternative B, 36 percent fewer acres than Alternative A, and 39 percent fewer acres than Alternative C. Under Alternative D, less special status wildlife habitat, including sensitive or limited habitats, could be lost, modified, or fragmented from development activities. Alternative D would result in greater beneficial impacts than alternatives A and C and more adverse impacts than Alternative B.

Lands

Alternative D identifies 8,073 acres of lands available for disposal by sale, exchange, or other methods, and makes an additional 6,665 acres available with restrictions for post-disposal use. Alternative D retains fewer acres in public ownership than alternatives B, C, and A. Alternatives B, C, and A would result in less risk of adverse impacts from the loss or alteration of special status wildlife habitat in than Alternative D, which makes more lands available for disposal.

Renewable Energy

Alternative D opens 224,289 acres (9 percent of the planning area) to wind-energy development, and avoids or excludes wind-energy development in the greater sage-grouse Core Area. (While Core Area is identified as avoided for wind-energy development, until such time as research identifies the impacts to greater sage-grouse from wind development and mitigation strategies have been developed, Core Area will be managed as closed to wind energy.) Where wind energy is developed in the Core Area, facilities will need to meet the location density and cumulative disturbance thresholds described above under *Program Management*. during the time that Core Area would be managed as closed to wind-energy development, Alternative D would result in very similar risk of adverse impacts to special status wildlife as under Alternative B, although to a less protective degree. Once research on the impacts to greater sage-grouse have been completed and mitigation measures identified, Alternative D would result in a greater risk of adverse impacts to special status wildlife from habitat loss, fragmentation, and avoidance, particularly in sensitive or limited habitats, than Alternative B, which opens only 26 percent of the planning area to wind-energy development. However, Alternative D would result in fewer adverse impacts than alternatives A and C, which open 88 percent and 95 percent of the planning area, respectively.

ROWs and Corridors

Similar to the mineral and other realty management actions discussed above, Alternative D opens fewer acres to ROWs than alternatives A and C and more acres than Alternative B. Alternative D excludes 35 percent of the planning area for ROWs and designates 44 percent as ROW avoidance areas. ROW exclusion areas encompass 284,356 acres of the greater sage-grouse Core Area and 27,015 acres of LAUs. ROW avoidance areas encompass 1,331,328 acres of the greater sage-grouse Core Area in the planning area. Opening fewer acres to ROW development would reduce the risk of habitat loss and fragmentation for special status wildlife and the introduction of electrocution, predation, and collision hazards. As previously described, surface disturbance from ROW development would likely result in beneficial impacts to mountain plover and white-tailed prairie dog because they tend to move into recently disturbed sites. Alternative D would result in greater beneficial impacts to special status wildlife from excluding or avoiding more lands than alternatives A and C and more adverse impacts from excluding fewer lands than Alternative B.

Alternative D designates almost as many ROW corridors as Alternative C and would thus have similar beneficial and adverse impacts to special status species. To the extent that surface disturbing activities were concentrated in fewer areas, there would be less habitat fragmentation. However, concentrating disturbance results in larger areas removed as habitat with more difficulty in reclamation. Since all designated corridors already contain habitat disturbance, some co-location would be likely to occur in any alternative.

Livestock Grazing Management

Alternative D opens approximately 97 percent of the planning area to grazing, which is almost the same as all the other alternatives. Alternative D closes 7,566 more acres to grazing than alternatives A and C and 5,273 fewer acres than Alternative B. Impacts would be almost the same as described for the other alternatives; however, Alternative D closes additional lands in the Dubois area, which would eliminate forage competition or reduce impacts to special status wildlife from livestock management activities. Like alternatives A and C, Alternative D adjusts livestock grazing use dates on a case-by-case basis on open allotments in the Dubois area to minimize conflicts with grizzly bears. Alternative D would result in a greater risk of grizzly bear removal by either relocation or death than Alternative B, which requires livestock grazing use dates be adjusted in all cases to minimize livestock-grizzly bear conflicts.

Alternative D livestock management actions would disturb approximately 42 acres each year during construction and/or development of range improvements. Alternative D allows more range improvement projects than Alternative B but fewer than alternatives A and C. Range improvement projects could beneficially and adversely impact special status wildlife by providing water in arid areas and changing where and how intensively habitats are grazed. Adverse impacts to special status wildlife from the construction of additional fences would be greater under Alternative D than alternatives A and B, which allow less fence construction, and less than under Alternative C, which allows more.

Alternative D allows livestock water development projects in greater sage-grouse nesting habitat if the project would improve nesting habitat and the development could be designed to be compatible with greater sage-grouse. Where constructed, water developments could adversely impact habitat near the developments through concentrated trampling and grazing use. However, water developments could beneficially impact special status wildlife through improved nesting cover in other parts of the grazing allotment. Alternative D allows new fences and removes existing fences on a case-by-case basis. Where new fences are constructed, there could be an increase in habitat fragmentation and the number of flight hazards across the landscape for some special status birds such as greater sage-grouse. Fence surveys in the Lander and Rock Springs Field Office areas have shown that greater sage-grouse can be injured or killed as a result of flying into fence wires. Similar to the other alternatives, removing fences would beneficially impact special status wildlife. Alternative D would result in the same or greater beneficial impacts than alternatives A and C, which do not restrict livestock water development and fences in nesting habitat. Alternative D would result in more adverse impacts to greater sage-grouse nesting habitat than Alternative B, which prohibits water developments and new fences except to protect wildlife or to address human health and safety issues.

Alternative D allows a moderate level of plant utilization when a Comprehensive Grazing Strategy is in place. As described for Alternative C, greater plant utilization would increase the potential for decreased hiding cover for special status birds, particularly greater sage-grouse, which could facilitate nest failure or predation. Alternative B allows the lightest plant utilization levels and

therefore would provide the most protection from adverse impacts related to overharvesting plants needed for special status wildlife cover or forage. Like Alternative B, Alternative D prohibits the placement of salt or mineral supplements within ½ mile of riparian-wetland areas and within 0.6 mile of greater sage-grouse leks. This action would prevent increased plant utilization and vegetation trampling in these key habitats, beneficially impacting special status wildlife. Alternative D would result in greater beneficial impacts than alternatives A and C, which prohibit supplements only within ¼ mile of riparian-wetland areas.

Recreation and Travel Management

Alternative D impacts from recreation management actions would be the same as impacts under Alternative B, except that SRMAs and distinct ERMAs will constitute fewer acres under Alternative D. In most cases, management of SRMAs and distinct ERMAs would beneficially impact special status wildlife by protecting the areas from activities that could degrade habitat. Management prescriptions that reduce or eliminate surface-disturbing activities (i.e., NSO for mineral leasing and locatable mineral withdrawals) in the Johnny Behind the Rocks Area and the Dubois Mill Site would provide long-term protection of special status wildlife habitat. Several SRMAs are in the Lander Slope ACEC and will be managed according to ACEC prescriptions; this would also beneficially impact special status wildlife by limiting surface-disturbing activities. Alternative D would result in greater beneficial impacts than alternatives A and C and fewer beneficial impacts than Alternative B.

Alternative D limits more acres to motorized travel than alternatives A and C and fewer acres than Alternative B. Alternative D opens 92 percent of the planning area to motorized travel on existing roads and trails, opens 6 percent to designated roads and trails, and closes 1 percent to motorized and/or mechanized travel. Closing areas to motorized travel would result in the greatest beneficial impacts to special status wildlife by eliminating disturbance or displacement from vehicle use and providing long-term protection from habitat loss and fragmentation. Most of the areas closed to motorized travel are open to mechanized travel. Areas open to mechanized travel would result in slightly fewer beneficial impacts than areas closed to all travel. Compared to alternatives A and C, the number of acres subject to seasonal travel limitations increases under Alternative D. Seasonal travel limitations would protect special status wildlife during sensitive winter, breeding, and birthing/nesting times. Overall recreation and travel management actions under Alternative D would result in fewer adverse impacts to special status wildlife than alternatives A and C and fewer beneficial impacts than Alternative B.

4.4.9.3.5.4. Special Designations

Alternative D designates eight ACECs totaling 243,836 acres (10 percent of the planning area), which is 51 percent more acres than Alternative A, 100 percent more acres than Alternative C, and 84 percent fewer acres than Alternative B. ACEC management would result in direct beneficial impacts to special status wildlife in the long term because it would protect the areas from habitat loss or fragmentation by (1) closing lands to mineral leasing, (2) extending existing or pursuing new locatable mineral entry withdrawals, (3) closing or limiting motorized vehicle use, (4) excluding major utility systems, ROWs, and wind-energy development, and (5) prohibiting other surface-disturbing activities not compatible with retaining or enhancing the areas' values. Alternative D does not designate the Government Draw/Upper Sweetwater Sage-Grouse ACEC, but does establish a small portion in this same area as the Twin Creek ACEC (35,102 acres). Alternative D provides limits on all types of mineral development in the Lander Front-Hudson-Atlantic City area, some of which is designated an ACEC, and proposes the

withdrawal of this area from locatable mineral development. This area would be managed for long-term protection of many species and resources, including special status species, and provides opportunities for continued greater sage-grouse research that could benefit the species statewide, such as identifying appropriate mitigation measures related to energy development. Management prescriptions are more restrictive than in other parts of Core Area to allow population trend studies and research to be conducted without the influence of other permitted activities. These management actions would protect habitat loss and the area's value as a reference area for greater sage-grouse and also benefit all other sagebrush-obligate special status wildlife species. Management prescriptions for the area would result in slightly fewer beneficial impacts than management under Alternative B and more beneficial impacts than alternatives A and C.

The East Fork and Green Mountain ACECs are larger under Alternative D than under Alternative A, increasing the amount of special status wildlife habitat covered by ACEC prescriptions. Alternative D does not designate the Dubois Badlands area as an ACEC and incorporates the 200 non-contiguous acres to the east of the badlands into the East Fork ACEC. This would not result in additional adverse impacts to special status wildlife because management under BLM Manual 6330, *Management of Wilderness Study Areas* would still protect their habitat in the Dubois Badlands WSA. Alternative D management of mineral and realty actions in the Whiskey Mountain and East Fork ACECs is the same as management under alternatives A and B (the most restrictive possible) and would provide the greatest protection to special status wildlife habitat. Under Alternative D, the Beaver Rim, Lander Slope, and Red Canyon ACECs are the same sizes as under Alternative A, but Alternative D includes slightly more restrictive prescriptions regarding surfacing-disturbing activities, which would beneficially impact special status wildlife.

Alternative D increases protections along NHTs and the CDNST in the NTMC over Alternative A except for the part of the CDNST in the Crooks Gap area. Additional constraints for surface-disturbing activities to protect the integrity and setting of the trails would beneficially impact special status wildlife habitat. Alternative D would result in greater beneficial impacts to special status wildlife habitat from trail protection than alternatives A and C, and fewer beneficial impacts than Alternative B.

Alternative D recommends NWSRS-eligible segments on Warm Springs Creek Segment 1, Baldwin Creek, and Sweetwater River as suitable for inclusion in the NWSRS and manages those segments in accordance with the Lander Slope ACEC and Sweetwater Canyon WSA prescriptions respectively, which constrain mineral and realty developments. Alternative D increases the level of protection for surface-disturbing activities over Alternative A because Alternative D increases protections in the Lander Slope ACEC and Sweetwater Canyon WSA. Alternative D would result in greater beneficial impacts than Alternative C and more adverse impacts than Alternative B.

Overall, Alternative D management actions for special designation areas would result in more beneficial impacts to special status wildlife than alternatives A and C and fewer beneficial impacts than Alternative B.

4.4.10. Wild Horses

This section describes potential impacts to wild horses from management of other resources and resource uses. The BLM manages wild horses for self-sustaining populations of healthy, free-roaming animals in balance with other uses and the productive capacity of their habitat. Management of wild horses is performed consistent with the Wild Free Roaming Horses and Burros Act of 1971, multiple use objectives in the FLPMA, in conformance with the

Wyoming Standards for Healthy Rangelands, and in compliance with relevant court orders and agreements, including the Consent Decree (August 2003). Adverse impacts to wild horses include management actions that impair the ability of native vegetation to produce forage, the availability of water, or other habitat components necessary to maintain the health of horses and the appropriate management levels in HMAs. Adverse impacts also result from management actions that impair wild horses' free-roaming behavior. Beneficial impacts to wild horses result from management that increases or improves vegetative health and amounts of forage and from management actions that support the long-term health, genetic viability, and free movement of wild horses in the HMAs.

4.4.10.1. Summary of Impacts

Primary adverse impacts to wild horses would result from management that reduces forage for and the health and free-roaming nature of wild horses. Alternative B would result in the greatest beneficial impact to wild horses due to its management emphasis on resource protection, which would increase forage and support the general free-roaming nature of wild horses. Alternatives A and C would result in similar types of impacts to wild horses, but Alternative C would result in more adverse impacts to wild horses than Alternative A, especially in the short term. Under all alternatives, wild-horse populations could be brought into balance with available habitat and resources needed to sustain genetically viable herds. Public encounters with wild horses would be the greatest under alternatives B and C because these alternatives increase opportunities for public viewing and opportunities for encounters associated with recreation.

4.4.10.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- The number of wild horses will increase approximately 15 to 20 percent annually and herd numbers will be maintained by periodic removals. Natural reproduction and recruitment rates will continue to exceed natural mortality from predation, disease, and other factors. Wild horse numbers managed within the appropriate management level will not adversely impact soil, water, or vegetation in a manner that would contribute to not meeting the Wyoming Standards for Healthy Rangelands.
- Wild-horse removals (gathers) will occur approximately every 3 to 5 years in each HMA.
- Maintenance of wild horse populations at appropriate management levels in existing HMAs will be accomplished through selective removal and application of other population control practices (i.e., fertility control).
- Wild-horse gathers will mostly use existing trap locations. Approximately 10 acres have been disturbed from the development of existing traps. It will be necessary to use new trap sites and disturb an additional 10 acres during the planning period.
- Public attitudes toward wild-horse protection and adoption will remain similar to attitudes over the past 10 to 20 years.
- Levels of wildlife will continue at the same rate as over the last 10 years.

4.4.10.3. Detailed Analysis of Alternatives

4.4.10.3.1. Impacts Common to All Alternatives

The types of impacts to wild horses under all alternatives would be similar; however, the extent and intensity of impacts would vary by alternative. Therefore, impacts to wild horses from soils and water management, surface-disturbing activities, minerals development, ROW development, motorized vehicle use, recreation, livestock grazing, special designations, fire and fuels management, wildlife use, and proactive management actions are described for individual alternatives.

Management in accordance with the Wyoming Standards for Healthy Rangelands would result in long-term beneficial impacts to wild horses. Conformance with the Standards for Healthy Rangelands (whether for soils, water, or vegetation) could result in short-term adverse impacts to wild horses if wild horses are determined to be a cause of not meeting the Standards for Healthy Rangelands.

Fencing to improve livestock grazing distribution and implement grazing systems would adversely impact the movement of wild horses and reduce their genetic viability and overall free-roaming nature. Water developments could improve the distribution of wild horses in each HMA, but also could draw wild horses into areas outside the current HMA boundaries. Conformance with the Wyoming Standards for Healthy Rangelands in upland areas would result in improved plant vigor, production, and diversity of species available as forage. This would provide consistent year-round forage and improve the year-round body condition of wild horses, which would have a beneficial impact on wild horses.

Management that decreases adverse impacts to water quality, watersheds, and soils, such as avoiding or prohibiting surface disturbance near water or on slopes, maintaining watershed improvement projects, and using BMPs to reduce runoff, soil erosion, and sediment yield to retain water on landscapes would result in long-term beneficial impacts to wild horses. Management of resources that enhance habitat and forage production contribute to habitat health and the overall health of horses.

All alternatives maintain herd numbers within the same range; therefore, herd numbers are not analyzed here. Maintaining the appropriate management levels of wild horses in the North Lander Complex of HMAs (Conant Creek, Muskrat Basin, Rock Creek Mountain, and Dishpan Butte) and the Lander Field Office portion of the Red Desert Complex (Green Mountain, Crooks Mountain, and Antelope Hills) would result in long-term beneficial impacts to wild horses. This provides for the maintenance of genetic viability of wild horses in the two complexes. Not restricting the movement of herds in the HMAs would further increase the genetic viability of wild-horse populations in HMAs. Employing selective removal criteria in accordance with current national policies during periodic gathers to increase desired genetic characteristics and avoid genetic depression would result in long-term beneficial impacts to wild horses by increasing long-term health and genetic viability.

HMAs are the same under all alternatives, therefore, this section does not address impacts to HMAs.

Considering the use of natural and artificial population control measures, as needed, to maintain the populations of wild horses within the established appropriate management levels would result

in long-term beneficial impacts to wild horses by improving health of populations and facilitating effective strategies for the management of wild horses and their habitat.

Basing future adjustments in forage allocations in the HMAs on monitoring and multiple-use considerations through a revision of the HMA plan would result in long-term beneficial impacts to wild horses. The process involved in adjusting forage allocations through the revision of HMA plans would provide appropriate review of herd objectives and conditions before forage allocations are made.

The use of certified weed-free forage supplements would beneficially impact wild horses by decreasing the potential for INNS establishment and spread that would compete with native vegetation and lead to losses or changes in available forage. The use of forage supplements also would reduce competition between wild horses and other wildlife for food sources during droughts.

Management of special designations within HMAs could beneficially impact wild horses by limiting adverse impacts to resources (e.g., soil, water, and vegetation) that would impact wild horses. All alternatives manage wild horses in the North Lander Complex and Red Desert Complex of HMAs.

Management of WSAs would result in the same impacts to wild horses under all alternatives. There are 56 acres of the Sweetwater WSA in the Antelope Hills HMA. Generally, WSA management beneficially impacts wild horses. However, the acreage of protection for horses is negligible.

The Wild Horse and Burro Act of 1971 requires that protection of a natural ecological balance, including endangered and all other wildlife species, be a consideration when making wild-horse management decisions. Accordingly, management that makes the listing of any species under the ESA more likely would result in an adverse impact to wild horses because it may require a reduction in wild-horse numbers to limit their adverse impacts to the endangered species. Under all alternatives, HMAs include suitable habitat for greater sage-grouse.

4.4.10.3.2. Alternative A

4.4.10.3.2.1. Program Management

Providing opportunities for the public to view wild horses in the various HMAs could adversely and beneficially impact wild horses. Increased human presence could adversely impact wild horses by acclimating horses to human presence and reducing their wild, free-roaming nature. If human activity lasts long enough, wild horses might move outside the existing HMAs. Increased foal mortality due to foal abandonments and increased risk of injuries to humans could result as wild-horse and human interactions continue to increase. However, public awareness could increase adoptions and support for the wild-horse program. Increased fencing demands in the HMAs for livestock management and protection of riparian-wetland values would continue to threaten the wild and free-roaming character of wild horses. The BLM would evaluate all fences to determine impacts to wild horses in the HMAs.

4.4.10.3.2.2. Resources

Soil and Water

Soil and water management indirectly impacts wild horses because they are causal factors for vegetation health. As described in the *Soil* section of this chapter, soil is protected from erosion through slope and surface disturbance limitations. Alternative A closes 30,385 acres of HMAs to surface disturbance. Water quality and riparian-wetland health are protected by prohibiting surface disturbance on 21,262 acres of HMAs.

Forests, Forest Products, Fire and Fuels

Alternative A provides for the development of forest products in the Green Mountain area. If demand supported this use, it would result in a major beneficial impact to wild horses in the Green Mountain HMA by creating additional forage (once an over story of trees are removed, the site becomes dominated by various grass species until trees revegetate the site) over a period that would provide high-quality habitat for wild horses. This would result in short-term adverse impacts during logging or mechanical treatment operations because horses would be displaced. However, there is no anticipated demand for commercial timber; this would reduce the potential for beneficial impacts, which would not vary substantially among the alternatives.

Full suppression in fire and fuels management would both adversely and beneficially impact wild horses. Management that increases the occurrence and spread of wildland fires in the short term, such as reduced restrictions on fire suppression activities, would result in temporary displacement of wild horses and short-term reductions in available forage. However, fires of the appropriate intensity improve forage production in the long term and result in vegetative communities with increased diversity, cover, and age class. Recovery of burned areas could adversely impact wild horses. Burned areas might also require temporary fencing during stabilization and rehabilitation, which could temporarily inhibit the movement of wild horses. Because impacts from fences would be short-term, these impacts are not expected to affect the long-term genetic variability of wild horses.

Fire suppression activities, such as firebreaks and staging areas for suppression, also would result in short-term loss of forage. These impacts would be expected to be minor considering the amount of suppression activities and localized disturbance compared to the size of the planning area and HMAs. Any fire suppression activities in or near HMAs would increase adverse impacts to wild horses.

Mechanical fuels treatments, prescribed fire, and other fuels reduction activities would result in short- and long-term adverse impacts to wild horses. In the short term, fuels reduction could temporarily displace wild horses from localized areas. In the long term, fuels reduction activities that help return fire to its natural role in the ecosystem would result in improved forage production and vegetative diversity, which would beneficially impact wild horses. Under Alternative A, there would be long-term beneficial impacts from prescribed fire and mechanical fuels treatments. However, under Alternative A, the BLM would be more likely to construct range improvement projects and would only occasionally perform vegetative treatments; this would adversely impact wild horses, which benefit from vegetative treatments in the long term.

Aggressive initial attack and full suppression of all natural or human-caused wildfire would minimize short-term impacts to wild-horse habitat and forage. Although prescribed fire could impact habitat and forage availability over the short term, pending recovery of vegetation from the impacts of direct, over the long term, prescribed fire maintains vegetative productivity and diversity. This would retain the viability of wild-horse herds, where it does not conflict with livestock grazing, and continue the capability to meet established herd numbers.

Grasslands and Shrublands

Alternative A manages vegetation in accordance with the NRCS ecological site guides. Meeting identified vegetative goals could adversely impact wild horses if the desired plant community does not contain enough plant diversity or contains improper types of vegetation to support wild horses. Vegetative and fuels treatments to enhance forage production would result in short-term adverse impacts to wild horses because forage would not be available while the areas become established in HMAs. There would be long-term beneficial impacts to wild horses because more high-quality forage would be available in the HMAs. This would provide for better long-term health of the wild horses.

INNS establishment and spread left untreated outcompetes native vegetation and grasses and could reduce available forage for wild horses. This creates more competition between livestock and wildlife for available forage. INNS treatments and reductions could displace wild horses and reduce forage in the short term, but would result in long-term beneficial impacts because it would reduce INNS competition with native vegetation and increase available forage for wild horses.

Riparian-Wetlands

Riparian-wetlands management under Alternative A could adversely impact wild horses. If water is not available, wild horses could seek water outside HMAs, which would result in new horse populations outside the HMAs. Dropping water tables created by unsuitable riparian-wetlands and fencing to improve riparian-wetland systems can cause water to be unavailable.

Wildlife

Consideration of wildlife big game herd objectives in allocation of forage could be adverse to supporting wild horse numbers. This would be especially true where the big game population is over the objective. Management to improve wildlife habitat would result in overall beneficial impacts to wild horses by creating diverse, complex vegetative communities with improved forage in riparian-wetland, grass, and shrub communities. Alternative A allows fences on a case-by-case basis in big game migration corridors, which, when authorized, would be likely to result in adverse impacts to wild horses if the fences are installed within the boundaries of HMAs.

Special Status Species

Management of special status plant and animal species in HMAs could limit opportunities for enhancement of wild-horse populations. Some proposed actions for greater sage-grouse also would limit these opportunities. Establishment of forage utilization limits in greater sage-grouse nesting areas could require reductions in wild-horse numbers in HMAs. See the *Special Status Species* sections of this chapter for additional analysis. To protect special status plants, wild-horse gathering or exclusion could be required on a site-specific basis; however, this would not adversely impact the wild-horse program because other gather locations are available. Management of special status species that improves habitat and reduces fences would beneficially impact wild-horse habitat.

4.4.10.3.2.3. Resource Uses

Locatable Minerals

Locatable mineral activities under Alternative A would result in adverse impacts to wild horses by increasing surface disturbance and increasing human presence. Alternative A does not withdraw land in HMAs from locatable mineral activities. Approximately 35,765 acres of in HMAs have potential for bentonite or uranium, the most likely types of locatable minerals to be explored or developed. Bentonite and uranium mining activities would adversely impact wild horses through removal of vegetation until it can be reclaimed, through human presence, fragmentation of habitat, and the increased likelihood of fences that would adversely impact the wild and free-roaming character of the wild horses. Fences also could block migration routes to winter ranges, depending on fence locations. Forage reductions would adversely impact wild horses by increasing competition with livestock and other wildlife. Removing vegetation also would encourage INNS establishment and spread.

Other Minerals

Alternative A opens all of the planning area HMAs to fluid mineral leasing. Alternative A closes small areas of riparian-wetlands and NHTs to solid mineral leasing and mineral materials disposals. Adverse impacts to wild horses from leasable minerals would be the same as described for locatable minerals.

Renewable Energy

Wind-energy development under Alternative A would result in direct adverse impacts to wild horses. Alternative A opens most HMAs to wind-energy development and 125,098 acres in HMAs have high potential for wind energy. Removing vegetation would result in a direct loss of available forage and result in habitat fragmentation through the development of new roads and fences. New fencing would deteriorate the wild, free-roaming character of wild-horses by reducing the amount of area in which they move and could block migration routes to winter ranges, depending on the locations of new fences. Reductions in forage would adversely impact wild horses by increasing competition with livestock and other wildlife. Removing vegetation also would encourage INNS establishment and spread. Wild horses stay away from the activities and movements associated with wind turbines. Management in areas in HMAs where this activity is authorized would be sharply curtailed, with no ability to inventory or round up horses using rotary-type aircraft. On a long-term basis, it might not be possible to control herd numbers in areas where wind turbines are developed. The southern HMAs have high potential for wind-energy development, including some areas along Beaver Rim.

ROWs and Corridors

Surface disturbance results in the removal of vegetation, which directly reduces the available forage for wild horses and other grazing animals. Surface disturbance and clearing of vegetation without appropriate reclamation or rehabilitation can also lead to the establishment and spread of INNS, which also could reduce forage. Forage reductions adversely impact wild horses by increasing competition between livestock and other wildlife. Alternative A does not designate corridors and allows ROWs on a case-by-case basis. Alternative A does not avoid or exclude acres of HMAs to ROWs.

Trails and Travel Management

Management of trails and travel results in both short- and long-term adverse impacts to wild horses. Alternative A does not increase or decrease motorized travel in HMAs and does not reduce duplicative roads. Increased development of other resource uses would increase traffic on

existing roads, but this would not be the result of travel management. Areas with seasonal travel limitations, such as in the Green Mountain area, reduce wild horse human interactions and would reduce adverse impacts to wild horses during winter when they are most vulnerable. Alternative A places seasonal travel limitations on 64 percent of the Green Mountain HMA.

Alternative A allows over-snow vehicles (snow machines) to run on existing roads and trails and cross-country in HMAs without any requirements for minimum snow depth. Motorized over-snow vehicles stress wild horses during winter and would increase the potential for wild-horse and human interactions, especially in areas near human population centers. This also would increase chances for wild horses to be harassed during critical winter months when they are already stressed by severe cold.

Livestock Grazing Management

Livestock grazing management under Alternative A would adversely and beneficially impact wild horses. Impacts to wild horses from livestock grazing depend on the location, timing, intensity, duration, and frequency of grazing. Livestock grazing management that results in the maintenance or improvement of range conditions as directed by the Wyoming Standards for Healthy Rangelands would beneficially impact wild horses, depending on how it is achieved. Range improvements associated with livestock grazing, such as springs, wells, and reservoirs, in HMAs would only result in theoretical beneficial impacts to wild horses because, although these range improvements would increase the availability of water, they would increase livestock use of upland vegetation. Increasing wild horse numbers show that wild horses currently have adequate water for their needs. Having more water developments but less forage would result in more of an adverse impact than a beneficial impact. Over the life of the plan, 416 acres would be disturbed from the development of spring, reservoir and well developments under Alternative A.

Alternative A would further adversely impact wild horses through the construction of fences for range improvements; fences would prevent herd movement and access to resources, and increase loss of vegetation along fence lines where livestock trail. Livestock grazing also would result in competition with wild horses for forage, water, and habitat; this would adversely impact wild horses, including where range improvement projects increase the use of upland vegetation in new areas. Alternative A manages all HMAs as open to livestock grazing. Drought conditions can exacerbate conflicts between wild-horse and livestock management related to water and forage availability on rangelands in HMAs. Under Alternative A, a total of 12,439 acres of surface disturbance is projected to take place over the planning period, including 355 miles of fences. It is not possible to determine how much of that activity would occur in HMAs; however, 41,333 acres in HMAs are not within 2 miles of a water development, which would make it likely that additional water developments and fences would be built in HMAs.

Alternative A authorizes fencing to promote healthy riparian-wetland areas. The use of permanent riparian-wetland fencing would result in short- and long-term adverse impact to wild horses by making the forage and water in the riparian-wetland unavailable. The use of temporary riparian-wetland fencing would result in a short-term adverse impacts to wild horses for the period the fence is in place. Fencing also could block migration corridors in the HMAs and prevent wild horses from moving freely to winter ranges. There would be long-term beneficial impacts to wild horses because improvements in riparian-wetland areas provide long-term, high-quality forage and water that would be available to wild horses. However, fencing of riparian-wetland systems could cause wild horses to seek water outside of HMAs, which would result in new horse populations outside HMAs.

Livestock grazing management under Alternative A could modify wild-horse distribution and their free-roaming nature, at least in the short term. As resource conditions improve, authorized active livestock grazing could increase without any adverse impact to wild-horse numbers. However, when grazing creates adverse impacts to resource values that cannot be rectified by changing livestock management, site-specific reductions in wild-horse numbers could occur. During drought conditions, the need to reduce grazing use (wild horse and livestock) could be compounded. Construction of additional fences would not beneficially impact wild horses, even though impacts would be minimized or mitigated through project layout and design. Fences could limit access to historic range and water, and restrict the free-roaming nature of wild horses.

Recreation

The Alternative A emphasis on increasing recreational uses, such as commercial opportunities and dispersed recreation, would adversely impact most HMAs. Recreation uses increase visitor numbers, motorized vehicles, and noise, thereby triggering an instinctive behavioral change in wild horses to avoid encounters with humans. Wild horses might slowly adapt to some of this increased use, but maximizing recreational use could create continued or prolonged disturbances. This would reduce or eliminate wild-horse use in a portion of an HMA, which would essentially decrease habitat acreage. Wild horses would concentrate in a smaller, more remote section of the HMA, increasing competition with wildlife and livestock for available forage and space, which could result in reductions in appropriate management levels. Additional recreation use also would increase the potential for displacement of wild horses to areas outside designated HMA boundaries, which would create the need for removal. Recreation management under Alternative A would result in localized short-term impacts to wild horses.

4.4.10.3.2.4. Special Designations

Under Alternative A, the Green Mountain ACEC is the only ACEC that overlaps an HMA. The only prescription for ACEC management is that mining and exploration activities of all sizes (not just those that would disturb more than 5 acres) require Plans of Operation. The BLM can use Plans of Operation as a tool to avoid undue or unnecessary degradation to the land, which would result in a minor beneficial impact to wild horses in the HMA.

4.4.10.3.3. Alternative B

4.4.10.3.3.1. Program Management

Alternative B wild horse management focuses on maintenance of healthy, viable herds and habitat and emphasizes conservation of physical, biological, heritage, and visual resources with constraints on resource uses. Alternative B establishes scenic loops in HMAs. Fencing and range improvements will be minimized under this alternative. Under this alternative, some water developments that could help wild-horse distribution in the HMAs and would not be constructed. Alternative B would result in long-term beneficial impacts to wild horses by increasing the availability of and ensuring the wild, free-roaming character of wild horses. This free movement also would improve the genetic viability of the wild horses and reduce the possibility of injuries and death associated with fencing. Providing opportunities for wild horse viewing in the HMAs would result in impacts the same as Alternative A.

Compared to other alternatives, management actions under Alternative B would result in the most direct and indirect beneficial impacts to wild horses and their habitat as those actions conserve the greatest land area for physical, biological, and heritage resources, and are the most restrictive to motorized vehicle use and mineral development.

4.4.10.3.3.2. Resources

Soil and Water

In general, management under Alternative B emphasizes the conservation and protection of soil and water and limits surface disturbance the most of any alternative, which would improve forage and the health of wild horses (see the *Soil, Water, and Vegetation – Grasslands and Shrubland Communities* sections of this chapter). Therefore, management of under Alternative B would result in the greatest beneficial impacts to wild horses compared to the other alternatives. However, Alternative B would result in adverse impacts to wild horses the same as Alternative A.

Forests, Forest Products, Fire and Fuels

Alternative B forest management practices (i.e., no clear-cutting) would create less new available forage (i.e., no clear-cutting), but this beneficial impact to the Green Mountain HMA would be limited in effect because of low demand for forest products. However, there will be more mechanical treatments for fuels and prescribed fires under Alternative B because the alternative would use more funds for non-infrastructure range improvements. This would result in a short-term adverse impact because it would reduce the potential disturbance to and displacement of wild horses; however, it would result in a long-term beneficial impact by improving vegetative condition and reducing the potential for larger, more intense fires that would result in slower rehabilitation and ultimately a greater loss of forage. This management also could require emergency roundups if large areas burn and leave very little forage for wild horses. Alternative B would result in fewer beneficial impacts to wild horses from fire suppression activities because fire would resume its natural role in the ecosystem. This management would result in more adverse impacts to wild horses, at least in the short term, and could result in no beneficial impacts to wild horses during the planning period.

Grasslands and Shrublands

In general, management under Alternative B emphasizes the conservation and protection of resources (e.g., vegetation), which should improve forage and the health of wild horses. Therefore, management of resources under Alternative B would result in the greatest beneficial impacts to wild horses compared to the other alternatives.

Invasive Species

Alternative B includes the most aggressive treatment for INNS. There could be a short-term adverse impact to wild horses because potentially larger areas in HMAs would be treated and the treated areas might require a rest period. The long-term beneficial impact of this aggressive treatment would be a healthy, diverse vegetative community free of INNS and more forage available to wild horses.

Riparian-Wetlands

In general, management under Alternative B emphasizes the conservation and protection of resources such as riparian-wetlands, which would improve forage and the health of wild horses. Therefore, management of resources under Alternative B would result in the greatest beneficial impacts to wild horses compared to the other alternatives. Alternative B precludes fencing as part of livestock allotment management unless there would be no impacts to resources. Therefore, improvement in riparian-wetlands might be achieved more slowly than under Alternative A, which authorizes riparian-wetland fences. Fencing riparian-wetland areas to exclude grazing animals is the fastest method to achieve riparian-wetland health, but it also removes the riparian-wetlands from available wild horse forage, an adverse impact to wild horses.

Wildlife

In general, management under Alternative B emphasizes the conservation and protection of resources (e.g., wildlife), which would improve forage and the health of wild horses. Therefore, management of resources under Alternative B would result in the greatest beneficial impacts to wild horses compared to the other alternatives. Under Alternative B, if there are modifications needed to accommodate forage allocations for wildlife, livestock grazing AUMs would be reduced as part of the natural systems management discussed below for livestock grazing.

Special Status Species

Management of special status species under Alternative B would result in impacts similar to Alternative A, although to a much greater degree in the case of greater sage-grouse. Under Alternative B, 70,078 HMA acres are outside the greater sage-grouse Core Area and would not be impacted by greater sage-grouse protections. Alternative B greater sage-grouse protections close 517,280 acres of HMAs to surface disturbance, range improvement projects, and wind-energy development. There are strict limits on density and number of developments. Alternative B would be more likely than Alternative A to prevent greater sage-grouse listing under the ESA, which would result in direct and indirect beneficial impacts to wild horses.

4.4.10.3.3.3. Resource Uses

Locatable Minerals

Alternative B withdraws more than 50 percent of HMAs from locatable mineral entry. Alternative B would result in the same types of adverse impacts to wild horses as Alternative A. However, because Alternative B opens fewer acres for development, it would result in the least surface disturbance (and related habitat fragmentation, including fences) compared to the other alternatives, and would therefore result in the fewest adverse impacts to wild horses from locatable minerals management.

Leasable and Salable Minerals

Alternative B management of leasable and salable minerals, including oil and gas, would result in the beneficial impacts to wild horses would be the same for locatable minerals. Alternative B opens fewer acres to these mineral activities and would therefore involve the least surface disturbance and related habitat fragmentation and human contact compared to the other alternatives. Alternative B would result in the fewest adverse impacts to wild horses from leasable and salable minerals management.

Renewable Energy

Alternative B excludes 100 percent of HMAs with high wind potential from wind-energy development. This management would be most beneficial to the Green Mountain and Red Desert HMAs. The North Lander Complex below Beaver Rim has relatively low wind-energy potential, whereas above the Beaver Rim the potential is high. The Red Desert Complex of HMAs also has high wind-energy potential in the Green Mountain, Crooks Mountain, and Antelope Hills HMAs.

ROWs and Corridors

Alternative B affords the most protection for wild horses by limiting ROWs to existing corridors. However, existing corridors bisect the Muskrat Basin HMA and intersect a very small portion of the Green Mountain HMA. Alternative B ROW and corridor management through the Muskrat Basin HMA would result in adverse impacts the same as described for ROW and corridor management under Alternative A. Alternative B would result in more beneficial impacts than Alternative A because Alternative B excludes the balance of the HMAs from ROWs; Alternative A allows them on a case-by-case basis.

Trails and Travel Management

Management of trails and travel under Alternative B would result in impacts similar to those under Alternative A, except regarding over-snow vehicles. Alternative A does not close HMAs to motorized vehicle traffic. Alternative B limits over-snow travel to when at least 12 inches of snow are on the ground; this would result in a major beneficial impact to wild horses because it limits the types of stresses and harassment that could occur under Alternative A.

Livestock Grazing Management

Alternative B livestock management would result in much more beneficial impact to wild horses than Alternative A. Under Alternative B, almost no spring and reservoir developments associated with livestock grazing are constructed compared to the continued development of projects under Alternative A. However, increasing herd numbers suggest that additional water sources are not needed for wild horses and that spreading livestock use to new areas and the loss of forage associated with water developments and the surrounding area where animals concentrate, would result in adverse impacts to vegetation. Therefore, Alternative B management of not building more water developments would result in at least a neutral impact and likely a beneficial impact to wild horses.

In other respects, Alternative B livestock grazing management would result in more beneficial impacts to wild horses. Establishing livestock use in allotments that would not exceed light utilization essentially means much less livestock use. Additional sustained yield forage for wild horses and wildlife would result in beneficial impacts to wild horses by increasing forage and decreasing the potential for competition with livestock and other wildlife. Not introducing additional infrastructure in HMAs would beneficially impact wild horses because no new fences (and perhaps less fencing if some fences are removed as contemplated under Alternative B) would ensure that the wild, free-roaming character of wild horses would be maintained.

Recreation

Impacts from recreation management under Alternative B would be similar to impacts under Alternative A. Alternative B establishes a number of recreation management areas, including the CDNST Destination SRMA and the National Trails Undeveloped SRMA. Recreation management stops the movement toward a more industrial setting and trends toward a more

primitive setting. While it is possible that more focused recreation management would increase visitation, recreation management would limit adverse impacts to wild-horse habitat.

4.4.10.3.3.4. Special Designations

Alternative B manages 64 percent of HMAs with ACEC prescriptions that would beneficially impact wild horses. The most direct beneficial impact would be that Alternative B increases the size of the Green Mountain ACEC, putting an additional 10,248 acres of HMA in the ACEC. ACEC management under Alternative B limits surface disturbance, mineral actions, ROWs, habitat fragmentation, and other human presence, which would result in direct beneficial impacts to wild horses by improving vegetation. While Alternative B in general limits range improvement projects, it allows none in ACECs.

4.4.10.3.4. Alternative C

4.4.10.3.4.1. Program Management

Overall, the Alternative C expansion of infrastructure to support managed grazing would be anticipated to result in smaller populations of wild horses that would not be able to maintain genetic viability with the anticipated fencing and potential blockage of migration routes. Site-specific adverse impacts could result from conflict with emphasizing livestock production and providing for motorized recreational opportunities. In addition, Alternative C allows fluid mineral development on 100 percent of HMAs. Alternative C prohibits other surface disturbance, such as mineral materials disposals and solid leasable minerals activities, only in NLCS units, and within ¼ mile of greater sage-grouse leks and riparian-wetland areas. This would result in many more adverse impacts to vegetation and habitat than Alternative B.

Wild horses could slowly adapt to the increased disturbances and competition with livestock, but with confined living space, their tolerance threshold might be exceeded. Wild horses might be concentrated into smaller use areas, and increased competition for forage and water between consumptive species would occur. Wild horses could be forced outside the identified HMA and would have to be gathered more frequently and returned or removed. However, to comply with the Wild Horse and Burro Act of 1971, limitations might be placed on other uses to ensure viable populations in HMAs. Emphasis on construction of exclusion fencing to protect riparian-wetlands and other resource values would result in long-term adverse impacts to the free-roaming nature of wild horses. The objectives might not be met with viable populations of wild horses maintained in all HMAs. In some cases, primarily in smaller HMAs with fewer animals identified, conflicts with objectives to emphasize livestock production would be great. Similarly, conflicts with emphasizing recreational opportunities would confine horses to more restricted portions of each HMA. The appropriate management level might need to be reduced in some HMAs over the long term to meet all management objectives.

General management under Alternative C would result in the same level of wild-horse viewing as Alternative A, but less than Alternative B.

Alternative C does not include seasonal restrictions on surface-disturbing or disruptive activities in HMAs. This would result in long-term adverse impacts to wild horses by increasing the potential for disturbance during sensitive times of the year; which could reduce forage and overall health of horses in the HMAs. Allowing Special Recreation Permits (SRPs) in HMAs would

result in impacts similar to those Alternative A, although to a higher degree because more SRPs would be issued under Alternative C.

Overall, the ability to manage for the protection of wild horses would be least under Alternative C.

4.4.10.3.4.2. Resources

Soil

Alternative C management of soil resources is the same as or slightly less restrictive than under Alternative A; therefore, impacts under Alternative C would be the same as under Alternative A.

Water

Many Alternative C management actions for water resources are the same as those under Alternative A. However, allowing permanent facilities in riparian-wetlands would result in a permanent long-term loss of forage if these kinds of activities were authorized in HMAs.

Forests, Forest Products, Fire and Fuel

Alternative C creates the most additional forage from clear-cutting and other silviculture practices in the Green Mountain HMA. There are no size limitations on cuts under this alternative. This would beneficially impact wild horses by providing high-quality forage over the long term due to the potential limited for forest products. Full fire suppression and unlimited use of heavy equipment would result in adverse impacts by suppressing natural fire regimes and holding some range sites in ecological states that might not be as productive for forage. Use of heavy equipment would take some areas out of production for a short period and would produce a seed bed conducive to INNS invasion. Many of the management actions under Alternative C would be the same as management actions under Alternative A and would result in the same impacts.

Grasslands and Shrublands

Alternative C maximizes vegetative forage production for each range site and uses soil and vegetative treatments in all cases. Maximizing forage production through aggressive vegetative treatments would help reduce competition between foraging animals. Alternative C will have fewer funds available for vegetative treatments than alternatives A and B because Alternative C develops more range infrastructure.

Invasive Species

Alternative C maximizes surface disturbance, including roads and ROWs, to support increased resource use. This management is the highest vector for the introduction of INNS and would result in more indirect adverse impacts to wild horses through more INNS damage of vegetation. Alternative C would result in the greatest adverse impacts to wild horses from INNS.

Riparian-Wetlands

Maximizing range improvements to meet PFC would adversely impact wild horses because riparian-wetland areas would likely be fenced. Wild horses would not be able to access these areas, which would reduce forage and water available to wild horses. Horses would be compelled to use alternative water sources that tend to be smaller, such as stock tanks and wells. This would increase competition between livestock and wild horses for limited watering space because too

many cattle could use limited water and restrict horse access. Conversely, some horses have been known to chase cattle away from water sources such as stock tanks. Furthermore, if water is limited, wild horses might leave the HMA in search of new areas in which to forage and water, potentially increasing wild-horse numbers outside the HMA and adversely affecting vegetation in new areas. Additional gathers might be needed to remove horses from outside HMAs, which would be an added expense not only in dollars, but time and management of the animals.

A potential beneficial impact to wild horses would be the availability of long-term high-quality forage and water as riparian-wetland areas approach PFC, but only if the fencing is removed, or, in some cases riparian-wetland areas could provide more water as improvement is achieved. During the non-grazing and non-growing season of some riparian-wetland pastures, horses would be allowed to graze these areas without adversely affecting vegetation during the dormant season.

Wildlife

Giving priority to livestock forage needs when allocating forage resource needs would result in adverse impacts to wild horses. Maximizing livestock forage needs might require the adjustment of appropriate management levels in HMAs downward to accommodate increased livestock use. In turn, this would reduce the genetic variability in several of the HMAs. In general, Alternative C wildlife management would result in more adverse impacts to wild horses because it is less protective of wildlife and therefore wild horse habitat. Management prescriptions for wildlife under Alternative C would result in more adverse impacts to wild horses because range developments and fences in HMAs could be constructed in wildlife migration corridors, crucial winter range, and parturition areas.

Special Status Species

Alternative C management of special status wildlife or plant species would result in impacts similar to those under Alternative A, although to a greater degree because Alternative C allows more development and surface disturbance. This is particularly true with greater sage-grouse management. Like Alternative A, Alternative C applies a ¼-mile buffer around greater sage-grouse leks rather than the Alternative B 0.6-mile buffer, which opens 19,781 acres of HMAs to surface disturbance. However, Alternative C includes more range development in the unbuffered areas. Like Alternative A, Alternative C management would accelerate the downward trend in greater sage-grouse population numbers, which would result in direct (due to loss of vegetation) and indirect (due to potential changes in herd numbers should the greater sage-grouse be listed under the ESA) adverse impacts to wild horses.

4.4.10.3.4.3. Resource Uses

Minerals

The types of impacts to wild horses under Alternative C minerals management would be the same as under Alternative A. However, impacts would be greater under Alternative C because it opens many more acres to surface disturbance rather than applying an NSO restriction, likely would result in many more roads and ROWs associated with resource use, and does not limit mineral materials disposals. See the *Fish and Wildlife Resources – Wildlife* section of this chapter for a discussion of the adverse impacts to habitat from resource use. With the most acres available to development and the fewest restrictions on that development, Alternative C would result in the most surface disturbance compared to the other alternatives, and would therefore result in the greatest adverse impacts to wild horses.

Renewable Energy

Alternative C opens a total of 555,620 acres in HMAs to wind-energy development. Impacts to wild horses from wind-energy development would be the same under Alternative A. However, with more areas open and no areas excluded from transmission lines under Alternative C, it would be more likely that wind energy could be developed in HMAs. Extensive wind-energy development in HMAs could preclude gathers and inventory, which could result in irreparable damage to the wild horses, a potential violation of protective federal legislation.

ROWs and Corridors

Alternative C would result in the same types adverse impacts to wild horses from ROW and corridor management as Alternative A. Alternative C would result in the more adverse impacts to wild horses than the other alternatives. Alternative C allows more ROWs and corridors in more locations, and includes the fewest avoidance or exclusion areas, including through HMAs.

Livestock Grazing Management

Livestock grazing under Alternative C would result the greatest adverse impact to wild horses of all the alternatives. Maximizing livestock grazing would create intense competition for forage and water resources. Increased infrastructure for water development would not provide beneficial impacts sufficient to offset the adverse impacts of shifting livestock use to upland areas that had not been utilized because of lack of water. Fencing in the HMAs would block migration routes and reduce genetic interchange between the various HMAs. Development of water outside the HMAs would draw wild horses out of the historic HMAs and would cause horse populations to increase outside their former HMAs. These animals would have to be monitored more frequently and gathered to keep animals managed in their respective HMA.

Alternative C allows the same livestock grazing level (41 to 60 percent) as Alternative A, with a managed grazing strategy. Alternative C would include more fences and their related adverse impacts to wild horses than Alternative A and substantially more than Alternative B.

Wild horses could slowly adapt to the increased disturbances and competition with livestock, but with confined living space their tolerance threshold could be exceeded (social space requirement). Wild horses could be concentrated into smaller use areas, and increased competition for forage and water between consumptive species would occur. Wild horses might be compelled to move outside the identified HMA and would have to periodically gathered and returned or removed. However, to comply with the Wild Horse and Burro Act of 1971, limitations could be placed on other uses to ensure viable populations in HMAs. Emphasis on construction of exclusion fencing to protect resource values would result in a long-term adverse impact to the free-roaming nature of wild horses.

In some cases, primarily in smaller HMAs with fewer animals identified in appropriate management levels, conflicts with objectives to emphasize livestock production would be great.

Trails and Travel Management

Alternative C trails and travel management would result in the same types of adverse impacts to wild horses as alternatives A and B, except to a greater degree. Alternative C does not limit over-snow vehicle use. In all areas, Alternative C allows travel on existing roads, which would result in more adverse impacts to wild horses than limiting travel to designated roads. Alternative B extends the limit on travel to designated roads to a larger part of the Green Mountain HMA.

Recreation

Alternative C recreation management would result in the same types of adverse impacts as Alternative A, except to a greater degree. Alternative C recreation management accelerates the trend away from more primitive recreation settings to a more urban-industrial setting occurring under Alternative A. This would result in a much more adverse impact to wild horses than Alternative B, under which the recreation setting trend would be the reverse. Long term, Alternative C recreation management would result in the most adverse impacts to wild horses of all alternatives.

4.4.10.3.4.4. Special Designations

Alternative C does not specifically designate the Green Mountain ACEC and manages the area with standard stipulations. No Plans of Operations are required for locatable mineral exploration that would disturb fewer than 5 acres. This would adversely impact the Green Mountain wild-horse herd. This management would result in adverse impacts to wild horses because there would be no protections from vehicular travel and no seasonal closures. Therefore, the horses would be subject to confrontations with humans during the winter months when horses would be stressed by severe winter weather.

4.4.10.3.5. Alternative D

4.4.10.3.5.1. Program Management

Except for livestock grazing and special designations, Alternative D wild horse management is more similar to Alternative B than to alternatives A and C. Alternative D focuses on maintenance of healthy, viable herds and habitat and emphasizes conservation of physical, biological, heritage, and visual resources with constraints on resource uses, although less so than Alternative B. Scenic loops would be established in the HMAs. Alternative D manages to protect vegetation and limits surface disturbance second only to Alternative B.

Livestock grazing management under Alternative D would utilize range improvement projects pursuant to a Comprehensive Grazing Strategy to meet the Wyoming Standards for Healthy Rangelands which would allow more livestock grazing than Alternative B but less than either Alternative A or C. Resource values such as wildlife winter range and migration corridors, riparian-wetland areas, and the greater sage-grouse Core Area could limit AUMs available for livestock, which would result in direct beneficial impacts to wild horses. Upland areas not used by livestock under alternatives A and B will be utilized under both alternatives C and D, with fencing and water developments utilized to alter livestock distribution although less so in Alternative D. Vegetation emphasis for the benefit of greater sage-grouse will benefit wild horses if it reduces competition from other foraging species. Limitations on fences would beneficially impact wild horses.

Providing opportunities for wild horse viewing in the HMAs would have the same impacts as those described under Alternative A.

Compared to other alternatives, management actions under Alternative D would result in the second most direct and indirect beneficial impacts to wild horses and their habitat.

4.4.10.3.5.2. Resources

Soil and Water

In general, management under Alternative D emphasizes conservation and protection of soil and water and limits surface disturbance more than any alternative except Alternative B; this management would improve forage and the health of wild horses (see the *Soil, Water, and Vegetation – Grasslands and Shrubland Communities* sections of this chapter). Therefore, management under Alternative D would result in the same types of beneficial impacts to wild horses as Alternative B, but to a lesser degree. However, to the extent that Alternative D allows more surface disturbance in HMAs, including opening 60 percent more of HMAs to mineral leasing with moderate or standard stipulations than Alternative B, it would result in many fewer beneficial impacts than Alternative B, although much more than alternatives A and C.

Forests, Forest Products, Fire and Fuels

Alternative D forest management practices (i.e., no clear-cutting) would create less new forage than management under Alternative C. However, this less-beneficial impact to the Green Mountain HMA would have a limited effect because of low demand for forest products. In addition, there will be the same level of mechanical fire and fuels treatment under Alternative D as under Alternative A and less than under Alternative B because Alternative D constructs range improvement projects to support comprehensive grazing management strategies. This would result in short-term beneficial impacts to wild horses because it would reduce the potential disturbance and displacement of wild horses; however, it would result in a long-term adverse impact by not improving vegetation condition or reducing the potential for larger, more intense fires, which would result in slower rehabilitation and ultimately a greater loss of forage. This management also could require emergency roundups if large areas burn and leave very little forage for wild horses. Alternative D uses a mixed approach to fire suppression activities, which would result in short- and long-term beneficial and adverse impacts to wild horses.

Grasslands and Shrublands

In general, management under Alternative D emphasizes the conservation and protection of resources (e.g., vegetation) by limiting surface disturbance. This should improve forage and the health of wild horses. Therefore, management of vegetative resources under Alternative D would result in more beneficial impacts to wild horses than alternatives A and C and fewer beneficial impacts than Alternative B.

Invasive Species

Alternative D INNS management is approximately the same as Alternative A, although Alternative D would result in more beneficial impacts because it allows less surface disturbance and allows livestock flushing. Alternative D would treat the same number of acres as alternatives A and C and fewer than Alternative B. There could be short-term beneficial impacts to wild horses because Alternative D treats fewer areas in HMAs under Alternative B (and the treated areas could require a rest period). However, long term, Alternative D would result in fewer beneficial impacts from treatment alone. The most substantial impact to wild horses from INNS management under Alternative D would be the more limited amount of non-livestock-related surface disturbance compared to all alternatives other than Alternative B.

Riparian-Wetlands

In general, management under Alternative D emphasizes the conservation and protection of resources such as riparian-wetlands, which would improve forage and the health of wild horses, but less than management under Alternative B. Alternative D includes the same riparian-wetland setback as alternatives A and C, but closes more areas to surface disturbance in the resource use areas, resulting in beneficial impacts to riparian-wetlands. However, some of this beneficial impact would be offset by riparian-wetland management for livestock grazing. Under Alternative D, a Comprehensive Grazing Strategy will be implemented to address livestock grazing in riparian-wetland systems while considering other resource values and their needs (e.g., wild horses).

Alternative D limits the use of fencing as part of livestock allotment management to cases where resource benefits exceed adverse impacts. Therefore, improvement in riparian-wetlands might be achieved more slowly than under Alternative A, which authorizes riparian-wetland fences. Fencing riparian-wetland areas to prevent grazing is the fastest method to achieve riparian-wetland health, but it also would remove the riparian-wetlands as available wild-horse forage and a source of drinking water, an adverse impact. Project implementation could be restricted in wildlife migration corridors and HMAs, thus allowing wild horses to continue to use their HMAs as they have historically.

If removal of these riparian-wetland areas occurred, restricting wild-horse access would cause wild horses to move away from their traditional use areas to other areas inside or outside the HMA. Wild horses also would utilize development water sources such as stock tanks and wells for their drinking water needs. This increase in use of these water sources would create competition between livestock and wild horses because the watering area of the source would be limited in size. Horses would chase livestock away and not allow them for instance to drink during the grazing season. Conversely, with smaller areas to water, cattle could drink all available water and not leave any available to other species such as wild horses. By not fencing these riparian-wetland areas as described for Alternative B, there would be more space for wild horses and cattle to water and freely forage, which would reduce competition between species.

Wildlife

In general, management under Alternative D emphasizes the conservation and protection of resources (e.g., wildlife), which would improve forage and the health of wild horses. Therefore, management of resources under Alternative D would result in the second greatest beneficial impacts to wild horses compared to the other alternatives (less only than Alternative B). However, unlike Alternative B, if there are modifications needed to accommodate forage allocations to wildlife, it is not likely that livestock grazing AUMs would be reduced because grazing is managed as part of a comprehensive system (see below in the discussion of livestock grazing).

Alternative D authorizes fences in migration corridors, crucial winter ranges, and parturition areas if needed to support a Comprehensive Grazing Strategy. This would result in more adverse impacts to wild horses than Alternative B and more beneficial impacts than alternatives A and C.

Special Status Species

Alternative D management of special status wildlife or plant species would result in impacts similar to Alternative B, although to a substantially lesser degree in the case of greater sage-grouse. Alternative D greater sage-grouse protections close 32,231 acres of HMAs to surface disturbance from a smaller list of activities than Alternative B (discussed below under *Resource Uses*). Alternative D applies the same limits on density and number of developments

in connection with oil and gas and wind-energy development projects and transmission lines (although only in the greater sage-grouse Core Area and not nesting habitat, as under Alternative B), but applies no similar limitations on range improvement projects, solid mineral leasing, and non-energy ROWs, which would result in less-beneficial impacts to wild horses.

While Alternative D greater sage-grouse management would result in fewer beneficial impacts to wild horses than Alternative B, Alternative D management would result in substantially more beneficial impacts than alternatives A and C.

4.4.10.3.5.3. Resource Uses

Locatable Minerals

Alternative D proposes to withdraw 16,866 acres of HMAs from locatable mineral entry, many fewer acres than Alternative B but more than Alternative A. Alternative D would result in the same types of adverse impacts to wild horses as Alternative A. However, Alternative D opens fewer acres open to development and would result in substantially less surface disturbance (and related habitat fragmentation, including fences) compared to alternatives A and C and would therefore result in fewer adverse impacts to wild horses.

Leasable and Salable Minerals

Alternative D management of leasable and salable minerals, including oil and gas, would result in the same beneficial impacts as management of locatable minerals. Alternative D opens fewer acres to these mineral activities than Alternative A and many fewer acres than Alternative C and also applies Required Design Features where development is allowed. Therefore, Alternative D would result in less surface disturbance and associated habitat fragmentation and human contact. Alternative D minerals management would result in many fewer beneficial impacts to wild horses than Alternative B but considerably more than Alternative A.

Renewable Energy

As discussed under Alternative A, wind-energy development can result in short- and long-term adverse impacts to wild horses. Alternative D opens 61,257 acres of HMAs with high wind potential to wind-energy development. The beneficial impact of closing almost all high-wind-potential areas would be the greatest in the Red Desert Complex HMAs (Green Mountain, Crooks Mountain, and Antelope Hills). The North Lander Complex (Rock Creek Mountain, Dishpan Butte, Conant Creek, and Muskrat Basin) HMAs has relatively low wind-energy potential below Beaver Rim (Conant Creek and a portion of Muskrat Basin) and high potential above Beaver Rim (Dishpan Butte, Rock Creek Mountain, and Muskrat Basin HMAs). Wind-energy development that could occur in these HMAs would make gather and removal become extremely difficult because aircraft used to gather wild horses would need to negotiate and work around wind turbines in these HMAs.

ROWs and Corridors

Alternative D affords more protection for wild horses than alternatives A and C, limiting major ROWs to designated corridors. However, the corridors bisect the Muskrat Basin HMA and intersect a very small portion of the Green Mountain HMA. Alternative D ROW and corridor management through the Muskrat Basin HMA would result in adverse impacts the same as described for ROW and corridor management under Alternative A. Like Alternative B, Alternative

D would result in more beneficial impacts than Alternative A or C because Alternative D excludes the balance of the HMAs from ROWs; Alternative A allows them on a case-by-case basis.

Trails and Travel Management

Alternative D trails and travel management would result in beneficial impacts similar to those under Alternative B and less adverse than impacts under Alternative C.

Livestock Grazing Management

Alternative D livestock management would result in beneficial impacts to wild horses similar to Alternative B. Alternative D avoids constructing range improvement projects across the planning area without consideration of other resource values, rather than maximizing livestock use. Alternative D requires that range improvement projects be in support of a Comprehensive Grazing Strategy to achieve healthy rangelands. However, range infrastructure projects developed pursuant to a Comprehensive Grazing Strategy could adversely impact wild horses if movement areas and migration corridors were cutoff or limited by fences constructed in HMA. Moreover, the strategy will disturb 620 acres associated with new fence construction and 227 acres associated with spring, reservoir, and well developments. These new water developments would draw horses away from their HMA and provide new habitat in which horses would establish. This would result in beneficial impacts to the horses, but also adverse impacts because horses would need to be inventoried and gathered more frequently outside the HMAs. Alternative D livestock grazing management allows range improvement projects that would adversely impact rangeland health if impacts were offset by rangeland improvements. However, there could be more adverse impacts to wild horses, particularly in upland range, than beneficial impacts from improved conditions for wild horses that do not loiter in riparian-wetland areas.

Under Alternative D, infrastructure, including riparian-wetland enclosure fences, will be utilized in some cases to achieve riparian-wetland health; however, this would adversely impact wild horses because fenced riparian-wetland areas would not be available for wild horses to forage and water in. Enclosure or pasture fencing of riparian-wetland areas would compel some wild horses to move out of the HMA to new areas in search of water and forage. This movement of horses outside the HMA would increase competition for forage and water with cattle. Livestock utilization levels under Alternative D are the same as under alternatives A and C (moderate) and would result in fewer beneficial impacts to wild horses than the light utilization under Alternative B. Upland range use by livestock will be greater under Alternative D (more like Alternative C than Alternative B because livestock distribution is spread out away from riparian-wetland areas). This would increase competition with other grazing animals such as wild horses. This would result in a less beneficial impact than Alternative B, which designates lower utilization levels and would likely have fewer livestock grazing AUMs, particularly over time.

Alternative D will develop infrastructure to support the Comprehensive Grazing Strategy. Fences are allowed in wildlife (and wild horse) migration corridors, crucial winter range, and parturition areas if needed to support the Comprehensive Grazing Strategy. However, such fences would need to be mitigated through design features that allow wild horses to freely migrate or move in and out of the areas. This impact would be similar to but lesser than Alternative C and much more adverse than Alternative B.

Recreation

Impacts from recreation management under Alternative D would be similar to those under Alternative B. Alternative D establishes a number of recreation management areas, including the CDNST Destination SRMA and the National Trails Undeveloped SRMA. Recreation management would stop the movement toward a more industrial setting and trend toward a more primitive setting. While it is possible that more focused recreation management would increase human visitation, recreation management would limit adverse impacts to wild horse habitat.

4.4.10.3.5.4. Special Designations

Alternative D manages 52,427 acres of HMA as ACECs, with management prescriptions that would beneficially impact wild horses. The most direct impact would result from the increased size of the Green Mountain ACEC, which puts 6,777 more acres of HMA into the ACEC than Alternative A. ACEC management under Alternative D limits surface disturbance, mineral actions, ROWs, habitat fragmentation, and other human presence; this would result in direct beneficial impacts to wild horses and indirectly beneficial impacts by improving vegetation, although less so than under Alternative B. For wildlife ACECs such as Green Mountain, Alternative D allows range improvement projects only if they would benefit wildlife, which would also beneficially impact wild horses.

Alternative D manages Congressionally Designated Trails in the Antelope Hills and Crooks Mountain HMAs as the NTMC. Beneficial impacts to wildlife from Congressionally Designated Trails management would be similar to beneficial impacts from ACEC management.

4.5. Heritage and Visual Resources

4.5.1. Cultural Resources

Cultural resources are defined as the places where the physical remains of past peoples can be found. If these remains are determined to be important, federal regulations require that effects to the resources be assessed and mitigation measures be instituted to help protect them.

Adverse impacts to cultural resources typically result when there is a loss of information and/or a loss of integrity of the resource. Impacts on significant prehistoric, historic, and spiritual/sacred/traditional cultural resources on BLM-administered lands can include actions that physically damage or destroy all or parts of a resource; actions that alter a significant element of a resource; actions that introduce visual, atmospheric (air), or audible (noise) elements that can diminish the historical integrity of a resource; or a lack of action that causes a resource to deteriorate. Increased access to areas that contain cultural resources can result in increased use, erosion, looting, and vandalism, all adverse impacts.

Actions that cause physical damage or destruction, or neglect, generally result in adverse impacts to cultural resources significant for their scientific-data potential; prehistoric campsites often fall into this category. Although data recovery at these sites can increase our knowledge of the past, adverse impacts to these types of resources are considered long-term, because once the resources are damaged or disturbed, impacts cannot be reversed.

All the actions identified above can adversely affect cultural resources significant for their important historical associations, their unique architectural, artistic, or representational characteristics, or their important spiritual and/or religious associations. Prehistoric and historic

sites such as Castle Gardens, the Oregon Trail, the Rawlins-Fort Washakie Stage Trail, Rocky Ridge, Martin's Cove, and Miner's Delight Townsite are some of the sites in this category. Adverse impacts to these types of resources can be short-term and long-term, because some of impacts could be reversed, while others could not.

Finally, all types of actions can adversely affect cultural resources significant for their spiritual, sacred, and/or traditional values. Prehistoric and historic sacred sites such as Cedar Ridge, Castle Gardens, burials, and Martin's Cove are some of the sites in this category. Adverse impacts to these types of cultural resources would be mostly long-term, because Native American groups consider such impacts to have a permanent impact on the spiritual nature of the sites.

Beneficial impacts on cultural resources result from special management measures that enhance the quality of a resource or its surroundings. Stabilization and repair of historic structures at Miner's Delight, stabilization at rock art sites and inscription sites like Castle Gardens and Devil's Gate, and fencing at grave sites such as the Miner's Delight Cemetery are examples of beneficial impacts. Erosion control measures on the Oregon Trail and at some prehistoric and historic campsites are also examples of beneficial impacts. Most of these beneficial impacts would be long-term, but eventually, more measures will be required to prevent natural and/or human influences from degrading these resources.

4.5.1.1. Summary of Impacts

Impacts to cultural resources would vary by alternative. Alternatives A and C are similar in their protections, but Alternative A generally provides more protections than Alternative C. Alternative B provides greater protection for cultural resources than alternatives A and C, and somewhat more protection than Alternative D. As for specific resources, Warm Springs Canyon Flume is somewhat protected under Alternative A, well protected under alternatives B and D, and minimally protected under Alternative C. Spiritual/sacred/traditional sites receive similar protections under all alternatives, although management would be more effective under alternatives B and D and slightly less effective under Alternative C.

The number of sites various actions would affect correlates directly with the degree, nature, and quantity of surface-disturbing and other disruptive activities in the planning area. In this regard, Alternative C would result in the most surface disturbance and Alternative B the least.

Under all alternatives, the BLM continues its obligation to conduct government-to-government consultations with interested tribes. Actions required by the NHPA and the Wyoming State Protocol Agreement will form the foundation of all project-specific decisions regarding cultural resources under all alternatives. Conflicts between cultural resources and other resource uses not covered by this RMP will generally be resolved by the Wyoming State Protocol Agreement and NHPA provisions. However, Alternative C would require the most consultation with the State Historic Preservation Officer (SHPO) because more surface-disturbing activities would occur under that alternative.

4.5.1.2. Methods and Assumptions

The degree of adverse impacts to sites and the total number of sites adversely impacted in the planning area is directly correlated to the amount of surface-disturbing or other disruptive activities allowed under each alternative. Cultural resources would be increasingly adversely impacted as the amount of resource use increases. Reduction or elimination of land uses in a

particular area would benefit cultural resources through a reduction in direct and indirect impacts to the resources.

All authorizations for land and resource use must comply with all relevant cultural resource laws, regulations, protocols, and policies. Protection of cultural resources must also conform to SHPO coordination requirements, with input from the local public, other interested parties, and Native American groups.

A cultural resource inventory, evaluation of site NRHP eligibility, and assessment of potential impacts from federal actions are required by law before the initiation of most surface-disturbing and other disruptive activities. This generally requires a Class III intensive field inventory of the affected area. This allows for prescriptive mitigation of impacts through avoidance or other measures where necessary, and minimizes or eliminates the potential for unmitigated impacts to cultural resources. In areas with high potential for buried resources, construction monitoring and open trench inspection are some of the methods used to discover and protect cultural resources not apparent from surface inventories.

Cultural resources are evaluated according to their significance under NRHP criteria. If cultural resources are found to be eligible for inclusion on the NRHP, they are managed for preservation of their important values. Conversely, if the resources are found to be not eligible for inclusion on the NRHP, they are, in most cases, not managed or preserved. Depending on the nature of their value, eligible resources are managed through avoidance and preservation, or if that is not feasible, through data recovery, intensive recordation, or interpretive/education mitigation.

Some significant cultural resources include the historical settings around them. For example, historic trails, sites, battlefields, disaster scenes, and sacred sites can contain intact settings, in which the landscape still retains much of the character it had when the historic events occurred. These historical settings are often considered an important component of the cultural resource, and can be included in consideration of potential impacts to the resource.

Certain projects, due to size or topography, could require consideration of visual intrusions into the setting beyond the foreground or middle-ground zones to comply with NHPA Section 106.

For historic trails (excluding NHTs which are discussed under *Special Designations*), direct and indirect impacts can result from a variety of natural and human-caused actions, such as those that physically alter, damage, or destroy all or part of the trail; improved access, which brings increased use to an area, altering characteristics of the surrounding environment that contribute to the trail's importance; the introduction of visual or audible elements out of character with the trail or that alter its historic setting; and neglect of the trail to the extent that it deteriorates or is destroyed.

Recognizing that historic trails often comprise numerous routes rather than a single trace, all protective zones are measured from the outer edges of the trails rather than from the center line.

Under all alternatives, the BLM encourages opportunities to cooperate with private landowners to minimize or eliminate disturbance to historic trails.

4.5.1.3. Detailed Analysis of Alternatives

4.5.1.3.1. Impacts Common to All Alternatives

Cultural resources in the planning area frequently experience adverse impacts. There are many different causes for these impacts, including surface disturbance, overuse, introduction of elements out of character with the resource, neglect, erosion, natural deterioration, and looting and vandalism. Surface disturbance is by far the most common adverse impact to cultural resources, especially in areas of industrial development.

Standard procedures have been developed to help address impacts to significant paleontological resources, and include archival research, on-the-ground inventories, locality recordation and evaluation, data recovery excavations, condition assessments, stabilization, and, in certain cases, avoidance. These standard procedures can protect paleontological resources from damage where paleontological resources are known or discovered. All of the alternatives are guided by these standard procedures.

However, standard procedures sometimes do not protect all types of cultural resources. Development projects can indirectly affect resources where setting is important. Projects that intrude on important historical settings can affect connected historic trails or sites. For example, a modern powerline built near the Oregon Trail would adversely impact the historical setting of the trail and would adversely affect its historical integrity. To help reduce these types of adverse impacts, land users and the BLM are able to and have entered into agreements where special guidelines to reduce visual effects have been incorporated into field-wide operations.

Another issue is that standard procedures do not identify all cultural resources before they experience adverse impacts, which can happen when cultural resources are below ground level and not visible from the surface. These resources are often discovered only after surface-disturbing activities have uncovered them, and construction activities can quickly and severely affect them, with data lost in the process. This type of impact occurs regularly in the planning area because sites thousands of years old are often buried by sand and soil. In these cases, mitigation usually entails data recovery and salvage excavations. These excavations are designed to retrieve the remaining data from the site and study it to reconstruct what occurred there in the past.

The standard procedures mentioned above also do not apply to small locatable minerals exploration. Locatable minerals projects affecting fewer than 5 acres are subject to the 43 CFR 3809 “Notice of Intent” regulations, which offer minimal protections to cultural resources. These operations do not require BLM approval and can result in adverse impacts to cultural sites if necessary for mining operations to proceed.

Increased public use of lands can also result in adverse impacts. Increased public use occurs due to improved access to formerly remote areas, such as areas where development creates new roads, or the use of OHVs to access formerly remote areas. A third cause is increased public interest in specific historic sites or areas. As public use increases from all these causes, so do impacts to cultural resources. As more use occurs, more cultural resources are visited or driven over, and some of the resources are looted or vandalized. This adverse impact would occur under any of the alternatives because access, OHV use, and public use and interest are all expected to increase.

Full suppression of wildfire and limitations on the use of prescribed fire provide short-term benefit to cultural resources (assuming that firefighting efforts themselves do not damage cultural

resources). On a long-term basis, cultural resources could be adversely impacted if the techniques utilized do not prevent landscape-level fires. However, in greater sage-grouse Core Area with less than 12 inches of precipitation per year, all alternatives use the same approaches to fire for the benefit of greater sage-grouse: full suppression of fire and the avoidance of prescribed fire except under unique conditions. Therefore, in the analysis that follows, discussion of the use of fire by alternative is limited to those areas not managed for the benefit of greater sage-grouse habitat.

Because certain cultural resources in the planning area (such as the NHTs, the South Pass Historic Mining Area, Castle Gardens, Cedar Ridge, and the RHT&EHs) have been identified or nominated as special designations (Congressionally Designated NHTs and ACECs), they are addressed under the *Special Designations* section rather than here.

4.5.1.3.2. Alternative A

4.5.1.3.2.1. Program Management

When development projects are proposed that could adversely affect paleontological resources, reactive cultural resource management uses the standard procedures to protect important paleontological resources. Proactive management protects important resources that are not threatened by development, but still require measures to maintain or enhance their significant qualities. Alternative A uses reactive management to address impacts on a case-by-case basis, and uses proactive management to address impacts to sites such as Warm Springs Canyon Flume and some rock art sites. Proactive management is necessary to protect or stabilize these sites and maintain their important qualities, which are threatened by natural or human-caused actions. Alternative A does not manage the Beaver Rim area with an MLP.

4.5.1.3.2.2. Resources

Air quality management under Alternative A would result in no or minor adverse impacts to cultural resources where setting is an important characteristic. Efforts to maintain air quality around sites with historic settings would help maintain their important qualities, but if degradation occurs, it would adversely impact these sites. As a result, there would be no or a minor adverse impact to Warm Springs Canyon Flume and to known spiritual/sacred/traditional sites in the planning area. Slope and riparian-wetland setbacks would beneficially affect cultural resources by limiting surface disturbance. The scale of beneficial impacts can be quantified only on a site-specific basis.

All alternatives are the same in limiting the use of heavy fire equipment for the protection of cultural resources. Alternative A uses a case-by-case method of determining whether to use full suppression. Alternative A management of wildfires would be unlikely to effectively protect cultural resources because information about the locations of cultural resources that could be damaged or destroyed is not readily available to fire personnel. Resource advisors are engaged for the management of some fires, but they cannot be everywhere on fires as they happen. The fire and fuels program has been notified about the presence of Warm Springs Canyon Flume, and it would be adequately protected from the impacts of surface disturbance and wildfire. However, spiritual/sacred/traditional site information is kept confidential and not disseminated to other programs; therefore, such sites are subject to adverse impacts.

VRM Class ratings that protect natural viewsheds also protect cultural resource sites where setting is considered important. The 1987 RMP includes a few areas that protect visual settings of cultural resources (some of the Lander Slope, South Pass, Dubois, Green Mountain, and the Sweetwater River area), but most of the planning area is not protected in this way. Warm Springs Canyon Flume and some known spiritual/sacred/traditional sites are in VRM Class III areas, which offers some limited protection for their historical/natural settings. Other sacred sites are in VRM Class IV areas, where surface-disturbing activities with the potential to result in moderate to major adverse impacts could occur.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) under Alternative A provide would additional protections from surface-disturbing activities for cultural resources.

4.5.1.3.2.3. Resource Uses

Alternative A provides mostly minimal protection from locatable mineral exploration, except where there are withdrawals or ACECs. Locatable mining regulations do not follow the standard cultural resource protection measures described above and, unless the exploration project covers more than 5 acres of disturbance or is in an ACEC, cultural resources are subject to little protection from the impacts of mining. Alternative A withdraws 23,114 acres from locatable minerals exploration and retains all existing ACECs, which would protect some cultural resources. Known spiritual/sacred/traditional sites are minimally protected under Alternative A and subject to adverse impacts from mining; however, the likelihood for locatable mineral exploration around most of these sites is low. The Warm Springs Canyon Flume site is mostly withdrawn from mineral entry, which protects it from the adverse impacts of locatable minerals exploration.

Under Alternative A, leasable fluid minerals activities are at BLM discretion; therefore, there would be better controls on impacts to cultural resources than for locatable minerals. Standard procedures under this program (see *Impacts Common to All Alternatives*) provide for minor to moderate protection of cultural resources, especially those resources important for their data potential. Field inventories, resource evaluations, and impacts mitigation are routinely performed for these types of projects, and most cultural resource sites are adequately protected from direct adverse impacts. However, protection of certain sites, such as historic sites with significant historic settings or spiritual/sacred/traditional sites, can be a problem. Alternative A manages these sites on a case-by-case basis, and protection measures usually focus on reducing impacts, rather than preventing them. This is the case for spiritual/sacred/traditional sites, and several of these sites are in areas with high potential for oil and gas. However, Warm Springs Canyon Flume is protected because 557 acres around it are protected with Category 4 restrictions.

There are no special management prescriptions for the cultural resources in the Beaver Rim area and there is no requirement to conduct tribal consultation even for those oil and gas activities very near to known cultural sites. As a consequence, adverse impacts may occur, particularly for sites that would be important to Native Americans.

Leasable solid minerals and mineral materials disposals, such as phosphates, zeolites, sand, and gravel, are different from fluid minerals because impacts to cultural resources from these resource uses depend largely on the location of the minerals near the surface. If a significant cultural resource is in or near an exposure to be explored, the likelihood of adverse impacts to the resource would be high. In addition, it is much more difficult to protect the historical settings of sites from solid minerals exploration. Exploration and mining operations cannot easily be hidden, and can

affect the historical settings of resources. Most of the planning area is open to phosphate leasing, although with some surface limitations that would moderately benefit cultural resources. The Warm Springs Canyon Flume site area is mostly closed to phosphate leasing under Alternative A, and no known spiritual/sacred/traditional sites are near known leasable solid minerals exposures; therefore, no impacts to known cultural resources from this type of activity would be expected. Warm Springs Canyon is mostly closed to phosphate leasing, but spiritual/sacred/traditional sites are not, and those resource could be subject to adverse impacts.

Highly visible ROW projects such as industrial wind-energy developments and large transmission lines can adversely impact cultural resources in several ways. Standard procedures cover direct impacts to resources important for their data potential, but the large size of these projects can easily adversely affect sites where setting is important. For example, an industrial wind-energy development or gas plant near a sacred site would result in a major impact to the site's value to Native American groups. Similarly, a dam along Warm Springs Creek would result in a major impact to the flume's historical setting. Alternative A does not include protections from these types of projects for Warm Springs Canyon Flume or known spiritual/sacred/traditional sites. The potential for large industrial plants and transmission lines near some of the known spiritual/sacred/traditional sites would be high under this alternative. Conversely, the potential for highly visible projects near Warm Springs Canyon Flume would be low. *Special Designations* below addresses the protection of cultural resources in ACECs from adverse impacts of ROW development.

Recreational activities on public lands have increased since the current RMP was implemented in 1987 and impacts to cultural resources have risen accordingly. Low levels of surface artifact collection and illegal digging of sites is an ongoing problem. Although a law enforcement ranger is stationed at the Lander Field Office, enforcement is difficult in a 2.4 million-acre planning area. Therefore, under Alternative A, impacts to cultural resources from recreational activities would result in moderate impacts to cultural resources.

4.5.1.3.2.4. Special Designations

Alternative A includes nine ACECs and Congressionally Designated Trails, and limits surface disturbances in various ways, including NSO restrictions for oil and gas development, mining Plans of Operation, and avoidance of major ROWs. These prescriptions indirectly protect cultural resources. Significant historic settings are protected to a certain extent, depending on the size of the protected area. Alternative A would result in moderate to major beneficial impacts to cultural resources in ACECs and within ¼ mile of Congressionally Designated Trails. Beyond ¼ mile of Congressionally Designated Trails, however, little protection is given to the setting. In addition, neither Warm Springs Canyon Flume nor any known spiritual/sacred/traditional sites are in existing ACECs, Congressionally Designated Trails, or NWSRS-eligible waterway segments.

Alternative A has standard stipulations only in the proposed expanded Beaver Rim and Green Mountain ACECs. This management has the potential of allowing adverse impacts to cultural resources in those area, particularly if tribal consultation is not conducted.

4.5.1.3.3. Alternative B

4.5.1.3.3.1. Program Management

Alternative B includes more proactive steps to manage cultural resources than Alternative A. Implementation of this alternative would prevent more adverse impacts to important cultural sites in the planning area, including a wider range of sites where setting is important and spiritual/sacred/traditional sites. Alternative B provides more protections to Warm Springs Canyon Flume and known spiritual/sacred/traditional sites.

4.5.1.3.3.2. Resources

Alternative B specifies that air quality management will reduce emissions and improve air quality. This action would beneficially impact cultural resources, including setting, more than Alternative A.

Restrictions on surface-disturbing activities for the protection of lands with wilderness characteristics under Alternative B provides additional protections for cultural resources. Alternative A does not apply these restrictions; therefore, Alternative B would be more beneficial than Alternative A for cultural resources in the Little Red Creek Complex.

Alternative B specifies full fire suppression near identified cultural sites to protect them from the impacts of fire. Identifying cultural resources in advance and making the fire program aware of their locations would be more protective of important resources than Alternative A, and would prevent adverse impacts from fire suppression.

Alternative B manages approximately 1 million more acres of BLM surface as VRM Classes I and II than Alternative A, and protects more cultural resources from the introduction of modern visual intrusions. This would especially protect more sites where setting is considered important and would result in major beneficial impacts to cultural resources. Alternative B manages Warm Springs Canyon Flume with VRM Class II prescriptions, which would better protect the historic settings of this site than would prescriptions under Alternative A, which allows more surface disturbance and visual intrusions. However, no known spiritual/sacred/traditional sites would be protected, because none are in VRM Class I and II areas. Therefore, the impacts under Alternative B to these types of sites from VRM would be the same as Alternative A.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) are greatest under Alternative B, which would provide additional protections for cultural resources and reduce adverse impacts.

4.5.1.3.3.3. Resource Uses

Alternative B proposes to withdraw 1,609,491 more acres of mineral estate from locatable mineral entry than Alternative A, and protects more cultural resources from potential disturbances than Alternative A. This would protect more cultural sites where setting is considered important. While not all of the area withdrawn under Alternative B has high potential for locatable mineral, the withdrawal would preclude any kind of surface disturbance from mining, which would result in a major beneficial impact to cultural resources and their settings. Alternative B withdraws 283 more acres from locatable minerals around Warm Springs Canyon Flume than Alternative A, which would better protect the historic setting around the flume. Some known spiritual/sacred/traditional

sites are in withdrawn areas and would be protected, but some are not and would be subject to potential adverse impacts. However, the likelihood of locatable mineral exploration around these unprotected spiritual/sacred/traditional sites would be low. New withdrawals would not apply to existing claims, because this management would not change preexisting rights.

Alternative B closes leasing for fluid minerals (oil and gas) exploration on 1,851,349 more acres of surface than Alternative A, and would protect more cultural resources from potential disturbances than Alternative A. This would especially protect more sites where setting is considered important. Under Alternative B, some known spiritual/sacred/traditional sites are in NSO areas and would be protected (not the case under Alternative A), but some are not and would be subject to more impacts because they are in areas with high potential for oil and gas.

Leasable solid minerals and mineral materials are more restricted under Alternative B. Alternative B closes approximately 2 million acres to these uses, while Alternative A closes approximately 229,014 acres to mineral materials development and 154,106 acres to phosphate development. Closure under Alternative B is a more specific prescription than the ambiguous surface disturbance limitations found under Alternative A, resulting in major beneficial impacts to cultural resources because the areas closed under Alternative B have the best potential for phosphate. Most known spiritual/sacred/traditional sites and Warm Springs Canyon Flume are closed from mineral material disposal and phosphate leasing under Alternative B, so these sites would not be subject to adverse impacts.

Alternative B restricts wind-energy development, mines, power and gas plants, and major ROWs to a much greater extent than Alternative A. Alternative B protects most cultural resources in the planning area from the impacts of wind-energy development, large mines, and ROW impacts, including Warm Springs Canyon Flume and known spiritual/sacred/traditional sites, and would result in major beneficial impacts to cultural resources.

Impacts from recreation management would generally be the same under Alternative B as under Alternative A. To the extent that some recreation areas are closed to motorized travel or cross-country nonmotorized vehicle use, this would beneficially impact cultural resources.

4.5.1.3.3.4. Special Designations

Alternative B limits surface disturbance in ACECs, Congressionally Designated Trails, and NWSRS-eligible and suitable waterway segments, including the application of NSO restrictions for oil and gas development, requirements for mining Plans of Operation, and avoidance of major ROWs. These management prescriptions would protect cultural resources. Significant historic settings are protected to a moderate to major extent as well, depending on the size of the protected area. Under Alternative B, a 1,325,818 acre increase in acres with surface protections as a result of special designations would result in major beneficial impacts to cultural resources in specially designated areas. This would enhance the protection of cultural resources in several parts of the planning area. However, neither Warm Springs Canyon Flume nor any known spiritual/sacred/traditional sites would be protected in this manner because none of them are in existing or proposed ACECs, Congressionally Designated Trails, or WSRs.

4.5.1.3.4. Alternative C

4.5.1.3.4.1. Program Management

Alternative C has less proactive management than Alternative A. The minimum actions necessary to comply with regulations will be applied to cultural resources, which would result in more adverse impacts to several types of heritage resources than Alternative A. Alternative C provides some protections for Warm Springs Canyon Flume and spiritual/sacred/traditional sites, but deterioration would be expected to continue at a low level. Only standard oil and gas stipulations are applied and not areas are avoided for ROWs.

4.5.1.3.4.2. Resources

Air quality management and fire management are the same under Alternative C as under Alternative A, and would result in the same impacts to cultural resources. However, Alternative C would result in more adverse impacts to cultural resources than Alternative B. Like Alternative A, air quality management under Alternative C would result in little to no adverse impacts to cultural resources where setting is an important characteristic.

Alternative C classifies 179,138 fewer acres as VRM Classes I and II than Alternative A, and protects fewer cultural resources from the introduction of modern visual intrusions. Alternative C would result in more adverse impacts to cultural resources than Alternative A, especially for sites where setting is considered important. Warm Springs Canyon Flume and all known spiritual/sacred/traditional sites are in VRM Class IV areas, which would provide little or no protection for the historic/natural settings of these sites.

Because Alternative C places more of an emphasis on resource use, there are fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations). Therefore, there would be more adverse impacts to cultural resources under Alternative C than under alternatives A and B.

4.5.1.3.4.3. Resource Uses

Alternative C provides minimal protection for cultural resources from locatable mineral exploration. This alternative proposes to withdraw 23,114 fewer acres of federal mineral estate from locatable mineral entry than Alternative A, and protects fewer cultural resources from potential disturbances. Locatable mining regulations do not follow the standard cultural resource protection measures previously described and, unless the mining exploration covers more than 5 acres of disturbance, cultural resources would be subject to little protection from mining impacts. Even for mining disturbance of more than 5 acres, the BLM has the authority only to require no “undue or unnecessary” degradation in reviewing the Plans of Operation. Because Alternative C does not include any ACECs, lands in ACECs designated under Alternative A would not be subject to Plans of Operation protections. Therefore, Warm Springs Canyon Flume and any known spiritual/sacred/traditional sites would be only minimally protected from the impacts of locatable mineral exploration under Alternative C. However, the likelihood for locatable mineral exploration around most of these sites would be low.

Alternative C authorizes leasing on 13,207 more acres for fluid minerals (oil and gas) exploration than Alternative A. This would protect fewer cultural resources from potential disturbances than

Alternative A. Alternative C also would result in more adverse impacts to sites where setting is considered important. Warm Springs Canyon Flume and all known spiritual/sacred/traditional sites are open with moderate constraints and potentially open to adverse impacts, especially because several known spiritual/sacred/traditional sites are in areas with high potential for oil and gas. Since there is only standard need to conduct tribal consultation, Alternative C would have the same impacts to cultural resources as Alternative A. Far more areas are open to oil and gas leasing than under Alternative B, so that the adverse impacts from oil and gas operations would be far more likely to occur. However, Warm Springs Canyon Flume is in an area with very low potential for oil and gas, so the likelihood of impacts to that site from fluid minerals exploration would be low.

Leasable solid minerals and mineral materials are less restricted under Alternative C than under Alternative A. For phosphates, Alternative C closes 32,255 fewer acres. For mineral materials, Alternative C closes 87,605 fewer acres. Known spiritual/sacred/traditional sites in places such as the Lander Slope would not be protected under Alternative C and would be subject to adverse impacts, especially from mineral materials disposal or phosphate leasing. However, Warm Springs Canyon Flume is closed from mineral material disposal and phosphate leasing.

Alternative C restricts wind-energy development, mines, and major ROWs to a lesser extent than Alternative A, which would adversely impact heritage resources. This alternative protects only a few cultural resources in the planning area from the impacts of wind-energy development and major ROWs; Warm Springs Canyon Flume and known spiritual/sacred/traditional sites are not protected under Alternative C and would be subject to adverse impacts. The potential for large industrial plants and transmission lines near some of the known spiritual/sacred/traditional sites would be high; the potential for highly visible projects near Warm Springs Canyon Flume would be low.

Under Alternative C, impacts to cultural resources from recreation management would be the same as under Alternative A.

4.5.1.3.4.4. Special Designations

Alternative C does not include any ACECs or recommend any waterway segments as suitable for inclusion in the NWSRS. This opens the ACEC areas and waterway segment corridors to development; impacts to cultural resources would be more likely under this alternative. Some of the areas protected as ACECs under alternatives A and B are known to contain heritage resources, so this loss of protection would be an adverse impact. Under Alternative C, Congressionally Designated Trails are generally protected to ¼ mile on each side, except for locatable minerals. For locatable minerals, this alternative removes withdrawals and opens the lands along NHTs to unrestricted mining. Alternative C manages WSAs the same as Alternative A, which would limit surface disturbances in these areas and indirectly protect cultural resources through avoidance. Sites where setting is important would not be protected, except for NHTs, and neither Warm Springs Canyon Flume nor any known spiritual/sacred/traditional sites would be protected.

Alternative C applies no special management to the Beaver Rim or Green Mountain expanded areas, so adverse impacts to cultural resources would likely occur, particularly in the area of the Rim itself.

4.5.1.3.5. Alternative D

4.5.1.3.5.1. Program Management

Alternative D includes more proactive management of cultural resources than alternatives A and C, but less than Alternative B. This alternative would better prevent impacts to important sites than management under Alternative A, including a wider range of sites where setting is important and where spiritual/sacred/traditional sites are present. Alternative D includes more protections to Warm Springs Canyon Flume and known spiritual/sacred/traditional sites, although not to the same degree as Alternative B. Alternative D requires tribal consultation if oil and gas operations will disturb lands near sacred and Native American sites. Required Design Features for the protection of wildlife will limit the location and extent of surface disturbance, which would benefit cultural resources. Although the Required Design Features are more limiting of development than Alternative A or C, they are less so than the protections afforded under Alternative B.

4.5.1.3.5.2. Resources

Like alternatives A and C, Alternative D specifies that air quality management will minimize adverse impacts to air quality, but will allow emissions up to current air quality standards. This is the minimum management level; it will result in more adverse impacts to cultural resources than Alternative B, which would result in more beneficial impacts to cultural resources, including setting. To the extent that particulate matter is caustic, such as calcium chloride used on road surfaces, fugitive dust from development activities and transportation could adversely impact cultural resources such as rock art.

Alternative D management of soil and water is generally the same as Alternative A in terms of limiting surface disturbance; therefore, it would result in the same beneficial and adverse impacts to cultural resources, although to a greater degree because surface disturbance is more limited. There would be fewer beneficial impacts under Alternative D than under Alternative B and somewhat more than under Alternative C.

Restrictions on surface-disturbing activities for the protection of lands with wilderness characteristics under Alternative D would provide additional protections for cultural resources that would not result under Alternative A or C. Therefore, impacts under Alternative D would be more beneficial than under Alternative A. Although Alternative D manages a smaller area as non-WSA lands with wilderness characteristics to protect wilderness characteristics than Alternative B, 4,954 acres versus 5,490 acres, it is not likely that this difference would result in substantially different impacts. This is because the areas excluded under Alternative D would be managed to support the wilderness characteristics of not only the Little Red Creek Complex but also the Whiskey Mountain ACEC. Alternative D would result in substantially more beneficial impacts than Alternative C. Not only does Alternative C not manage for wilderness characteristics, it also protects only the bighorn sheep habitat on Whiskey Mountain with standard stipulations (see *Special Designations*); therefore, there would be no “spill-over” protections for the Little Red Creek Complex.

Alternative D specifies that the full range of fire suppression tactics be used based on resources at risk. This would result in somewhat fewer beneficial impacts than Alternative B or Alternative C, which use full suppression and rely on informing firefighters in advance of at-risk cultural resources. Alternative D would be likely to result in more beneficial impacts than Alternative A,

which operates on a case-by-case basis and includes no advance notification for at-risk cultural resources. Identifying cultural resources in advance and having the fire program aware of their locations would be more protective of important resources than Alternative A, and would prevent adverse impacts from fire suppression activities. However, full suppression could result in long-term adverse impacts to cultural resources to the extent that this management technique increases the potential for landscape-level fire, which would exceed fire suppression efforts to protect cultural resources.

Alternative D classifies approximately 1 million more acres of BLM surface as VRM Classes I and II than Alternative A, and would protect more cultural resources from the introduction of modern visual intrusions. This would be especially beneficial to sites where setting is considered important. Warm Springs Canyon Flume is in a VRM Class II area under Alternative D, which would better protect the historic settings of this site than would alternatives A and C. However, no known spiritual/sacred/traditional sites would be protected because none are in Class I or II areas. For these types of sites, the impacts of Alternative D would be the same as under Alternative A.

Alternative D protections for riparian-wetland resources are the same as Alternative A, slightly more restrictive than Alternative C, and substantially less restrictive than Alternative B. Therefore, Alternative B would result in the most beneficial impacts to riparian-wetland areas, areas with high potential for cultural properties, than any other alternative. Alternative D, like alternatives A and C, would result in more adverse impacts to cultural resources by allowing surface-disturbing activities on approximately 125,403 more riparian-wetland acres than Alternative B.

In general, restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological, and visual resources) are greatest under Alternative B, with alternatives A, C, and D providing substantially fewer protections for cultural resources.

Management for wildlife protection is stronger and applied to more areas under Alternative D although less so than Alternative B. This management, discussed in more detail under Resource Uses below, would beneficially impact cultural resources.

4.5.1.3.5.3. Resource Uses

Alternative D proposes to withdraw 425,935 more acres of mineral estate from locatable mineral entry than Alternative A. Alternative D protects more cultural resources from potential disturbances than Alternative A, much more than Alternative C, and substantially fewer than Alternative B. Withdrawals protect more sites where setting is considered important. Around Warm Springs Canyon Flume, Alternative D proposes to withdraw the same number of acres from locatable minerals as alternatives A and C, and 283 fewer than Alternative B. This would result in more adverse impacts to the historic setting around the flume than Alternative B, but the low mineral potential could make this impact less substantial. The withdrawals in the Lander Front-Hudson-South Pass area would protect the extensive cultural resources, including historic trails, rock art, and Native American sacred sites and their settings. This management provides the same benefits to cultural resources as Alternative B, although to a smaller area.

Some known spiritual/sacred/traditional sites are in withdrawn areas and are protected under Alternative D, but many fewer than under Alternative B. The likelihood of locatable mineral exploration around these unprotected spiritual/sacred/traditional sites would be low, but in a few cases it is possible and would result in a substantial risk of adverse impacts. However, the beneficial impacts of the new withdrawals would not apply to areas with existing mining claims,

because this management would not change preexisting rights. However, over time the claims could expire and then be withdrawn.

Alternative D closes 141,438 more acres of mineral estate to fluid minerals leasing than Alternative A, 166,496 more acres than Alternative C, and 2,112,951 fewer acres than Alternative B. Closing an area to surface use protects cultural resources from potential disturbances, especially where setting is considered important. Under Alternative D, some known spiritual/sacred/traditional sites are in NSO areas and are protected, but some are not and would be subject to more adverse impacts because they are in areas with high potential areas for oil and gas. In comparison, no spiritual/sacred/traditional sites would be protected under alternatives A and C, and more such sites would be protected under Alternative B. Areas managed as closed or NSO under Alternative D to protect wildlife, viewsheds, and other resources in the Dubois area and the Lander Front-Hudson-South Pass areas would beneficially impact cultural resources. The application of Required Design Features that would limit the size and extent of disturbance associated with development provides further benefits (or avoids further adverse impacts) associated with that disturbance.

Alternative D management of the important parturition areas on the south side of the Green Mountain ACEC and Beaver Rim will beneficially impact the cultural resources in the area. Requiring tribal consultation would avoid adverse impacts to Native American sites.

Leasable solid minerals and mineral materials disposals are only slightly less restricted under Alternative D than Alternative B and far more protective of cultural resources than either Alternative A or C. Most known spiritual/sacred/traditional sites and Warm Springs Canyon Flume are closed to mineral materials disposals and phosphate leasing under Alternative D; therefore, those sites would not be subject to adverse impacts.

Alternative D restricts wind-energy development, mines, power plants, gas plants, and major ROWs to a much greater extent than Alternative A, substantially more than Alternative C, and less than Alternative B. Alternative D protects many cultural resources from the impacts of wind-energy development, large mines, and ROWs, including Warm Springs Canyon Flume and known spiritual/sacred/traditional sites, although to a lesser extent than Alternative B. Although Alternative D utilizes avoidance of areas that are excluded to ROWs under Alternative B, the adverse impacts to cultural resources by such management would be reduced by the application of avoidance criteria. Even the use of designated corridors would still require cultural resource clearances and mitigation. Concentrating disturbance in corridors would more severely impact cultural resources in those locations or the setting of other resources outside of the actual disturbance, where setting is important.

Impacts from recreation management would be the same under Alternative D as under Alternative A, except that Alternative D, like Alternative B, withdraws Johnny Behind the Rocks. Alternatives A, B, and D recreation management would result in more beneficial impacts to cultural resources than Alternative C, which favors development over recreation.

4.5.1.3.5.4. Special Designations

ACECs, Congressionally Designated Trails, NWSRS-eligible waterway segments recommended as suitable WSRs, and WSAs in the planning area limit surface disturbances in various ways. These limits include NSO for oil and gas development, mining withdrawals or Plans of Operation, and ROW avoidance. These prescriptions protect cultural resources through avoiding disturbances

to cultural resources in those areas. Significant historic settings are protected to a certain extent as well, depending on the size of the protected area. Under Alternative D, 243,838 acres of ACECs close or limit surface disturbance, 5 percent more of the planning area than Alternative A, but 52 percent less of the planning area than Alternative B. Alternative C does not include any ACECs, and therefore only standard stipulations on surface disturbance, which would result in substantially more adverse impacts to cultural resources, would apply.

Alternative D does not manage either Cedar Ridge or Castle Gardens as ACECs, and therefore would result in fewer beneficial impacts to cultural resources than Alternative B. However, Alternative D would result in more beneficial impacts to these two significant cultural sites than Alternative A, and substantially more than Alternative C. Neither Warm Springs Canyon Flume nor any known other spiritual/sacred/traditional sites would be protected in this manner, because none of them are in existing or proposed ACECs, Congressional Designated Trails, or WSAs.

Alternative D management of Congressionally Designated Trails would be less beneficial to cultural resources than Alternative B, but would result in substantially more beneficial impacts to non-trail resources than Alternative A or C. Alternative C would result in substantially more adverse impacts to cultural resources because of its management of the CDNST, which requires that the trail be moved if there is a conflict with another use. This management would have the effect of increasing disturbance, which would adversely impact cultural resources.

Although Alternative D does not manage either the expanded Beaver Rim or the Green Mountain areas as ACECs, the special management applied to both those areas will limit adverse impacts from oil and gas operations.

4.5.2. Paleontological Resources

Paleontological resources are defined as any fossilized remains, traces, or imprints of organisms, preserved in or on the Earth's crust, that are of paleontological interest and that provide information about the history of life on Earth. If these resources are found to be scientifically significant, federal regulations require that impacts to them be assessed and impact mitigation measures be instituted to help protect them.

Adverse impacts to significant paleontological resources typically result in a loss of information and/or a loss of integrity of the resource. Adverse impacts to significant paleontological resources on BLM-administered lands include actions that physically damage or destroy all or parts of a resource and lack of protective action, which can result in resource deterioration. Adverse impacts to paleontological resources also result from increases in access to areas containing paleontological resources, which can lead to increases in use, erosion, looting, and vandalism.

Paleontological resources are important for their scientific-data potential. Adverse impacts to these resources are considered long-term, because once the resources are damaged or disturbed, impacts cannot be reversed.

Beneficial impacts to paleontological resources result from special management measures that can enhance the quality of a resource. Stabilization and recovery of paleontological resources and information are examples of long-term beneficial impacts. Erosion control at paleontological localities is another example of beneficial impacts. The beneficial impacts of erosion-control measures would be long-term, but eventually, adverse natural and/or human influences would require more measures to keep paleontological resources from degrading.

4.5.2.1. Summary of Impacts

Impacts to paleontological resources vary by alternative. Alternatives A, B, and C are similar in their protections; Alternative B provides the most protection, followed by Alternative D, and then alternatives A and C. As for specific resources, Alternative B provides for management to protect the Beaver Rim, Bison Basin, Bonneville to Lost Cabin, Lander Slope, and Gas Hills paleontological areas; alternatives A and C manage those resources on a project-specific basis.

4.5.2.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Paleontological resources are most typically associated with bedrock exposures. Areas of deep soils, alluvium, or colluvium only rarely contain significant fossils. Therefore, the main areas of concern for impacts to paleontological resources are where fossil-bearing bedrock is at or near the surface, such as badlands, hill slopes, or areas with thin soils over bedrock.
- Vertebrate fossils continue to be found throughout the Jurassic, Cretaceous, and Tertiary units exposed in the planning area. The Wind River and Bridger Formations are the most important geologic formations for significant paleontological resources, but several sedimentary formations are known to contain important fossils.
- Surface-disturbing and surface-disruptive activities can dislocate or damage previously undiscovered significant paleontological resources (i.e., unanticipated discoveries) but may also result in their discovery. Destruction of these resources results in a loss of scientific information and precludes interpretation of the resource values to the public.
- Surveys required before surface disturbance in areas known or suspected to contain significant paleontological resources can result in the identification and evaluation of previously undiscovered resources. In addition, continuing scientific research in the planning area will identify new paleontological resources. The BLM will then manage these newly discovered resources accordingly.
- The number of paleontological resources affected by various actions correlates directly to the degree, nature, and quantity of surface-disturbing activities in the planning area.

4.5.2.3. Detailed Analysis of Alternatives

4.5.2.3.1. Impacts Common to All Alternatives

Surface disturbance, neglect, erosion, natural deterioration, and looting and vandalism frequently impact paleontological resources in the planning area. The most common cause of impacts is surface disturbance, especially in areas of industrial development. The more mineral and realty activities likely to occur, the more impacts to paleontological resources are likely.

Standard procedures have been developed to help address impacts to significant paleontological resources, and include archival research, on-the-ground inventories, locality recordation and evaluation, data recovery excavations, condition assessments, stabilization, and, in certain cases, avoidance. These standard procedures can protect paleontological resources from damage where paleontological resources are known or discovered. All of the alternatives are guided by these standard procedures.

However, implementing standard procedures does not ensure the identification of all paleontological resources before they are affected. This happens when paleontological resources

are buried and are not visible from the surface. These resources are often only discovered after surface-disturbing activities have uncovered them, and construction activities can quickly and severely damage them and result in the loss of much data. This happens regularly in the planning area because paleontological resources are often buried by sediments and soils. In such cases, mitigation of impacts to significant paleontological resources usually entails data recovery and salvage excavations. These excavations are designed to retrieve the remaining data from the locality and study the data to determine what kinds of organisms lived there in the past.

The standard procedures also do not apply to small locatable mineral exploration projects. Locatable minerals exploration projects of fewer than five acres are subject to the 43 CFR 3809 “Notice of Intent” regulations, which offer minimal protections to paleontological resources. These operations do not require BLM approval, and fossil localities may be adversely impacted if mining operations proceed.

Another impact to paleontological resources common to all alternatives results from increased public use of lands, which can result for several reasons, including improved access to formerly remote areas, which is common in areas where development allows for the creation of new roads; the increased popularity and availability of OHVs, which also allows access to formerly remote areas; and increased public interest in paleontological sites or areas. As public use of lands increases, so does the impact to paleontological resources. As there is more use, more paleontological resources are visited or driven over, and some of these resources are looted or vandalized. These impacts would occur under any of the alternatives because access, OHV use, and public use and interest are all expected to increase.

The limitations on the use of prescribed fire and full suppression described in the Cultural Resources section would be equally true for paleontological resources.

4.5.2.3.2. Alternative A

4.5.2.3.2.1. Program Management

When development projects are proposed that could affect paleontological resources, reactive paleontological resource management uses the standard procedures to protect important paleontological resources. Proactive management protects important resources that are not threatened by development but still require measures to maintain or enhance their significant qualities. Alternative A uses reactive management to address impacts on a case-by-case basis, and uses proactive management to address impacts to localities such as Beaver Rim, Lander Slope, and Gas Hills. Proactive management is necessary to protect or stabilize these localities and maintain their important qualities, which are threatened by natural or human-caused actions. No special management is applied to the Beaver Rim area outside of the ACEC.

4.5.2.3.2.2. Resources

Under Alternative A, building fire lines with heavy equipment could impact paleontological resources. Current management for wildfires is not well positioned to protect these resources, because information on the locations of paleontological resources likely to be damaged or destroyed is not readily available to fire personnel. Resource advisors are consulted on some fires, but they cannot be everywhere on fires as they happen. Significant paleontological locality information is currently kept confidential, so these resources could inadvertently be impacted.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) under Alternative A provide additional protection for paleontological resources.

4.5.2.3.2.3. Resource Uses

Alternative A provides mostly minimal protection from locatable mineral exploration, except where there are withdrawals or ACECs. Locatable mineral regulations do not follow the standard paleontological resource protection measures described above and, unless the exploration project covers more than 5 acres or is in an ACEC, paleontological resources are subject to little protection from the impacts of mining. Alternative A pursues withdrawals on 23,114 acres and retains all existing ACECs, which would protect some paleontological resources. The Bison Basin, Bonneville to Lost Cabin, and Gas Hills paleontological areas are minimally protected under Alternative A and would be subject to impacts from mineral exploration, while the Beaver Rim and Lander Slope paleontological areas are in ACECs and would be better protected from impacts of locatable minerals exploration.

Impacts to paleontological resources from leasable fluid minerals, leasable solid minerals, mineral materials disposals, and ROWs are better controlled under Alternative A than impacts from locatable minerals exploration. Standard procedures under these programs (described above under *Impacts Common to All Alternatives*) provide for the study, retrieval, and, in some cases, avoidance of paleontological resources. Field inventories, construction monitoring, evaluation of resources, and impacts mitigation are routinely performed for these types of projects, and most paleontological resource sites are adequately studied, collected, and/or protected.

Paleontological resources in the Beaver Rim area could be adversely impacted by oil and gas development because of limited protections.

4.5.2.3.2.4. Special Designations

Most ACECs, Congressionally Designated Trails, and WSAs in Alternative A limit surface disturbances in various ways. These limits include NSO for oil and gas development, mining Plans of Operation, and avoidance of major ROWs. These prescriptions indirectly protect paleontological resources. The Beaver Rim and Lander Slope paleontological areas are in ACECs and would therefore be protected, while the Bison Basin, Bonneville to Lost Cabin, and Gas Hills paleontological areas would not. The Beaver Rim and Green Mountain areas outside of the ACECs could be adversely impacted through unrestricted development.

4.5.2.3.3. Alternative B

4.5.2.3.3.1. Program Management

Alternative B includes more proactive management than Alternative A, which would benefit important fossil localities in the planning area. Alternative B also includes more attention to important paleontological areas like Beaver Rim, Bison Basin, Bonneville to Lost Cabin, Lander Slope, and Gas Hills.

4.5.2.3.3.2. Resources

Fire management under Alternative B protects paleontological resources more than Alternative A. Under Alternative B, management plans will be written for areas with high for potential paleontological areas. These plans will be coordinated with fire personnel and will be used to protect fossil localities when fire suppression activities are needed in these areas.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) are greatest under Alternative B, which would provide additional protection for paleontological resources and reduce adverse impacts.

4.5.2.3.3.3. Resource Uses

Alternative B proposes to withdraw 1,609,491 more acres of mineral estate from locatable mineral entry than Alternative A. This would protect more paleontological resources from potential disturbances. Lands withdrawn from locatable minerals entry around the Lander Slope, Beaver Rim, and Bison Basin areas would provide more protection for these areas than under Alternative A. However, Alternative B does not propose to withdraw the Bonneville to Lost Cabin and Gas Hills areas, and those areas would receive fewer protections.

Alternative B closes 1,851,349 more surface acres to leasable fluid minerals exploration than Alternative A, and this would protect more paleontological resources from potential disturbances. Lands closed to leasable fluid minerals exploration around the Lander Slope, Beaver Rim, and Bison Basin areas would provide more protection for these areas than Alternative A. However, Alternative B does not close the Bonneville to Lost Cabin and Gas Hills areas, and those areas receive fewer protections.

Both the Beaver Rim and Green Mountain areas are closed to oil and gas leasing and would therefore have far more beneficial impacts to the paleontological resources located in those areas in comparison to Alternative A.

Leasable solid minerals and mineral materials disposal are more restricted under Alternative B than under Alternative A. Approximately 2 million acres are closed to each of these uses under Alternative B, while Alternative A closes approximately 229,014 acres to mineral materials disposal and 154,106 acres to phosphate leasing. Most identified paleontological areas are closed to mineral materials disposal and phosphate leasing under Alternative B, so those areas would not be subject to impacts.

Alternative B restricts wind-energy development and major ROWs much more than Alternative A. Alternative B protects most paleontological resources in the planning from adverse impacts of wind-energy development and major ROWs, including most of the Lander Slope, Beaver Rim, Bison Basin, Bonneville to Lost Cabin, and Gas Hills paleontological areas.

4.5.2.3.3.4. Special Designations

ACECs, Congressionally Designated Trails, and WSAs in the planning area limit surface disturbances in various ways, including NSO restrictions for oil and gas development, mining Plans of Operation, and avoidance of major ROWs. These prescriptions indirectly protect paleontological resources. Alternative B expands five existing ACECs and designates six additional ACECs. This would enhance the protection of paleontological resources in several

parts of the planning area. However, the Bison Basin, Bonneville to Lost Cabin, and Gas Hills paleontological areas would not be protected by any of these special designations, because none of them are in existing or proposed ACECs, Congressional Designated Trails, or WSAs under this alternative.

The expansion of the Beaver Rim and Green Mountain ACECs would beneficially impact paleontological resources by prohibiting oil and gas development. However, the knowledge of the resources that is gained through surface disturbance would not occur as it would under Alternative A.

4.5.2.3.4. Alternative C

4.5.2.3.4.1. Program Management

Alternative C includes somewhat less proactive management than Alternative A. Alternative C would give less attention to the Beaver Rim and Bison Basin paleontological areas, so deterioration would be expected to continue in those areas.

4.5.2.3.4.2. Resources

Fire management under Alternative C would be the same as under Alternative A, and would result in the same impacts to paleontological resources.

Because Alternative C places a greater emphasis on resource use, there are fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations). Therefore, there would be more adverse impacts to paleontological resources than under alternatives A and B.

4.5.2.3.4.3. Resource Uses

Alternative C provides minimal protection for paleontological resources from adverse impacts of locatable mineral exploration. This alternative proposes to withdraw 23,114 fewer acres of federal mineral estate from locatable mineral entry than Alternative A, which would protect fewer fossil resources from potential disturbances. Locatable mining regulations do not follow the standard paleontological resource protection measures described above, and, unless the exploration project covers more than 5 acres, paleontological resources are subject to little protection from the adverse impacts of mining. Also, because this alternative does not include ACECs, lands in ACECs under other alternatives would not be subject the protections of Plans of Operation. None of the identified paleontological resource areas are more than minimally protected from the impacts of locatable mineral exploration under this alternative.

Alternative C authorizes leasable fluid minerals exploration on 13,207 more acres than Alternative A; this would protect fewer paleontological resources from potential disturbances. All identified paleontological resource localities are open with moderate constraints and would be subject to adverse impacts. Alternative C does not apply an MLP in the Beaver Rim area and would therefore not result in the beneficial impacts to paleontological resources that occur under Alternative D from management of the Beaver Rim MLP.

Leasable solid minerals and mineral materials are less restricted under Alternative C than under Alternative A. For phosphates, Alternative C closes 32,255 fewer acres than Alternative A.

For mineral materials, Alternative C closes 87,605 fewer acres than Alternative A. Identified paleontological localities are not protected under this alternative and would be subject to adverse impacts from these resource uses.

Alternative C includes fewer restrictions on wind-energy developments, mines, and major ROWs than Alternative A. This alternative protects only a few fossil resources in the planning area from impacts caused by these kinds of developments. Known identified paleontological areas are not protected and would be subject to adverse impacts from these activities.

4.5.2.3.4.4. Special Designations

Alternative C does not include ACECs and does not recommend any NWSRS-eligible waterway segments as suitable for inclusion in the NWSRS. This opens these areas to development, which would subject paleontological resources to adverse impacts. Under Alternative C, Congressionally Designated Trails are generally protected to ¼ mile on each side, except for locatable minerals entry. For locatable minerals entry, this alternative removes withdrawals and opens the lands along NHTs to unrestricted mining. None of the identified paleontological areas would be protected, including in the Beaver Rim and Green Mountain areas. However, Alternative C manages WSAs the same as Alternative A, which would limit surface disturbances in these areas, and would indirectly protect paleontological resources through avoidance.

4.5.2.3.5. Alternative D

4.5.2.3.5.1. Program Management

Alternative D includes more proactive management with more restrictions on development than Alternative A or C, but less than Alternative B. This would further prevent adverse impacts to important fossil localities in the planning area, but the focus under Alternative D would be primarily on significant paleontological resources rather than all resources, as under Alternative B. Alternative D management of important paleontological areas like Beaver Rim, Bison Basin, Bonneville to Lost Cabin, Lander Slope, and Gas Hills would be more protective of resources than Alternative A, but less protective than Alternative B, which closes these areas to leasing. The MLP adopted for the Beaver Rim area would prioritize inventories in the area. Required Design Features for surface-disturbing activities would limit the size and scope of development, which benefits the paleontological program.

4.5.2.3.5.2. Resources

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) are greatest under Alternative B, which would provide additional protections for paleontological resources and reduce adverse impacts. Alternative D management of soil, water, and riparian-wetland areas would result in beneficial impacts to paleontological resources similar to those under Alternative A, and slightly more beneficial than those under Alternative C. Alternative D impacts would be substantially more adverse than impacts under Alternative B, which closes 125,403 more riparian-wetland acres to surface disturbance. Under Alternative D, FMPs will be written for areas with high potential for paleontological resources. These plans will be coordinated with fire personnel and used to protect significant fossil localities when fire suppression activities are needed in these areas.

Impacts to paleontological resources under Alternative D would be similar to but less beneficial than under Alternative B.

Limitations on disturbance to protect wildlife, which also protect paleontological resources, are less in Alternative D than B, but greater than Alternative A and substantially more than Alternative C. The Core Area Strategy and the management to benefit resources in the Lander Front-Hudson-Atlantic City area would strongly benefit paleontological resources, and Alternative D is second only to Alternative B in these protections. However, development would still be authorized, with resulting adverse impacts to paleontological resources.

4.5.2.3.5.3. Resource Uses

Alternative D proposes to withdraw 425,935 more acres of mineral estate from locatable mineral entry than Alternative A, 449,068 more acres than Alternative C, and 72 percent fewer acres in the planning area than Alternative B. Withdrawal protects an area from locatable mineral entry and mineral materials disposal, so the more acres withdrawn, the more beneficial impacts to paleontological resources because they are protected from potential disturbances. However, Alternative D would result in many fewer beneficial impacts to paleontological resources than Alternative B because it does not propose to withdraw lands from locatable minerals around the Bison Basin areas. No alternative proposes to withdraw the important paleontological areas of Bonneville to Lost Cabin in the north end of the planning area and Gas Hills, so these areas would receive fewer protections.

Alternative D closes or manages with major constraints 694,348 more acres to mineral leasing than Alternative A and 1,125,193 fewer acres than Alternative B. Accordingly, Alternative D would result in substantially fewer beneficial impacts to paleontological resources than Alternative B, but many more than Alternative C and somewhat more than Alternative A. The closing of Dubois to leasing under Alternative D would beneficially impact paleontological resources similar to Alternative B, would be more beneficial than Alternative A, and substantially more beneficial than Alternative C. The Beaver Rim MLP prioritizes information gathering of the paleontologic resources which would result in beneficial impacts in comparison to alternatives A and C.

Alternative D management of leasable solid minerals and mineral materials disposals would result in more beneficial impacts to paleontological resources than Alternative A or C and almost as many beneficial impacts as Alternative B, because Alternative D closes so many acres with phosphate potential to leasing. Mineral material disposals would be allowed in some greater sage-grouse Core Area although much less than under Alternative A. Because mineral material sales are discretionary, sales that would adversely impact other resources such as paleontological resources would be avoided or mitigated.

Alternative D's ROW management is more similar to Alternative B but to a much less protective extent. Fewer areas are excluded and more avoided for ROWs. Alternative D also designates far more corridors. To the extent that more corridors facilitate co-location of major ROWs, impacts to paleontological resources in general would be reduced but areas within the corridors would be more severely impacted. Designation of corridors does not cause ROWs to be requested; ROWs are part of other programs such as an increase in mineral development leads to an increase in ROWs. Therefore designation of corridors does not result, in and of itself, in any impacts to paleontological resources.

Alternative D restricts wind-energy development and major ROWs to a much greater degree than Alternative A or C, but less than Alternative B, particularly along Congressionally Designated Trails (see below). Like Alternative B, Alternative D protects many paleontological resources in the planning area from the impacts of wind-energy development and major ROWs, including most of the Lander Slope and Beaver Rim. Alternative D does not protect other areas, such as the Bonneville to Lost Cabin and Gas Hills important paleontological areas, from wind-energy development. However, these areas have low potential for wind-energy development, so the difference in impacts between alternatives D and B might not be substantial.

4.5.2.3.5.4. Special Designations

ACECs, Congressionally Designated Trails, WSRs, and WSAs limit surface disturbances in various ways, including NSO restrictions for oil and gas development, viewshed protections, and avoidance of major ROWs. These prescriptions indirectly protect paleontological resources. Alternative D manages 52 percent less of the planning area as ACECs than Alternative B, but 5 percent more of the planning than Alternative A. Alternative D ACEC prescriptions would be more protective of paleontological resources than Alternative A. Like alternatives A and B, Alternative D maintains the original Beaver Rim area as an ACEC, which would beneficially affect the area's important paleontological resources. Although the expansions of the Beaver Rim and Green Mountain ACECs are not designated, the application of the MLP in the Beaver Rim area and the application of an NSO stipulation in the Green Mountain area will beneficially impact the resources in those area.

Alternative D would result in substantially more beneficial impacts to paleontological resources than Alternative C, which manages ACEC areas identified in other alternatives with standard stipulations. Standard stipulations provide no protection to paleontological resources other than Paleontological Resources Preservation Act protections. Alternative D ACEC designations protect 80,832 acres of significant paleontological areas. However, the Bison Basin, Bonneville to Lost Cabin, and Gas Hills paleontological areas would not receive protections in this manner because none of them are in existing or proposed ACEC, Congressionally Designated Trails, or WSAs.

Alternative D management of Congressionally Designated Trails would result in fewer beneficial impacts to paleontological resources than Alternative B, but substantially more than Alternative A or C, because alternatives B and D close many more areas to surface disturbance for the protection of trails settings. Management of the CDNST under Alternative A, B, or D would result in more beneficial impacts to paleontological resources management than under Alternative C, which requires moving the trail if there are conflicts with other resource uses. Moving the trail would increase surface disturbance and the potential to adversely impact paleontological resources.

4.5.3. Visual Resources

4.5.3.1. Summary of Impacts

VRM Classes establish a measurable standard for the amount of change allowed to visual resources in a specific area. Visual Resource Inventory (VRI) Classes establish the general value of the landscape in terms of its scenic resources. VRM Classes range from I-IV with Class I allowing the least amount of change and IV allowing the most amount of change to the characteristic landscape. VRI Classes also range from I-IV with I being the highest value scenic resource and IV being the lowest value scenic resource. Comparing and contrasting VRM

Classes to Lander Field Office VRI Classes provides an indicator of the level of impact to visual resources across the planning area.

Table 4.20, “Visual Resources Inventory and Management Classes by Alternative” (p. 1016) provides a comparative analysis between the acres of VRI Class versus the acres of VRM Classes. To facilitate impact analysis, VRM Classes represent the allowable levels of impacts (see Chapter 3) and the VRI Classes represent the general value of the landscape, or a baseline. VRI Classes I or II that are designated as VRM III or IV constitutes an adverse impact to visual resources. This is due to the fact that such a designation exposes these high value scenic resources to a management scenario that allows for moderate to high levels of contrast within the existing environment. Whereas VRI Classes III or IV that are designated as I or II marks a beneficial impact to visual resources. This is due to the fact that such a designation exposes these lower value scenic resources to a management scenario that limits the amount of contrast with the existing landscape. As such, Alternative B would result in the greatest beneficial impact to visual resources, with Alternative D also benefiting scenic values. Alternative C would have the highest level of adverse impact on visual resources with nearly 97 percent of VRI Class I and II areas being managed as VRM Class III or IV. Alternative A has nearly 75 percent of VRI Class I and II areas being managed as VRM Class III or IV.

Table 4.20. Visual Resources Inventory and Management Classes by Alternative

		Inventory Class (IC) Acres							
		I		II		III		IV	
		54,682		570,502		849,370		917,485	
Management Class (MC) Designation		Relation of Management Class (MC) To Inventory Class (IC)							
MC	Acres	Intersect Acres	Percent (MC/IC)	Intersect Acres	Percent (MC/IC)	Intersect Acres	Percent (MC/IC)	Intersect Acres	Percent (MC/IC)
Alternative A									
I	57,443	54,391	99.47%	2,887	0.51%	83	0.01%	15	0.00%
II	202,785	160	0.29%	117,152	20.53%	66,583	7.84%	18,389	2.00%
III	221,121	90	0.16%	80,178	14.05%	87,574	10.31%	54,054	5.89%
IV	1,853,862	42	0.08%	355,248	62.27%	687,850	80.98%	809,348	88.21%
V ¹	57,995	0	0.00%	15,037	2.64%	7,279	0.86%	35,679	3.89%
Alternative B									
I	59,318	54,682	100.00%	4,636	0.81%	0	0.00%	0	0.00%
II	1,284,122	0	0.00%	565,866	99.19%	565,871	66.62%	152,281	16.60%
III	292,890	0	0.00%	0	0.00%	284,500	33.50%	8,390	0.91%
IV	756,813	0	0.00%	0	0.00%	0	0.00%	756,813	82.49%
Alternative C									
I	55,360	54,274	99.25%	921	0.16%	83	0.01%	15	0.00%
II	25,730	138	0.25%	14,815	2.60%	10,781	1.27%	0	0.00%
III	722,356	189	0.35%	342,633	60.06%	324,409	38.19%	54,301	5.92%
IV	1,590,758	82	0.15%	212,126	37.18%	514,094	60.53%	863,169	94.08%
Alternative D									
I	60,115	54,391	99.47%	5,550	0.97%	83	0.01%	15	0.00%
II	780,810	254	0.46%	462,700	81.81%	296,659	34.93%	20,322	2.21%
III	857,979	27	0.05%	102,181	17.91%	483,027	56.87%	272,176	29.67
IV	694,756	0	0.00%	0	0.00%	69,599	8.19%	624,971	68.12%
¹ VRM Class V no longer exists as a class objective option for managing visual resources. As a result, these areas are managed as Class IV visual resources under Alternative A.									
Source: BLM 2012a									

The planning area has several unique scenic features that could experience adverse impacts from activities authorized under this RMP. Table 4.21, “VRM Class Designation of Sensitive and Unique Scenic Features in the Lander Planning Area by Alternative” (p. 1017) identifies those features and the supporting VRM Class designation under each alternative. An alternative that designates a sensitive and unique scenic feature above Class II represents an adverse impact to this feature, whereas designating the area as a Class II or higher represents a beneficial impact. Overall, Alternative B manages the majority of scenic features as VRM Class II, with Alternative D managing slightly less scenic features as VRM Class II than Alternative B. Alternative C would result in the most adverse impacts to scenic features by managing most of these areas as VRM Class III or IV.

Table 4.21. VRM Class Designation of Sensitive and Unique Scenic Features in the Lander Planning Area by Alternative

Sensitive and Unique Scenic Feature	Inventory Class	VRM Class designation by Alternative			
		Alternative A	Alternative B	Alternative C	Alternative D
Beaver Rim	II, III	II, III, IV	II	III, IV	II, III
Rattlesnake Hills	IV ¹	II, III, IV	II, IV	IV	IV
Cedar Ridge/Johnny Behind the Rocks	II	III	II	IV	II
Green Mountain	II, III	II-IV	II	III, IV	II, III
Red Butte	II	II, III	II	III	II
Red Canyon	II	I, II	I, II	IV	I, II
South Pass Historic Mining District	II, III	I-IV	II	III, IV	II
Copper Mountain, Lysite Mountain	I, III	II-IV	I, III	IV	II-IV
Sweetwater Canyon	I	I	I	I	I
Sweetwater Rocks/Granite Mountains/Sentinel Rocks	I, II	I, II, III	I, II	I, III	I, II, III
Table Mountain-Lander	II	II, III	II	III	II
Twin Creek	II, III	II-IV	II	IV	II
Dubois Area	I-III	II-IV	I-III	III-IV	II
Lander Slope (Eastern Aspect of the Wind River Range)	II, III	I, II, III	II	III	I, II

Source: BLM 2012a

¹ The Rattlesnake Hills was evaluated and found to have Scenic Quality Class B (borderline Class A), seldom seen from important vantage points, and in the Middle ground (5–15 miles) from important vantage points. The inventory IV level may not accurately reflect overall visual quality in the area.

VRM Visual Resource Management

4.5.3.2. Methods and Assumptions

This analysis uses VRM Class designations to project impacts to the visual value of the landscape (as identified in the VRI). VRI Class designations are the baseline for quantifying changes to the existing visual environment. In addition, the analysis qualifies anticipated impacts under each alternative to the key visual features described above. Lander Slope (including Red Butte and Table Mountain), Red Canyon, South Pass Historic Mining Area, and Sweetwater Rocks/Granite Mountains/Sentinel Rocks are proposed scenic ACECs; the *Areas of Critical Environmental Concern* section describes impacts to these key features. The *Recreation* section addresses impacts to Cedar Ridge/Johnny Behind the Rocks, Green Mountain, and Sweetwater Canyon as important recreation features. The *Congressionally Designated Trails – Recreation and Visual Resources* section addresses visual impacts to National Historic and Scenic Trails. This section addresses impacts to the following scenic features: Beaver Rim (entire feature including the existing ACEC), the Twin Creek area, and the Dubois area.

Methods and assumptions used in this impact analysis include the following:

- VRM objectives provide for varying degrees of change (impact) to the visual quality of the landscape. Because VRM planning objectives will be achieved throughout the planning

period, it is assumed that impacts to visual quality would reach the allowable change levels described for the various VRM Class objectives.

- VRI Classes I or II that are designated as VRM Class III or IV constitute an adverse impact to visual resources. This is due to the fact that such a designation exposes these high value scenic resources to a management scenario that allows for moderate to high levels of contrast with the existing characteristic landscape. Whereas VRI Classes III or IV that are designated as VRM I or II marks a beneficial impact to visual resources. This is due to the fact that such a designation exposes these lower value scenic resources to a management scenario that limits the amount of contrast with the existing landscape.
- Areas inventoried at high levels of scenic value and managed under lower VRM Class objectives would, in the long term, assume the characteristics of lower VRM Classes because surface disturbance and visual intrusions would be allowed to degrade visual/scenic quality in those areas. Therefore, long-term shifts in scenic quality in the planning area would be confined to the proposed VRM Classes.
- Surface disturbances will adversely impact visual resources. Surface disturbances will introduce new visual elements onto the landscape or intensify existing visual elements, altering the line, form, color, and/or texture that characterize the existing landscape.
- VRM objectives (in Classes I and II) will be reached more effectively and efficiently through complementary allowable use decisions (e.g., NSOs) that include exception criteria that match the allowable change levels described for VRM Class objectives.
- Higher visual protections will be afforded to scenic ACECs; therefore designating scenic ACECs will benefit the visual resource.

4.5.3.3. Detailed Analysis of Alternatives

4.5.3.3.1. Impacts Common to All Alternatives

Common practice in the VRM planning process allows areas projected for intensive resource uses to be managed as VRM Class IV, despite inventory class information. Reducing acres in the planning area in higher (I or II) inventory classes to accommodate resource uses would adversely impact visual resources.

Closing VRM Classes I and II to surface-disturbing activities (subject to exception criteria that match allowable change levels described in VRM objectives) would preserve and/or protect visual resources to the extent allowable under the VRM Class objectives, with long-term beneficial impacts to scenic quality in these areas.

Managing WSAs as a VRM Class I visual resource would benefit visual resources in these areas.

4.5.3.3.2. Alternative A

4.5.3.3.2.1. Program Management

Alternative A designates nearly 100 percent of VRI Class I areas as Management Class I. Alternative A would result in long-term adverse impacts to visual resources because more acres (79 percent) of VRI Class II is managed at a lower level of scenic quality protection (VRM Class III or IV). Alternative A would subject approximately 75 percent of the planning area to surface-disturbing activities, and in the long term allow moderate to major modifications

to areas with high scenic quality. This would occur in major portions of Beaver Rim, Twin Creek, and Dubois.

4.5.3.3.2.2. Resources

Often during the planning process areas with resource concerns are assigned a higher VRM Class than shown in VRI Classes. This allows VRM to complement the objective of protecting resources. Under Alternative A, 10 percent of VRI Class III or IV area is designated at the higher management Classes of I and II. This is probably due in part to VRM Class II designation in the Castle Gardens area. This designation was placed to primarily dovetail VRM with cultural resource management. The VRM Class II designation in the Castle Gardens area has a beneficial impact on visual resources because it allows an area inventoried at a lower level to be afforded the protections of a higher VRM Class.

4.5.3.3.2.3. Resource Uses

Alternative A allows for impacts to visual resources that would substantially decrease scenic quality across the entire planning area. As a result of Alternative A, 77.4 percent of the planning area is managed at the lowest VRM Class (IV). In addition, this alternative provides for VRM Classes that are not designated in consideration of the spatial relationship between management classes. By mapping VRM Classes in this way, Alternative A would allow areas with higher VRM Classes to be in view of areas with lower VRM Classes. This would allow the visual impacts associated with VRM Class IV areas to impact neighboring VRM Class II areas. Therefore, it is assumed that numerous VRM Class I and II areas would be degraded by management activities in neighboring VRM Class IV areas. Under Alternative A, this impact would occur in all key visual features. Across the entire planning area, this alternative would allow surface-disturbing activities to develop major modifications to the existing character of the landscape, create a high level of change to the characteristic landscape, and dominate the view and be the major focus of the viewers attention.

Adverse impacts to visual resources in the Beaver Rim area could occur because no MLP is applied under Alternative A.

4.5.3.3.2.4. Special Designations

The following ACEC designations under Alternative A would protect scenic resources: Red Canyon, Lander Slope, and Dubois Badlands. ACEC designation would benefit and enhance visual resources only within the boundaries of these areas. The visual resources in the Beaver Rim and Green Mountain areas adjacent to the ACECs could be adversely impacted because those areas are managed with standard oil and gas stipulations.

The *Congressionally Designated Trails – Recreation and Visual Resources* section addresses direct impacts to visual resources associated with Congressionally Designated Trails.

4.5.3.3.3. Alternative B

4.5.3.3.3.1. Program Management

Alternative B allows for major modifications to the existing character of the landscape in 31.6 percent of the planning area; this designation only intersects VRI Class IV areas. This would result in a negligible impact to visual resources, because the designation would not change the visual quality of the landscape. Alternative B designates the fewest acres as VRM Class IV.

Program management under this alternative would protect important visual resources as identified in the inventory and function to support landscape-level protection of resources. This alternative proposes a slight increase in the acreage managed as VRM Class I compared to VRI Class I areas. This alternative designates 100 percent of the VRI Class II as VRM Class I or II; therefore, this alternative has the least adverse impact to visual resources. In addition, Alternative B designates 82 percent of VRI Classes III and IV as VRM Class II. These VRM Classes afford a high level of scenic quality protection on more than half of the planning area. Alternative B would retain most of the visual landscape in the planning area. All key visual features would be managed as VRM Class I or II. This alternative would protect more high value visual landscapes than Alternative A, and would provide improved protection of key visual features in the planning area.

4.5.3.3.3.2. Resources

Resource impacts are similar to those detailed under Alternative A except that Alternative B's limitations on surface disturbance for the benefit of greater sage-grouse would limit adverse impacts to visual resources in a much larger area.

4.5.3.3.3.3. Resource Uses

Common practice in the VRM planning process allows areas projected for intensive resource uses to be managed as VRM Class IV, despite inventory class information. Reducing acres in the planning area in higher (I or II) VRI Classes to accommodate resource uses would adversely impact visual resources. However, this practice does allow for VRM planning decisions to complement resource use needs, thus avoiding future conflicts between resource use decisions and VRM.

Alternative B would result in 31.6 percent of the planning area being managed as VRM Class IV. This designation only encompasses areas inventoried as Class IV. The Class IV area occurs primarily in a blocked area and is flanked by VRM Class III or higher, which provides VRM Classes that consider the spatial relationship between management classes. Alternative B would result in fewer adverse impacts to visual resources from resource uses than Alternative A.

4.5.3.3.3.4. Special Designations

The following ACEC designations under Alternative B would benefit and enhance visual resources in these areas: Lander Slope (including Red Butte and Table Mountain), Red Canyon, South Pass Historic Mining Area, and Sweetwater Rocks/Granite Mountains/Sentinel Rocks. This is more beneficial than Alternative A.

The *Congressionally Designated Trails – Recreation and Visual Resources* section addresses direct impacts to visual resources associated with Congressionally Designated Trails. In addition, Alternative B prescribes the background zone (5 to 15 miles) of NHTs as VRM Class II. This results in an increase of Class II visual resources from inventory levels, which would beneficially impact visual resources associated with trails and non-trails areas.

4.5.3.3.4. Alternative C

4.5.3.3.4.1. Program Management

Alternative C proposes no increase in the area managed as VRM Class I compared to VRI Class I areas. This alternative designates 97 percent of VRI Class II and III areas as VRM Class III or IV. This would allow for major modifications to the existing character of the landscape in more than 66 percent of the planning area. Under this alternative, VRM Class III and IV areas include all key visual resource features. The 1.1 percent of the planning area managed as Class II under Alternative C encompasses only ¼ mile on either side of Congressionally Designated Trails. This alternative would result in more adverse impacts to visual resources than Alternative A.

4.5.3.3.4.2. Resources

Under Alternative C, the 3.4 percent of the planning area designated as VRM Classes I and II is based primarily around WSAs and Congressionally Designated Trails. This alternative designates less area than Alternative A to VRM Classes I and II.

4.5.3.3.4.3. Resource Uses

Alternative C would result in more long-term adverse impacts to visual resources than Alternative A because more acres of VRI Class II would be managed at a lower level of scenic quality protection (VRM Class IV). Alternative C would subject 66 percent of the planning area to surface-disturbing activities, and in the long term allow high value scenic areas to assume impacts characteristic of VRM Class IV. This would occur in major portions of Beaver Rim, Twin Creek, and Dubois areas.

Adverse impacts to visual resources from standard management in the Beaver Rim and Green Mountain areas could occur from oil and gas operations.

4.5.3.3.4.4. Special Designations

Alternative C does not designate any ACECs. This would adversely impact visual resources in areas designated as ACECs under other alternatives. The *Areas of Critical Environmental Concern* section addresses these impacts.

The *Congressionally Designated Trails – Recreation and Visual Resources* section addresses direct impacts to visual resources associated with Congressionally Designated Trails. The areas designated as expanded ACECs under Alternative B would likely be adversely impacted in the same manner as under Alternative A.

4.5.3.3.5. Alternative D

4.5.3.3.5.1. Program Management

Alternative D allows for major modifications to the existing character of the landscape on 29 percent of the planning area; this designation only intersects VRI Class IV areas. This would result in a minor impact to visual resources because the designation would not change the visual quality of the landscape. This alternative designates fewer acres to VRM Class IV than Alternative A, but more than Alternative B.

Program management under this alternative would protect important visual resources as identified in the inventory and function to support landscape-level protection for resources. This alternative proposes a slight increase in the area managed as VRM Class I compared to VRI Class I areas. This alternative designates 82 percent of VRI Class II as VRM Class I or II. Approximately 32 percent of VRI Class III and IV is designated as VRM Class I or II. The VRM Class II designation would beneficially impact visual resources because it would allow areas inventoried at a lower quality to be afforded the protections of a higher VRM Class. The increase in VRM Classes I and II would result in more than one third of the planning area being managed at VRM Classes I and II. Alternative D would retain most of the visual landscape in the planning area. All key visual features would be managed as VRM Class I or II. Therefore, this alternative would protect more visual landscapes than Alternative A, and would provide improved protection of key visual features in the planning area.

4.5.3.3.5.2. Resources

The impacts to visual resources from resource management would be the same as Alternative A.

4.5.3.3.5.3. Resource Uses

Common practice in the VRM planning process allows areas projected for intensive resource uses to be managed as VRM Class IV, despite inventory class information. Reducing acres in the planning area in higher (I or II) VRI Classes to accommodate resource uses would adversely impact visual resources. However, this practice does allow for VRM planning decisions to complement resource use needs, thus avoiding future conflicts between resource use decisions and VRM.

This alternative would result in 18 percent of VRI Classes I and II areas being managed as VRM Class IV; therefore, this alternative would result in fewer adverse impacts to visual resources from other resource uses than Alternative A but more than Alternative B. Alternative D applies an MLP to the Beaver Rim area which would beneficially impact the visual resources in the area by applying an NSO stipulation to the most important visual resources in the area.

4.5.3.3.5.4. Special Designations

The following ACEC designations under Alternative D would benefit and enhance visual resources in those areas: Lander Slope (including Red Butte and Table Mountain), Red Canyon, and South Pass Historic Mining Area.

The *Congressionally Designated Trails – Recreation and Visual Resources* section addresses direct impacts to visual resources associated with Congressionally Designated Trails. This alternative prescribes the background zone (5 to 15 miles) of NHTs as VRM Class II. This results in an increase in the area managed as VRM Class II compared to the VRI Class II area, which would beneficially impact visual resources associated with trails and non-trails areas.

Visual resources in the expanded Green Mountain ACEC would be beneficially impacted by the application of an NSO stipulation for the benefit of the elk calving area since surface disturbance, including building highly visible roads, would be prohibited.

4.6. Land Resources

4.6.1. Lands and Realty

This section describes potential impacts to the lands and realty program from management alternatives. Included in the lands and realty program are land tenure adjustments (e.g., sales, exchanges, acquisitions), land use authorizations (i.e., leases, permits, grants), and withdrawals, classifications, and segregations. Lands and realty actions (land use authorizations) also authorize ROWs and renewable energy; however, the *Rights-of-Way and Corridors* and *Renewable Energy* sections address impacts to these specific resource uses. This section focuses on how management actions could impact the lands and realty program by increasing, limiting, or preventing the potential for realty actions.

The purpose of the lands and realty program is to facilitate management of BLM-administered lands and resources in the planning area. The program adapts according to changing land management, resource needs, demand for public land to meet expanding communities and other public purposes, and other issues. Therefore, lands and realty program actions generally result in beneficial impacts in the planning area in relation to multiple-use objectives.

Adverse impacts to the lands and realty program result from management actions that reduce the available land base or make land tenure adjustments or land use authorizations more difficult. Beneficial impacts to the lands and realty program result from land tenure adjustments that increase land management efficiency or enhance the management of resources through consolidation of public lands into more easily managed blocks. Direct impacts to lands and realty occur when other resources are present, preventing or making it more difficult to complete a transaction. Mitigating resource values required for a land disposal transaction can require further lands and realty actions and increase processing costs and timeframes required to complete the transaction and temporarily delay the transaction. Indirect impacts to the lands and realty program result from management that subsequently affects realty actions, such as the development of parcels transferred out of BLM ownership, which can increase, limit, or prevent the potential for future realty actions. Most impacts to the lands and realty program would be long-term and result from management that allocates land for land tenure adjustments or land use authorizations over the course of the planning period.

Impacts that affect the lands and realty program result from management that increases, limits, or prevents the potential for realty actions. The primary impacts under the alternatives would be associated with lands identified for potential disposal, acquisition, and withdrawal, and management that makes realty actions more difficult to complete. In the past, there has been very little change in land tenure through either disposal or acquisition, and this trend is expected to

continue. Alternative A identifies lands for disposal that, upon review, do not meet the current requirements for disposal because some might have important resources, such as riparian-wetland areas or wildlife values. Otherwise, there is very little difference among the alternatives regarding lands identified for disposal.

4.6.1.1. Summary of Impacts

By Lander Field Office privacy policy, no private lands are identified for acquisition under any alternative, although lands that have been proposed for exchange have been identified for disposal. NEPA analysis of any transfer will be completed, allowing for public input.

The Lander Field Office identified certain state lands for exchange to support resource program objectives. These lands are typically surrounded by BLM-administered public lands and would be managed in the same manner as the public lands. In 2011, the State of Wyoming Office of State Lands and Investments and the WGFD identified the state-owned lands on the Lander Front as suitable for trade for other BLM lands, either in the planning area or elsewhere in Wyoming. Some of these lands had been nominated for lease of the phosphate minerals thought to be located there. These lands are located in the areas on the Lander Front designated by the BLM as ACECs for wildlife and viewshed values. The specifics of the proposal by the State of Wyoming will be memorialized by a written MOU in 2012. The Lander Field Office will pursue these exchanges and conduct NEPA analysis on the transaction. To the extent that BLM-administered lands in the planning area are the subject of the trades and they have not been identified in this land use plan for disposal, the exchange would require an RMP amendment.

No lands are identified for community expansion under any alternative. Certain areas are identified for potential R&PP leases, although there are no current proposals for such leases. These areas are identified in Chapter 2 in the Recreation section and Map 92.

Due to regulatory provisions, decisions regarding whether areas are available for locatable mineral exploration and development are actions in the lands and realty program. Unlike decisions that open or close an area to oil and gas leasing which are managed in the oil and gas program or whether an area is open or closed to livestock grazing which is managed as a range decision, prohibiting locatable mineral actions is pursued through the lands and realty program. Accordingly, limits on uranium or bentonite mining are undertaken as a realty action.

The biggest difference among the alternatives is in the segregation of lands to pursue locatable mineral withdrawal. (For the sake of readability, these lands are discussed here and in other sections as “withdrawn,” although the RMP action is to identify lands to segregate for purposes of withdrawal from mineral entry.) See the discussion under *Management Actions Common to All Alternatives* at the beginning of Chapter 2 and the Mineral Report for further explanation of mineral withdrawals.

The procedural action to withdraw or exchange a property is handled through the realty program, but the reasons for the exchange, disposal, or acquisition and the adverse or beneficial impacts are primarily to other programs (e.g., withdrawals adversely impact the locatable mineral program). Specifics of each proposed withdrawal are analyzed in the sections covering the programs that would initiate the action. For example, withdrawal from locatable mineral entry for protection of elk in the East Fork ACEC is analyzed in the *Areas of Critical Environmental Concern* section. Each resource and use further analyzes the adverse and beneficial impacts of withdrawals on other resources and resource uses.

Alternative A continues withdrawals identified in the 1987 RMP and withdrawn, but proposes no new withdrawals. Under Alternative B, 1,632,605 acres (68 percent of the planning area) are withdrawn. Under Alternative C, no new withdrawals are identified and all existing withdrawals except for the Yermo threatened and endangered species withdrawal are allowed to expire. Under Alternative D, 449,068 acres are pursued for withdrawal.

Withdrawals may result in long-term adverse impacts to the lands and realty program by limiting or restricting lands and realty actions in these areas. Withdrawals revoked or modified could open these public lands to allocation and management under the mining laws. Opening public lands to management and allocation would result in long-term impacts to the lands and realty program by increasing the available land base for land tenure adjustments and land use authorizations.

Table 4.22, “Acreage of Withdrawals in the Lander Planning Area” (p. 1025) summarizes segregations and withdrawals by alternative in the planning area by the resource they protect. In some cases, an area is withdrawn for the protection of more than one resource. Therefore, individual resource withdrawal acres in the table cannot be added to determine total acreage of withdrawal; the final row of the table shows the total acres of withdrawal for each alternative, regardless of resource.

Table 4.22. Acreage of Withdrawals in the Lander Planning Area

	Alternative A	Alternative B	Alternative C	Alternative D
Habitat protection	21,862	1,482,580	0	449,068
Cultural or paleontological value protection	927	563,640	0	352,429
Recreation or visual values and/or visitor protection	355	169,774	0	449,068
Total Withdrawals	23,114	1,632,605	0	449,068
Note: Values do not sum to total due to overlap.				
Source: BLM 2012a				

4.6.1.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- The demand for land-tenure adjustments will increase, but BLM's ability to respond to or to satisfy increased demands for land sales and exchanges will be limited by budget and personnel constraints into the foreseeable future. However, the number of land use authorizations will increase over the course of the planning period.
- Land-tenure adjustments (e.g., disposal and acquisition) focus on disposing of scattered parcels in the planning area to improve management opportunities and increase resource protection and use.
- Existing withdrawals to other federal agencies (i.e., the U.S. Bureau of Reclamation, the U.S. Department of Energy, and the Federal Energy Regulation Commission) will continue and will not vary by alternative. These lands are not analyzed in this chapter.
- The lands and realty program is a support program rather than an environmental component. The program responds to requests for authorizations, permits, leases, land tenure adjustments, etc., from other programs or outside entities. The discussion of impacts to the lands and realty program under each alternative would be limited to the influences on ROW authorizations for other permitted activities; that is, whether the impacts of other resource actions would

influence or modify the location, size, or design of a given proposal or, in some cases, preclude approval of a lands and realty action.

- The priority or the urgency associated with any acquisition is established by the resource program benefiting from the acquisition; funding sources are limited.
- The demand for disposal of public land is very infrequent and primarily to support public purpose (R&PP) lease. Before any disposals, lands would be examined for the presence of high-value resources. Lands with high surface values would not be disposed of, or the disposal would provide for those values to be preserved. Therefore, land disposals would not substantially impact other resource programs.
- The BLM has received expressions of interest by members of the public to exchange privately owned property for public lands. The lands identified for BLM disposal are identified on Map 141. BLM has not analyzed impacts of disposal of these lands because other management decisions to be made in the plan revision will determine whether disposal would be authorized. For example, one of the parcels identified for disposal is within an ACEC in two alternatives but not in the other two alternatives. Whether or not the ACEC is designated will be a major factor to determining whether disposal is appropriate. A site-specific analysis during the implementation phase will then be made.
- Existing withdrawals will be retained throughout the planning period. Whether existing withdrawals will be allowed to expire varies among the alternatives.
- Before any disposals, lands will be examined for the presence of high-value resources. Lands containing high-value resources will not be disposed of, or the disposal would allow for those resources to be preserved.
- Before any potential land disposal, mineral development potential will be evaluated according to FLPMA sections 206 and 209.

4.6.1.3. Detailed Analysis of Alternatives

The alternative analysis for the lands and realty program is summarized above in the *Summary of Impacts* section. The lands and realty program responds to requests that are based on other resources, such as a withdrawal from locatable mineral entry for wildlife. The analysis of that proposal is presented in the *Fish and Wildlife Resources – Wildlife and Locatable Minerals* sections, not in this section. The BLM analyzes land exchanges on a site-specific basis in response to inquiries. The BLM did not analyze the pros or cons of any particular exchange in the RMP, but will do so in response to requests.

4.6.2. Renewable Energy

The May 2001 report of National Energy Policy Development Group (National Energy Policy Development Group 2001), defines renewable energy as energy obtained from sources that are essentially inexhaustible (unlike for example, fossil fuel, of which there is a finite supply; see the *Mineral Resources* section). Renewable sources of energy include conventional hydroelectric power, wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

Renewable energy management actions under the alternatives focus solely on wind energy in the planning area due to the lack of demand in the near future for development of solar and biomass energy. The following assumptions support the approach:

The BLM manages geothermal resources as a leasable mineral; therefore the *Leasable Minerals – Geothermal* section addresses geothermal resources.

If a solar or other type of renewable project is proposed in the future, it would be analyzed under a new NEPA document that would evaluate whether an RMP amendment would be required to approve the action. If the proposal does not meet the objectives of the RMP – for example, a proposed industrial solar project on the south-facing slope of the Dubois Badlands WSA – the project could be denied without evaluating an RMP revision because it clearly would not meet RMP objectives for WSA management. The project could not be approved without an RMP amendment.

Management actions by alternative for renewable energy include the consideration of renewable energy projects throughout the planning area, with consideration of other resource values, and generally to support national energy plans and policies regarding the development of renewable energy projects.

Management actions that limit, prohibit, or otherwise decrease the potential for wind-energy development would result in adverse impacts to renewable energy.

Management actions and resource uses that increase the locations with the potential for renewable energy and do not exclude or avoid wind-energy development would result in beneficial impacts to wind-energy development.

Direct impacts to wind-energy development include management actions that designate wind-energy or renewable-energy avoidance and exclusion areas.

Indirect impacts to wind-energy development include management actions that result in subsequent restrictions, such as management for resource values that require mitigation, relocation, or denial of authorizations for wind-energy development.

4.6.2.1. Summary of Impacts

The following actions would have a long-term impact to wind-energy development: actions that prohibit, or otherwise decrease the potential for wind-energy development; ROW avoidance and exclusion areas; and actions that cannot be mitigated to allow for wind-energy development.

4.6.2.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Future wind-energy development proposals on BLM-administered lands in the planning area are subject to the decisions and policy developed in the BLM *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (BLM 2005a) and ROD. The ROD includes policies and BMPs for minimizing the impacts of wind-energy development on BLM-administered lands. The Programmatic ROD is broad in scope and does not address most site-specific issues.
- Wind-energy demand and development is expected to increase during the planning period, directly related to energy prices, national and state policies regarding renewable energy, and other factors that encourage demand for and development of renewable-energy resources.
- Renewable-energy projects depend on the ability to transmit the energy product. Therefore, there is a direct relationship between the ability for energy transmission and renewable-energy project placement.
- Mapping of areas with wind-energy potential is based on a large-scale nationwide mapping process likely to show a large margin of error if used for specific project location and

prioritization of available renewable-energy development sites. Wind-energy potential in the planning area is described by wind power classification, as shown in Table 4.23, “Wind Power Classification” (p. 1028). This information is derived from U.S. Department of Energy National Renewable Energy Laboratory wind-energy potential data (NREL 2002). Wind-power-class areas comprise large geographic areas, within which there are numerous areas that do not meet the overall resource potential for each wind power class.

Table 4.23. Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 Meters (watts per square meter)	Wind Speed at 50 Meters (meters per second) ¹	Wind Speed (miles per hour)
2	Marginal	200-300	5.6-6.4	12.5-14.3
3	Fair	300-400	6.4-7.0	14.3-15.7
4	Good	400-500	7.0-7.5	15.7-16.8
5	Excellent	500-600	7.5-8.0	16.8-17.9
6	Outstanding	600-800	8.0-8.8	17.9-19.7
7	Superb	>800	>8.8	>19.7

Source: NREL 2002
¹ Wind speeds are based on a Weibull k value of 2.0.
 > greater than

- Lands in the planning area have varying wind-energy potentials. Approximately 104,707 acres have been classified for outstanding and superb potential; 1,546,249 acres have been classified for excellent potential, and 743,254 acres have been classified for good, fair, poor, or marginal potential. For purposes of this analysis, it is assumed that only lands with excellent or better wind potential will be economically feasible for industrial-scale wind-energy generation. The potential for wind-energy development in the planning area will directly relate to the proximity of high wind-power classification areas to transmission lines, and the potential to cause impacts to other resources or resource uses (such as visual resources).
- Ice can accumulate on the blades of wind turbines and occasionally be released. Therefore this analysis assumes that the design of the wind-energy development will close to human presence any area necessary to protect human health and safety.
- Wind energy is the most likely type of renewable energy to be developed in the planning area.
- Increased development of wind-generated energy (or other renewable energy) will also increase the demand for wind-energy development authorizations for transmission lines to distribute produced energy to the electrical grid.
- Management objectives for other resources and resource uses could limit the location and development of wind-energy infrastructure in the planning area.
- Wind-energy development proposals will likely be for areas where there are conflicting resource issues.

Biomass Energy

- Beetle-killed trees are potential stock to generate electricity, either by direct burning or by anaerobic digestion (biomass-generated energy). Because there is no infrastructure for converting the dead trees into energy and because of the large inventory of product from other areas that have experienced severe tree loss, it is not likely that commercial or industrial generation of electrical power from biomass will occur in the planning area.
- Any large-scale use of trees from the public lands would require a site-specific analysis and would depend on technologies and infrastructure that cannot be analyzed in this EIS.

Solar Energy

- As indicated by the exclusion of Wyoming from the Programmatic Solar Energy EIS, Wyoming is not likely to be developed for industrial-scale solar-generated electricity projects. Future solar energy development will be site-specific and individual/commercial in scope.
- On a site-specific basis, solar-generated electricity might be the best source to power electrical equipment for activities such as range improvements. This type of action is allowed within the appropriate program, such as the range improvement program or the wildlife program if a fish gate is being operated, and is not treated as a renewable energy project.

4.6.2.3. Detailed Analysis of Alternatives**4.6.2.3.1. Impacts Common to All Alternatives**

Areas in the NLCS are exclusion areas for wind-energy development by programmatic decision. These areas include WSAs (55,338 acres), the CDNST, NHTs, and eligible and suitable waterway segments proposed for inclusion in the NWSRS. This will influence the locations of wind-energy development projects allowed in the planning area.

The Wind Energy EIS ROD did not identify any buffer for trails (both scenic and historic) that were closed to wind-energy development. Accordingly, the alternatives identify different buffers based on the objectives associated with each alternative. These vary from ¼ mile on either side to exclusions for wind-energy development of 20 miles on each side of the NHTs.

Management under all alternatives will preclude the development of wind-energy projects within the boundaries of NWSRS-eligible waterway segments.

4.6.2.3.2. Alternative A**4.6.2.3.2.1. Program Management**

Alternative A opens 2,113,512 acres for wind-energy development. A total of 215,882 acres are wind-energy exclusion areas and 64,816 acres are wind-energy avoidance areas (Map 97).

4.6.2.3.2.2. Resources

Alternative A soil resource management that avoids disturbing soils with LRP, on slopes, in riparian-wetland areas, or in groundwater recharge areas would restrict the location of or, in some cases, preclude the development of wind energy. Even if these areas were available on a case-by-case basis, it is likely that BMPs or relocation would be required. Approximately 58,179 acres with wind-energy potential are in areas that could be precluded for the protection of soils. Protections for groundwater recharge areas would limit the location or design of some projects, and in situations where these areas would not be avoided, additional BMPs would be applied to prevent contamination of these areas and adversely impact wind-energy development. While adverse impacts to the renewable energy program, they would not be likely to make development infeasible.

Alternative A mitigation measures (i.e., seasonal restrictions to protect wildlife resources and critical habitat) would restrict the timing of surface-disturbing and other disruptive activities, but would not preclude construction at another time of the year. This wildlife management would not adversely impact the renewable energy program.

Alternative A management to protect special status plants by creating keep-out zones (exclusion areas) for wind-energy development would restrict the location and design of wind-energy facilities and in some locations preclude the placement of turbines. However, the only mapped site for threatened and endangered plants is for the desert yellowhead (Yermo), a species which is not in an area considered to have wind-energy potential.

Protection of cultural resources under Alternative A would adversely impact wind-energy development because mitigation measures designed to reduce impacts could require alternate locations. The protection of the setting of sacred/spiritual/TCPs (where the setting contributes to NRHP eligibility) will be achieved through avoidance within ¼ mile of the cultural property. In some cases, wind-energy development would be precluded because it involves high-profile structures with a high level of contrast with setting. Paleontological resource management under Alternative A could restrict the location of wind-energy development to avoid adverse impacts to paleontological values. The location of these resources could limit the placement of facilities or require facilities relocation, but would rarely preclude the action as a whole.

VRM Class I and II restrictions would adversely impact wind-energy development under Alternative A by limiting the amount of contrast that would be allowed. Wind-energy projects and their related transmission lines are linear and often 400 to 500 feet tall. Limitations on contrast related to these most restrictive VRM Classes would adversely impact wind-energy development, although not preclude it depending on a visual contrast simulation. Federal Aviation Administration requirements for air safety mandate that wind turbines be marked to make them highly visible. More contrast is allowed in Class III and IV areas, and these areas would be open to wind-energy development on a case-by-case basis. Acres of VRM Classes under this alternative are as follows: Class I, 57,443; Class II, 202,785; Class III, 222,121; Class IV, 1,853,862; and Class V, 57,995.

4.6.2.3.2.3. Resource Uses

Alternative A management for mineral resources is generally compatible with wind-energy development and might beneficially impact wind-energy development to the extent that ROWs are developed in conjunction with oil and gas or uranium development that would be available for use by wind-energy projects. Travel management that closes areas to motorized vehicle use would adversely impact wind-energy development; however, the areas closed to motorized vehicle travel under Alternative A do not have wind-energy potential. Recreation management precludes or limits ROWs, including wind energy, in developed recreation sites, which would adversely impact wind-energy development.

Alternative A does not designate any ROW corridors, which would adversely impact wind-energy development because the transmission line ROWs would need to be analyzed on a case-by-case basis. However, except for special designations and Beef Gap, Alternative A does not designate ROW exclusion areas, so there would be no other adverse impacts to wind-energy development from ROW management. It is not likely that the Beef Gap ROW exclusion area would impact wind-energy development because required transmission lines would be likely to extend from the area of wind-energy potential in the eastern part of the planning area south to the Gateway

transmission line currently being analyzed in an EIS or north to Casper (a route that would not go through Beef Gap).

4.6.2.3.2.4. Special Designations

Alternative A management to protect resource values in special designation areas would adversely impact wind-energy development by managing certain ACECs as avoidance areas for major ROWs, which would include wind-energy development and related transmission lines. There are 169,229 acres of special designations in Alternative A. All wind-energy proposals in ACECs or other special designations are reviewed on a case-by-case basis, with mitigation measures applied through activity-level planning; proposed wind-energy developments could be denied or required to relocate. Because of the contrast of the very large turbines used by current wind-energy technology, it is not likely that wind-energy projects would meet the VRM objectives for ACECs, Congressionally Designated Trails, and WSRs. While any proposal would need to be analyzed on a site-specific basis (Wind Energy EIS ROD does not specifically exclude wind-energy development in ACECs), management of special designations would likely result in a major and long-term adverse impact to wind-energy development in the planning area. Alternative A protection of Congressionally Designated Trails would adversely impact the renewable energy program by limiting or precluding development within ¼ mile of trails and could limit the places where ROWs may cross NHTs. This would be a long-term adverse impact.

4.6.2.3.3. Alternative B

4.6.2.3.3.1. Program Management

Alternative B opens a total of 41,372 acres for wind-energy development, while 2,328,951 acres are exclusion areas and 23,887 acres are avoidance areas (Map 98).

4.6.2.3.3.2. Resources

Alternative B protections for soil and water resources would result in greater adverse impacts to wind-energy development than Alternative A, because Alternative B protects substantially more areas from surface disturbance. This management would require much more relocation of wind-energy projects and would preclude more projects than Alternative A. Limitations to protect lands with wilderness characteristics under this alternative would result in more adverse impacts from wind-energy development than Alternative A, which does not specially manage these areas. Riparian-wetland management under Alternative B would be likely to require relocations or make some projects impossible that would be allowable under Alternative A.

Management protections for wildlife under Alternative B would result in substantially more adverse impacts to wind-energy projects than under Alternative A, because Alternative B applies more timing restrictions and buffers, and avoids or closes more areas to surface disturbance. Some of these protections would not adversely impact ROWs, because the protections limit only the time of construction and not the ROW authorization. However, ROW exclusion or avoidance areas would result in more adverse impacts to wind-energy development unless, on a case-by-case basis, it could be shown that there would be no adverse impacts to wildlife species. Because there has been relatively little research to identify impacts to wildlife from industrial wind-energy generation, the requirement to show that there would be no impacts to wildlife could preclude most wind-energy development.

Adverse impacts to wind-energy development from the protection of special status plants under Alternative B would be relatively minor, the same as under Alternative A. Adverse impacts from management of special status wildlife, however, would be much greater under Alternative B, because the alternative places substantially more limitations on ROWs and surface disturbance. Particularly regarding protections for greater sage-grouse, Alternative B would open many fewer areas to wind-energy development and place more restrictions on the allowable height of poles or structures where adverse impacts to greater sage-grouse would result. This would restrict or preclude many utility ROWs and turbines. Alternative B surface disturbance limitations and closure of the greater sage-grouse Core Area would close 2,328,951 acres to wind-energy development. In addition, nesting habitat outside the Core Area have limits on the number of energy disturbances and the percent of surface disturbance from any source, including on private and state owned lands, which would require a site-specific analysis to determine if disturbance caps have been reached or would be reached by the wind-energy project. While adverse impacts to wind-energy development cannot be quantified, these limits could preclude wind-energy development outside the Core Area, making adverse impacts to wind-energy development under Alternative B the greatest of any alternative.

Alternative B protection of special status species and other wildlife habitat in the Dubois area not already included in an ACEC would result in many more adverse impacts to wind-energy development than protections under Alternative A. Alternative A manages ACECs in the Dubois area avoidance areas for wind-energy development; Alternative B manages the entire Dubois area as an exclusion area for wind-energy development. This difference in impacts between alternatives A and B could mean little considering other limitations in the area, such as wilderness designations in the Shoshone National Forest.

Because Alternative B includes a much larger avoidance area around the setting of sacred/spiritual/TCPs (where the setting contributes to NRHP eligibility) than Alternative A, Alternative B would result in many more adverse impacts to wind-energy development than Alternative A. Under Alternative B, there would be fewer ROWs and related projects completed due to the increase in distance from the cultural property, but it is not likely that these avoidance areas would preclude most developments. Management of paleontological resources under Alternative B would result in more adverse impacts to ROWs than Alternative A by managing non-ACEC NNLS as exclusion areas for wind-energy development. The demand for ROWs in these areas could be limited, so the degree of adverse impacts to the renewable energy program cannot be determined. However, in the Beaver Rim area, which has wind-energy potential, there could be major adverse impacts to wind-energy development.

Alternative B VRM would result in substantially more adverse impacts to wind-energy development and associated ROWs because many more areas are designated as VRM Classes I and II under Alternative B than under Alternative A, and fewer are designated VRM Classes III and IV. Alternative B acres of VRM Classes are as follows: Class I, 59,317 (2 percent); Class II, 1,284,122 (54 percent); Class III, 292,890 (12 percent); and Class IV, 756,813 (32 percent). While this management under Alternative B would not preclude wind-energy development and ROWs, it would be unlikely that any projects using the high-profile technology currently in use on an industrial scale would meet VRM Class I or II objectives and might not meet Class III objectives, a substantial impact to wind-energy development.

4.6.2.3.3. Resource Uses

Alternative B sharply limits mineral development, which would result in a secondary indirect impact to wind-energy development. Alternative B withdraws 1,609,491 more acres and closes areas that are only avoided under Alternative A. It is not likely that areas closed to mineral development to protect other resources would be made available for wind-energy development, even if wind-energy development is not specifically excluded. Moreover, mineral programs generally require ROWs, including ROWs for power transmission. Alternative B would result in more beneficial impacts to wind-energy development than Alternative A to the extent that Alternative B designates more ROW corridors, which would facilitate transmission lines. However, these beneficial impacts would be outweighed by the adverse impacts from other management under Alternative B, including limiting major ROWs to the designated corridors (an adverse impact) and closing substantially more land to wind-energy development to protect other resources.

Alternative B opens 867 acres with wind potential for industrial wind-energy development and designates major ROW corridors; this would beneficially impact wind-energy projects situated to use these areas and corridors.

Alternative B recreation and travel management would result in more adverse impacts to wind-energy development than Alternative A, Alternative B closes 12 times more acres to motorized vehicle travel than Alternative A; closures to motorized vehicle travel also create exclusion areas for wind-energy development and transmission line ROWs. However, this travel management would not be likely to result in measurable adverse impacts to wind-energy development because, even without motorized vehicle closures, it is not likely that wind-energy development would be authorized because of the values that drive the travel management closures (the areas are ROW exclusionary areas).

4.6.2.3.3.4. Special Designations

Alternative B management to protect ACECs and other special designations would result in substantially more adverse impacts to wind-energy development than Alternative A. Alternative B manages many more areas as exclusion or avoidance areas for wind-energy development and transmission line ROWs, particularly in association with NLCS units. Limitations on locations for crossing Congressionally Designated Trails would be more adverse than Alternative A, which would make north-south transmission lines very difficult. Limits on wind-energy development and its related transmission lines in the buffers around the trails would be much more adverse under Alternative B, although the alternative does allow projects not visible from the trails. With current technology for turbines, it is not likely that wind-energy development would be allowed within trail buffers, and perhaps beyond, depending on a visual contrast rating.

Alternative B extends NWSRS suitability management to more areas than Alternative A, which would adversely impact wind energy, although it is not likely that these waterway segments would have the wind potential suitable for wind-energy development.

4.6.2.3.4. Alternative C

4.6.2.3.4.1. Program Management

Alternative C opens 2,284,235 acres for wind-energy development. A total of 94,157 acres are exclusion areas for wind-energy development and 15,818 acres are avoidance areas for wind-energy development (Map 99).

4.6.2.3.4.2. Resources

Alternative C would result in the fewest adverse impacts to wind-energy development because it restricts surface disturbance less than any other alternative for the protection of soil, water, fish, wildlife, and cultural resources, and substantially less than Alternative B. Alternative C is the same as Alternative A in its lack of special management of lands with wilderness characteristics, so there would be no adverse impacts to the ROW program, of which wind-energy development is a part. This difference could impact wind-energy development if the demand for such development increased in response to management of the Whiskey Mountain area, which has wind-energy potential, under standard stipulations.

Alternative C includes many fewer protections for special status species and therefore would result in many fewer adverse impacts to wind-energy development from this management than any other alternative. However, the BLM must still manage to protect special status species under Alternative C, so these adverse impacts may be only slightly fewer under this alternative. Therefore, even without RMP prescriptions such as limitations on height of structures in the greater sage-grouse Core Area, each project would be considered for adverse impacts in the Core Area and the height of proposed structures would be analyzed. However, management under Alternative C would be likely to accelerate the downward trend in greater sage-grouse populations and would be the most likely alternative to lead to greater sage-grouse listing under the ESA.

Alternative C management for the protection of cultural and paleontological resources is the same as Alternative A. Therefore, impacts to wind-energy development under Alternative C would be the same as under Alternative A, but less than adverse impacts under Alternative B. Alternative C manages fewer areas as VRM Classes I and II and more areas as VRM Classes III and IV than Alternative A or B. Therefore, Alternative C includes many fewer limitations on the wind-energy program, substantially so compared to Alternative B.

4.6.2.3.4.3. Resource Uses

Alternative C closes the fewest areas to mineral development, which would result in secondary beneficial impacts to wind-energy development because there would be more locations for roads, transmission lines, and pipelines. Alternative C designates the most ROW corridors and places the fewest restrictions on ROW locations, including major ROWs, which would beneficially impact wind-energy development. Therefore, Alternative C would result in the fewest adverse impacts to the ROW program (and therefore wind-energy development) of all the alternatives, and would result in substantially fewer adverse impacts than Alternative B. Alternative C would result in the most beneficial impacts to wind-energy development, which can generally be co-located with other resource uses.

Alternative C closes the fewest areas to motorized vehicle travel and has the fewest roads with travel limited to designated roads and trails. Therefore, Alternative C would result in the fewest adverse impacts to ROWs and the most beneficial impacts to wind-energy development by opening the most areas to new ROWs.

Recreation management under Alternative C would not preclude wind-energy development in the areas closed under Alternative B, but is evaluated on a case-by-case basis to evaluate impacts to highly used recreation sites.

4.6.2.3.4.4. Special Designations

Alternative C would result in substantially fewer adverse impacts to wind-energy development in its management of Congressionally Designated Trails because wind-energy development is allowed outside the ¼-mile buffer around the trails. In addition, Alternative C has none of the limitations on crossing the NHTs that are included under Alternative B and, to a lesser extent, would improve the ability to install north-south transmission lines.

Alternative C does not manage any waterway segments as eligible and suitable for inclusion the NWSRS, so there would be no adverse impacts to wind-energy development from these areas management. However, as stated previously, these areas contain little potential for wind-energy development.

The management of special designations under Alternative C would reduce adverse impacts to the wind-energy program compared to the other alternatives. Areas managed as ACECs under alternatives A and B are managed with standard stipulations under Alternative C. Consequently, Alternative C management of areas designated under other alternatives would result in no adverse impacts to wind-energy development. Alternative C allows wind-energy development in 100 percent more special designations than Alternative A and B as well.

4.6.2.3.5. Alternative D

4.6.2.3.5.1. Program Management

Alternative D opens 224,289 acres for wind-energy development; 954,322 acres are renewable energy exclusion areas and 1,215,599 acres are avoidance areas (Map 100). Wind-energy development would have Required Design Features identified to reduce the amount and location of surface disturbance and for other benefits.

4.6.2.3.5.2. Resources

Alternative D would result in more adverse impacts to the renewable energy program than Alternative A, and substantially more than Alternative C, because it includes more restrictions on surface disturbance for the protection of soil, water, and other resources. Alternative D would result in many fewer impacts than Alternative B, because B has more restrictions on surface disturbance for the protection of soil, water and other resources.

The more acres managed for wilderness characteristics, the more adverse impacts to the renewable energy program. Alternative D manages slightly fewer acres of lands with wilderness characteristics as non-WSA lands with wilderness characteristics than Alternative B. The management of these areas could result in substantial adverse impacts to wind-energy

development in the acquired land in the Little Red Creek Complex near Dubois, which has high wind-energy potential.

Protections for wildlife, fish, and special status species under Alternative D would result in more adverse impacts to wind-energy development than Alternative A, and substantially more than Alternative C. Alternative D would result in fewer adverse impacts from wildlife protections than Alternative B, and closes less area to surface disturbance in lands with wind-energy potential than that alternative. This more restrictive management might mean little, because under any alternative, the BLM is required to manage to protect special status species, including greater sage-grouse and raptors and other birds protected by regulation and treaty. However, Alternative D explicit avoidance and closure would result in much more adverse impact to wind-energy development than managing on a case-by-case basis, as under Alternative C.

Alternative D greater sage-grouse management would be much less adverse to wind-energy development than Alternative B, because Alternative D limits the protected area for greater sage-grouse to Core Area while Alternative B applies them to all nesting habitat. Core Area is managed as an avoidance area for wind energy in this alternative, but applications for wind-energy development will be denied in greater sage-grouse avoidance zones until research on the impact of wind energy on greater sage-grouse has been completed and mitigation identified. There are 57,669 more acres of land open with wind development potential in Alternative D compared to Alternative B. In addition, the Alternative D surface disturbance cap for greater sage-grouse Core Area protection is double that of Alternative B (as opposed to alternatives A and C, which have no cap). Like Alternative B, Alternative D limits energy projects, including wind, to one project per section (640 acres). Required Design Features for the benefit of wildlife protections would have additional adverse impacts to the renewable energy program by restricting the size and location of development.

General protections for wildlife and cultural resources and viewshed further restrict wind development beyond limits that would be the result of greater sage-grouse protections by themselves. Because of these overall limitations on development, Alternative D would result in impacts more similar to Alternative B than either Alternative A or C.

Alternative D management of cultural and paleontological resources is similar to that of Alternative A and would result in the same level of adverse impacts to wind-energy development. While some projects might need to be relocated, cultural resource management would not be likely to preclude a wind-energy project. Management of Warm Springs Canyon Flume would theoretically result in fewer adverse impacts to ROWs than Alternative B. However, this difference would not substantially change the impacts because all alternatives manage the area as a ROW exclusion area, which includes wind-energy development, due to slope limitations and the adjoining USFS wilderness areas.

VRM under Alternative D would result in substantial adverse impacts to wind-energy development, even in VRM Class III areas, because of the linear nature of transmission lines and the high profile and dispersed nature of wind-energy developments. This impact would increase the likelihood that wind-energy projects would not meet VRM objectives. Alternative D VRM would result in more adverse impacts to wind-energy development than Alternative A, substantially more than Alternative C, but fewer than Alternative B. It is not possible to quantify this difference because VRM is applied on a case-by-case basis and adverse impacts depend on the degree of contrast. However, in general, the more acres managed as more restrictive VRM Classes, the more adverse the impacts to wind-energy development. Alternative D includes less

restrictive VRM management than Alternative B, and therefore would result in fewer adverse impacts to wind-energy development than Alternative B. Conversely, Alternative D would result in more adverse impacts to wind-energy development than Alternative A and substantially more than Alternative C.

4.6.2.3.5.3. Resource Uses

Alternative D mineral management would result in substantially more adverse impacts to wind-energy development than Alternative C, and somewhat more than Alternative A. Alternative D closes more acres to mineral activity in areas with wind-energy potential, but substantially less than Alternative B. Management of solid mineral leasing, mineral material disposals, and locatable minerals could result in adverse impacts under Alternative D. Under Alternative D, wind-energy development, like oil and gas development, is subject to a 5 percent surface disturbance cap for greater sage-grouse Core Area protection regardless of cause of the disturbance. Disturbances on private and state lands and disturbances on federal lands from phosphate or uranium mining or non-energy ROWs count toward the disturbance caps, which could be a limiting factor for wind-energy development (as is the case for oil and gas development). While it is not possible to calculate the potential for this adverse impact to occur, it is a conflict in management between the renewable energy program and other resource uses that is not present under Alternative A or Alternative C.

Alternative D closes more areas to motorized vehicle travel and avoids more areas for new roads than alternatives A and C, but fewer than Alternative B. However, the areas closed under Alternative D do not have high wind-energy potential, so there would be limited adverse impacts to the renewable energy program.

In addition to managing campgrounds as exclusion areas for wind-energy development and transmission corridors, like Alternative B, Alternative D manages the Beaver Creek Ski Area, the CDNST ERMA, Johnny Behind the Rocks, the Bus @ Baldwin Creek, and the Dubois Mill-Site area as exclusion areas for wind-energy development. This would result in somewhat more adverse impacts to wind-energy development than Alternative A and substantially more than Alternative C. Seasonal restrictions for recreation and travel management are not considered adverse impacts.

4.6.2.3.5.4. Special Designations

There are important differences in impacts to wind-energy development among the alternatives based on their management of special designations. Alternative D considers wind-energy development on a case-by-case basis, except in exclusion areas but as indicated above, there are limits on development for the protection of greater sage-grouse and other values that would apply this case-by-case management to very limited areas in the planning area.

Alternative D management of Congressionally Designated Trails in the NTMC would result in adverse impacts to wind-energy development similar to the impacts from ACEC management under Alternative B, except that no Plan of Operations would be required, which is not an impact to the wind-energy program. Under Alternative D, limitations on large or out-of-scale projects, as well as VRM would adversely impact wind-energy development in a manner very similar to Alternative B. The limits on ROWs under Alternative D would also be a limiting factor for wind-energy development because of the need to connect generated electricity with users.

Alternative D management of NWSRS-eligible and recommended suitable waterways would result in somewhat more adverse impacts to wind-energy development than Alternative A, but the adverse impacts would be limited for the reasons stated under Alternative B.

The greater the extent to which an alternative manages areas as exclusion or avoidance areas for wind-energy development in areas managed as ACECs, the greater the adverse impacts to the renewable energy program. Alternative D ACEC designations contain 80,572 acres with wind-energy potential in exclusion or avoidance areas for wind-energy development; this is substantially fewer acres than Alternative B, but more acres than Alternative A.

4.6.3. Rights-of-Way and Corridors

In accordance with 43 CFR 2801.5(b), ROW means the public lands the BLM authorizes a holder to use or occupy under a grant or authorization. Designated ROW corridor or communication site means a parcel of land with specific boundaries identified as being a preferred location for existing and future ROWs and facilities and for which approval for use will be granted if consistent with corridor management and not in conflict with existing uses. The designated corridor may be suitable to accommodate more than one type of ROW use or facility or one or more ROW uses or facilities that are similar, identical, or compatible. The use of the word “corridor” in this analysis means designated corridors. The alternatives vary in their designation of corridors and the designation of ROW avoidance and exclusion areas.

4.6.3.1. Summary of Impacts

Adverse impacts to ROWs and designated corridors result from management actions for other resources that limit, prohibit, or otherwise decrease the potential for ROWs. When there are restrictions on ROWs, there is an adverse impact to the lands and realty program.

Beneficial impacts to ROWs and designated corridors result from management actions and resource uses that increase the locations open to and with the potential for ROWs and corridors. When there are fewer or no restrictions identified in this analysis, there is a beneficial impact to the lands and realty program.

4.6.3.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- The BLM treats wind-energy projects (test sites and industrial wind-energy development) as ROWs; impacts to wind-energy development are addressed in the *Renewable Energy* section.
- The demand for ROW increases in conjunction with expanded oil and gas, utility, and communications development.
- Corridors and communications sites or ROW-use areas are designated as the preferred future locations for ROWs.
- Temporary and permanent ROWs for smaller distribution facilities for minerals development and transportation, power and telephone services, and access roads are expected to increase depending on the degree of development. Each ROW grant will identify whether the development will be temporary or permanent.
- The impacts of development and designation of transportation and utility ROWs would be mitigated on a case-by-case basis. Generally, this would be accomplished by locating future transportation and utility ROWs adjacent to existing facilities.

- Designated corridors are ½ mile wide, except as specifically identified under an alternative. The corridors will be designated for aboveground and/or underground use.
- Specific proposals will require site-specific environmental analysis and compliance with established permitting processes. Activities generally excluded from ROW corridors include mineral materials disposals, range and wildlife habitat improvements involving surface disturbance and facility construction, campgrounds and public recreation facilities, and other facilities that would attract public use and new oil and gas facilities. ROW facilities will not be placed adjacent to each other if resource conflicts or issues with safety or incompatibility are identified.
- To meet demand for major utility lines, companies will focus on the maintenance and upgrade of existing lines before undertaking new construction of major utility lines.
- New construction of major infrastructure (ROWs) and utility facilities will be based on public need and demand.
- ROWs will be granted to qualified individual, business, or government entities in a manner that protects natural resources associated with public lands and adjacent lands, whether administered by the government or a private entity (43 CFR 2801).
- Existing ROWs and communications sites will be managed to protect valid existing rights.
- The more restrictive VRM, the more adverse the impacts to ROWs. VRM Class I and II visual resources allow very limited to limited visual contrast with the existing landscape, and Class III has some limits on contrast. Accordingly, the more acres managed with lower VRM Classes, the more adverse impacts to ROWs. While VRM does not exclude or avoid areas for ROWs, the lower the VRM Class, the more difficult the placement of a ROW. Adverse impacts to the ROW program from VRM is more severe the larger or higher the proposed action (30-foot wide roads result in less contrast than high-voltage electrical transmission lines).
- Limits on surface-disturbing activities for the protection of other resources would have adverse impacts on ROWs and would limit areas available for corridors. The greater the restriction on surface disturbance, regardless of the resource being protected (soil, water, wildlife, etc.), the greater the adverse impact to ROWs.
- Although not an environmental impact, ROW applicants would benefit from reduced proposal processing time with the application of mitigation measures and BMPs and by co-locating proposed projects in existing disturbance and in specified areas in the planning area. This is considered a benefit to the lands and realty program.

4.6.3.3. Detailed Analysis of Alternatives

4.6.3.3.1. Impacts Common to All Alternatives

The ROD for Designation of Energy Corridors on Bureau of Land Management-Administered Lands in the 11 Western States (DOE and BLM 2008), designated energy corridor 79-216 in the planning area, a beneficial impact to the lands and realty program. All alternatives include corridor 79-216, so it is not further addressed in this section.

Proposed ROWs will be evaluated for location on a case-by-case basis except where an alternative excludes ROWs. Mitigation measures and BMPs will be applied to ensure ROWs are co-located with existing ROWs in existing disturbance where possible. This would adversely impact the ROW program, because it would restrict the location of ROWs in the planning area and could require some proposed projects to be relocated.

Mitigation measures and BMPs are applied to proposed linear ROWs such as fiber-optic cables and low-voltage powerlines to place them along currently established road systems (e.g., interstate or state highways and paved county roads). This would restrict the location of ROWs in the planning area.

The section of the Sweetwater Rocks complex known as Beef Gap is a ROW exclusion area, even if the ROWs would be co-located with existing ROWs.

Protection of grassland and shrubland resources under other programs such as ACECs would result in indirect adverse impacts to the ROW program and corridor development by limiting areas open to surface disturbance. See the *Vegetation – Grassland and Shrubland Communities* section for ROW management in these areas.

WSAs are units of the NLCS and are managed under BLM Manual 6330, *Management of Wilderness Study Areas*, which precludes ROWs and corridors within WSA boundaries.

4.6.3.3.2. Alternative A

4.6.3.3.2.1. Program Management

Under Alternative A, a total of 205,916 acres are ROW exclusion areas and 66,099 acres are ROW avoidance areas.

4.6.3.3.2.2. Resources

Alternative A soil and water management that avoids disturbing soils with LRP, slopes, riparian-wetland areas, or groundwater recharge areas restricts the location of or, in some cases, precludes the development of ROWs. Even if these areas are available on a case-by-case basis, it is likely that BMPs or relocation would be required. Protections for groundwater recharge areas would limit the location or design of some projects, and in situations where these areas would not be avoided, additional BMPs would be applied to prevent contamination to these areas. This would adversely impact ROWs. However, these adverse impacts would not be likely to make an ROW infeasible.

Alternative A mitigation measures (i.e., seasonal restrictions to protect wildlife resources and critical habitat) would restrict the timing of surface-disturbing and other surface-disruptive activities, but would not preclude construction at another time of the year. This wildlife management would not adversely impact ROWs.

Alternative A management to protect special status plants by use of exclusionary areas for ROWs, restricts the location and design of facilities and in some locations precludes placement of ROWs. Mitigation measures (i.e., seasonal restrictions to protect wildlife resources and critical habitat) would restrict the timing of surface-disturbing and other surface-disruptive activities, but this would not adversely impact the location of facilities or the placement of ROWs.

Alternative A protection of cultural resources would adversely impact ROWs because mitigation measures designed to reduce impacts to cultural resources could increase costs or require different locations. The protection of the setting of sacred/spiritual/TCPs (where the setting contributes to NRHP eligibility) would be achieved through avoidance within ¼ mile of the cultural property. In rare cases, ROWs and corridors would be precluded, especially those involving higher-profile

structures. Paleontological resource management could restrict the location of ROWs and corridors to avoid adverse impacts to paleontological values. The location of these resources could limit the placement of facilities or require their relocation, but would rarely preclude the action as a whole.

VRM Class I and II restrictions under Alternative A would adversely impact ROWs by limiting the amount of permissible contrast. ROWs are typically linear and often tall, so limitations on contrast would adversely impact ROW development. More contrast is allowed in Class III and IV areas, and these areas are open for ROWs and corridors on a case-by-case basis. Under Alternative A, 11 percent of the planning area is VRM Class I or II; 89 percent of the planning area is VRM Class III or greater.

4.6.3.3.2.3. Resource Uses

Alternative A management for mineral resources is generally compatible with ROWs and could result in beneficial impacts to ROWs to the extent that ROWs are developed in conjunction with oil and gas or uranium development. Recreation management precludes or limits ROWs in developed recreation sites, an adverse impact to the ROW program. See Chapter 2 for a list of this management and associated acres. Travel management limitations that close areas to motorized vehicle use adversely impact the ROW program. However, Alternative A closes only 5,923 acres to motorized vehicle travel.

4.6.3.3.2.4. Special Designations

Alternative A management to protect resource values in special designation areas would adversely impact the lands and realty program by avoiding certain ACECs for major ROWs unless no other location is possible. All ROWs in ACECs or other special designations are reviewed on a case-by-case basis, with mitigation measures applied through activity-level planning, and may be denied or possibly relocated. This would result in a potential major long-term adverse impact to the lands and realty program. Protections of Congressionally Designated Trails would adversely impact the ROW program by limiting or precluding development within ¼ mile of the trails and could limit the places where ROWs could cross NHTs. This would be a long-term adverse impact.

Under Alternative A, communications facilities are authorized under site-specific leases on a case-by-case basis. ROW avoidance areas are voided for any and all ROWs, including communications sites. Communications sites are located in areas where completed Communication Site Management Plans (Horse Heaven, Atlantic City/South Pass, Crooks Mountain, and Cedar Rim) are located.

4.6.3.3.3. Alternative B

4.6.3.3.3.1. Program Management

Under Alternative B, a total of 1,919,029 acres are ROW exclusion areas and 315,219 acres are ROW avoidance areas. Designated ROW corridors areas make up 15,364 acres, or less than 1 percent of the planning area.

4.6.3.3.2. Resources

Alternative B protections for soil and water resources would adversely impact the ROW program more than Alternative A, because Alternative B protects substantially more areas from surface disturbance. This management would require more relocation of ROWs, would preclude more ROWs, and could require more BMPs and mitigation than Alternative A. In particular, riparian-wetland management under Alternative B would be likely to require the relocation of or exclude some projects that would be available under Alternative A. Limitations to protect lands with wilderness characteristics under Alternative B would have more adverse impacts on ROWs than Alternative A, which does not specially manage these areas.

Management protections for wildlife under Alternative B would result in more adverse impacts to ROWs than Alternative A, because Alternative B applies more timing restrictions and distances and makes more areas ROW avoidance or exclusion areas. While some of these protections would not adversely impact ROWs because they limit only the time of construction and not the ROW authorization, the areas that are ROW avoidance or exclusion areas would adversely impact the lands and realty program unless, on a case-by-case basis, it can be shown that there would be no impacts to the species.

Adverse impacts to ROWs from protection of special status plants under Alternative B would be the same as under Alternative A. Adverse impacts from management of special status wildlife would be much greater under Alternative B than under Alternative A because Alternative B places substantially more limitations on ROWs. Particularly regarding protections for greater sage-grouse, Alternative B opens fewer areas to ROWs and places more restrictions on the allowable height of poles or structures. This would restrict or preclude many utility ROWs. Alternative B management to remove duplicative roads also would adversely impact ROWs.

Alternative B protection of special status species and other wildlife habitat in the Dubois area not already included in an ACEC would be much more adverse to ROWs than Alternative A, because only ACECs in this area are ROW avoidance areas while the entire Dubois area is an exclusion area for major ROWs. The importance of this difference might mean little considering the low demand for major ROWs and the fact that minor ROWs are still allowed although avoided.

Because Alternative B includes a substantially larger ROW avoidance area around the setting of sacred/spiritual/TCPs (where the setting contributes to NRHP eligibility) than Alternative A, adverse impacts to ROWs would be substantially greater. There would be fewer ROWs and corridor projects completed due to the increase in distance from the cultural property, but it would not be likely that such avoidance would preclude most developments. Management of paleontological resources under Alternative B would result in more adverse impacts to ROWs than Alternative A by excluding non-ACEC NNLs from ROWs. The demand for ROWs in these areas might be limited, so the degree of adverse impacts to the lands and realty program cannot be determined. However, in the Beaver Rim area, there could be substantial adverse impacts to ROWs.

Alternative B VRM would result in substantially more adverse impacts to ROWs than Alternative A, because Alternative B designates many more areas as VRM Classes I and II and designates fewer areas as VRM Classes III and Class IV. Alternative B manages 56 percent of the planning area as VRM Classes I or II and 44 percent as Classes III and IV.

4.6.3.3.3. Resource Uses

Mineral development is much more limited under Alternative B than Alternative A, which would result in secondary adverse impacts to the ROW program because it limits the areas where ROWs for oil and gas, uranium, and other development can occur. Primarily, these limits are to protect the resources described above, such as greater sage-grouse or soils. Alternative B would result in more beneficial impacts to the ROW program than Alternative A to the extent that Alternative B designates more corridors. While these beneficial impacts could be outweighed by adverse impacts from other management, including limiting major ROWs to the designated corridors (an adverse impact), Alternative B would facilitate the approval of ROWs within designated corridors.

Alternative B recreation and travel management would result in more adverse impacts to ROWs because the alternative includes more areas as ROW exclusion areas, including areas that are only avoided under Alternative A, and closes more areas to motorized vehicle travel, which prohibits ROWs in the areas. Alternative B closes 2.7 percent more of the planning area to motorized vehicle travel than Alternative A.

4.6.3.3.4. Special Designations

Alternative B management to protect ACECs and special designations would result in many more adverse impacts to ROWs than Alternative A. Alternative B manages substantially more areas as ROW and wind-energy development avoidance and exclusion areas, particularly in association with NLCS units, and would require project relocations in many areas. Alternative B opens only 867 acres with wind-energy potential to development. Alternative B closes the remaining areas of high wind-energy potential due to special designations. Alternative B limitations on locations for crossing Congressionally Designated Trails would result in more adverse impacts to ROWs than Alternative A. Limits on ROWs in the buffers around trails would result in greater adverse impacts to ROWs, although ROWs that cannot be seen from trails are allowed. Alternative B trails management for highly visible projects, such as high-voltage transmission lines, would result in major adverse impacts to ROWs. Alternative B management of NWSRS-eligible waterways managed as suitable for inclusion in the NWSRS makes more acres (9,919) exclusion areas for wind-energy development and transmission lines.

Alternative B allows major ROWs in the following locations: Lost Creek Corridor, which runs north-south from Wamsutter to Lysite (approximately $\frac{1}{4}$ mile wide, except near NHTs, where it is 400 feet wide); approximately 10 miles of corridor connecting Lost Creek and the Casper Field Office designated corridor; and corridor 79-216 with a 3,500-foot width. While ROWs in these corridors would be processed faster, a benefit, no ROWs would be approved anywhere else in the planning area, which would adversely impact the ROW program compared to Alternative A.

Under Alternative B, communications facilities will be co-located within the following existing sites: Atlantic City, Black Rock, Cedar Rim, Crooks Mountain, Gun Barrel, Horse Heaven, and Muskrat. This would restrict the location of communications sites in other areas, and adversely impact the lands and realty program compared to Alternative A.

4.6.3.3.4. Alternative C

4.6.3.3.4.1. Program Management

Under Alternative C, a total of 147,053 acres are ROW and corridor-development exclusion areas, 11,714 acres are ROW and corridor-development avoidance areas, 660,908 acres are designated as corridors, and the remainder of the planning area is open for ROW and corridor development.

Alternative C allows major utility ROWs in designated corridors and almost everywhere else on a case-by-case basis. Designated corridors up to 3 miles wide are allowed in Alcova Boysen Transmission Line, Beaver Creek CO₂, Beaver Creek North to the Reservation, Bison Basin Road, Colorado Interstate Gas near Muddy Gap, Frontier-Exxon-Anadarko, Highway 20/26, KN East West Gas Pipeline, Lost Creek, PP&L powerline, Shoshoni-Badwater, Sinclair near Pathfinder Reservoir, WAPA – Pacificorp Transmission, and West Wide.

Alternative C places the fewest restrictions on ROWs and would result in the fewest adverse impacts to ROWs, including corridors, of all alternatives.

Alternative C allows communications facilities under site-specific leases on a case-by-case basis, and does not require them to be co-located. This is the least restrictive of the alternatives, and would result in the most beneficial impacts to ROWs.

The most important difference in impacts to the ROW program under Alternative C is in its management of special designations. Areas managed as ACECs under alternatives A and B, including ROW avoidance and exclusion areas are managed with standard stipulations under Alternative C. Consequently, Alternative C ACEC management would not adversely impact ROWs. This is unlike Alternative A, which would result in moderate adverse impacts, and Alternative B, which would result in major adverse impacts. Although the actual effect of these differences would depend on demand for ROWs in areas managed as ACECs under other alternatives, in at least some areas (e.g., Beaver Rim and South Pass), the demand could be high and the difference important.

4.6.3.3.4.2. Resources

Alternative C would result in the fewest adverse impacts to the ROW program because it restricts surface disturbance less than any other alternative for the protection of soil, water, and other resources, and substantially less than Alternative B. Alternative C is the same as Alternative A in its lack of special management of lands with wilderness characteristics, so it would not adversely impact the ROW program through that management. The absence of such management could limit adverse impacts to the ROW program if demand for ROWs to access forest resources in the acquired land in the Little Red Creek Complex near Dubois increases.

Protections for fish, wildlife, and special status species under Alternative C would result in fewer adverse impacts to the ROW program than any other alternative. Therefore, those protections would be less likely to result in a change in location or design of ROWs than Alternative B. The difference in adverse impacts between alternatives A and C would likely mean little, because under all alternatives the BLM must specially manage to protect special status species. Therefore, even without RMP prescriptions such as limitations on the height of structures in greater sage-grouse Core Area, the BLM would consider each site-specific project for adverse impacts in the Core Area and would analyze the height of proposed structures. Across the planning area,

Alternative C would result in the fewest restrictions for the benefit of resources and therefore would result in the fewest adverse impacts to the ROW program. However, management under Alternative C would be likely to accelerate the downward trend in greater sage-grouse populations and would be the alternative most likely to lead to greater sage-grouse listing under the ESA.

Alternative C management for the protection of cultural and paleontological resources is the same as Alternative A, so adverse impacts to ROWs would be the same as under Alternative A and less than under Alternative B. Alternative C manages fewer areas as VRM Classes I and II and more areas as VRM Classes III and IV than alternatives A and B. Therefore, Alternative C places many fewer limitations on the ROW program. See the *Visual Resources* section for acres of VRM Classes under Alternative C.

4.6.3.3.4.3. Resource Uses

Alternative C designates the most corridors and places the fewest restrictions on ROW locations, including major ROWs. Therefore, Alternative C would result in the fewest adverse impacts to the ROW program of all of the alternatives, and substantially fewer adverse impacts than Alternative B.

Under Alternative C, no ROWs or corridors will be considered in the following developed recreation sites: Atlantic City Campground, 181 acres; Big Atlantic Gulch, 181 acres; Cottonwood Campground, 80 acres; lands adjacent to the Fremont County Campground, 20 acres; Miners Delight, 239 acres; and Wildhorse Point, 20 acres.

Under Alternative C, limitations for ROWs will be evaluated on a case-by-case basis in the following areas: the Beaver Creek Ski Area, the CDNST ERMA, Johnny Behind the Rocks, the Bus @ Baldwin Creek, the Dubois Mill-Site area, including the Muskrat Basin ERMA of Mule Deer hunt area 90 and Antelope hunt area 67 and the Agate Flats ERMA of Antelope hunt areas 68, 69, and 106.

Alternative C closes the fewest areas to motorized vehicle travel and includes the fewest roads with travel limited to designated roads and trails. Therefore, Alternative C would result in the fewest adverse impacts to ROWs.

4.6.3.3.4.4. Special Designations

Alternative C would result in fewer adverse impacts to the ROW program in its management of the Congressionally Designated Trails because only the ¼-mile buffer on each side of trails is excluded to ROWs. In the case of NHT management, this difference would be substantial due to the very large area closed to trails crossings and the broad buffer around trails under Alternative B. In addition, management of the CDNST requires moving the trail if there is a conflict with another use and safety issues are involved. This management would be beneficial to the ROW program, and substantially beneficial compared to Alternative B.

4.6.3.3.5. Alternative D

4.6.3.3.5.1. Program Management

Under Alternative D, a total of 417,426 acres are ROW and corridor-development exclusion areas, 1,369,300 acres are ROW and corridor-development avoidance areas, 103,646 acres are

designated as corridors, and the remainder of the planning areas is open for corridors on a case-by-case basis, but the burden is on the proponent to establish that the use of a designated corridor is not possible.

4.6.3.3.5.2. Resources

Alternative D would result in more adverse impacts to the ROW program than Alternative A, and substantially more than Alternative C, because Alternative D places more restrictions on surface disturbance for the protection of soil, water, and other resources than alternatives A and C, but substantially fewer than Alternative B. Alternative D manages slightly fewer acres of lands with wilderness characteristics as non-WSA lands with wilderness characteristics than Alternative B.

Alternative D protections for fish, wildlife and special status species would result in more adverse impacts to the ROW program than Alternative A, and substantially more than Alternative C, which is likely to result in a need to change the location or design of ROWs than alternatives A and C. Alternative D would result in fewer adverse impacts than Alternative B from wildlife protections. However, in effect, this more restrictive management might mean little because under all alternatives the BLM must specially manage to protect special status species. Therefore, even without RMP prescriptions such as limitations on the heights of structures in the Core Area, the BLM would consider each site-specific project for adverse impacts in the Core Area and analyze the height of proposed structures. Avoiding ROWs in Core Area would result in far fewer adverse impacts than Alternative B. The one area in which Alternative D management of special status species could result in substantially less adverse impact to the ROW program than Alternative B is that greater sage-grouse Core Area surface disturbance calculations are applied only to energy ROWs and transmission lines and not to other ROWs. However, the disturbance associated with all ROWs could limit mineral development which in turn would adversely impact the demand for ROWs. This is analyzed in detail in the *Renewable Energy* section.

The Required Design Features to limit adverse impacts associated with surface disturbance as well as those that require aggressive reclamation would adversely impact the ROW program. However, measures to minimize disturbance footprints would reduce the cost of reclamation. These limits, coupled with strict avoidance criteria would make the adverse impacts more similar to Alternative B than to Alternative A.

Alternative D management of cultural and paleontological resources is similar to Alternative A and would result in the same adverse impacts. ROWs could need to be relocated, but cultural resource management would not be likely to preclude ROWs. Management of Warm Springs Canyon Flume could result in fewer adverse impacts to ROWs under Alternative D than under Alternative B, but the difference would mean little because the area is a ROW avoidance area under all alternatives due to slope limitations and adjoining USFS wilderness areas. The management of the Lander Front-Hudson-Atlantic City area would result in adverse impacts that are similar to but slightly less than the impacts that would result under Alternative B.

Alternative D would result in more adverse impacts to ROWs from VRM than Alternative A, substantially more than Alternative C, and fewer than Alternative B. It is not possible to quantify this difference because VRM is applied on a case-by-case basis and adverse impacts would depend on the degree of contrast. However, the more acres managed for more restrictive VRM objectives, the more adverse the impacts to ROWs. See the *Visual Resources* section for a comparison of the numbers of acres in each VRM Class. VRM can often result in substantial adverse impacts to the ROW program, even in Class III areas, because of the linear nature of

ROWs and, in the case of powerlines, their high profile, which increases the likelihood that the ROW would not meet VRM objectives.

4.6.3.3.5.3. Resource Uses

Minerals management under Alternative D would result in adverse impacts to ROWs similar to but less intense than the impacts under Alternative B. The demand for ROWs is, in substantial part, directly related to development of minerals. As development is reduced the demand for ROWs is also reduced.

Alternative D designates more corridors and places fewer restrictions on ROW locations, including major ROWs, than Alternative B, and therefore would result in fewer adverse impacts than Alternative B. Although Alternative D designates more corridors than Alternative A and in that regard would result in more beneficial impacts to the ROW program than Alternative A, Alternative D manages more areas as ROW exclusion areas than Alternative A, which would offset this beneficial impact. Alternative D allows major utility ROWs in designated corridors and in other places under some limited circumstances. Designated corridors up to ½ mile wide are allowed except where the corridor crosses an NHT, where it could be only ¼ mile wide or less. With the exception of Alternative B, these substantial restrictions would result in the greatest adverse impacts to ROWs.

Recreation management in Alternative D, in addition to the closure of campgrounds to ROWs and corridors common to all alternatives, excludes the Beaver Creek Ski Area, the CDNST ERMA, Johnny Behind the Rocks, the Bus @ Baldwin Creek, and the Dubois Mill-Site area to ROWs, which would result in more adverse impacts to the ROW program than Alternative A, and substantially more than Alternative C. Seasonal restrictions for recreation and travel management are not adverse environmental impacts.

Alternative D closes more areas to motorized vehicle travel and avoids more areas for new roads than alternatives A and C, but fewer than Alternative B. The more ROW avoidance and exclusion areas, the greater the adverse impacts to the ROW program.

Alternative D identifies more sites for co-location of communications facilities, and therefore would result in more beneficial impacts to the ROW program than alternatives A, B, and C, even though Alternative D closes two sites included under Alternative B when the existing leases expire. Alternative D also would result in more beneficial impacts than Alternative B because other locations would be considered for communications sites if the designated sites are unsuitable, whereas no additional sites will be allowed under Alternative B. Alternative D would result in more adverse impacts than Alternative A or Alternative C, which consider new communications site locations. Alternative D consolidates communication sites, thus fewer new sites are authorized.

4.6.3.3.5.4. Special Designations

Special designations would result in adverse impacts to ROWs that are similar to those under Alternative B, but more limited in degree.

Alternative D management of Congressionally Designated Trails as the NTMC would result in similar adverse impacts to ROWs as Alternative B, although less severe because an additional designated corridor in the Bison Basin Road area allows the Congressionally Designated Trails to

be crossed. Alternative D would result in impacts more severe than Alternative A. Alternative D would result in substantially more adverse impacts both in where trails may be crossed and the buffer in which ROWs are excluded. Alternative D also includes special management for major ROWs in the viewshed of trails, which would adversely impact ROWs much more than under Alternative A. However, Alternative D would result in fewer adverse impacts than Alternative B, potentially substantially fewer.

The more an alternative manages ACECs as ROW avoidance or exclusion areas, the greater the adverse impacts to the ROW program. Alternative D designates more areas as ACECs than Alternative A and would therefore result in more adverse impacts. Moreover, Alternative D manages some ACECs (the Dubois ACECs, the South Pass Historical Landscape ACEC, Red Canyon, and the Lander Slope ACECs) as ROW exclusion areas, which would result in greater adverse impacts. This management is similar to the ROW management in Alternative B; as noted above, the adverse impact to the ROW program depends upon the demand for ROWs which has historically been relatively low. Alternative D would result in far more adverse impacts than would result from ROW management under Alternative C. Alternative D management of ACECs includes 21 percent more avoidance areas than Alternative A and 1 percent fewer than Alternative B. Alternative D includes .011 percent fewer acres of ROW exclusion areas, than Alternative B. The actual impact would, again, depend on the degree to which there is demand for ROWs; if there is no demand there would be no adverse impact from ROW avoidance or exclusion areas.

4.6.4. Comprehensive Trails and Travel Management

The travel system is managed to achieve the goals and objectives of each alternative and to provide for appropriate public access. This program is considered a support function for all BLM programs. Therefore, the goals of the trails and travel management program (as discussed in Executive Order 11644 and 43 CFR 8340) are as follows:

- Provide and improve sustainable access for public needs and experiences.
- Protect natural resources and settings.
- Minimize conflicts among the various users of BLM-administered lands.

As a result of the (sometimes divergent) program goals discussed above, impacts to travel management cannot be completely labeled as adverse or beneficial; instead impacts to travel management represent a given areas travel management focus or priority. To facilitate impact analysis of the various alternatives, the following impact parameters would be the focus of this analysis:

- The minimum standard for protecting natural resources is planning for route densities and locations that meet or exceed Wyoming Standards for Healthy Rangelands. Travel management to protect resources beyond the minimum is considered an increased resource protection focus. Areas with an increased protection focus will be managed to meet minimum standards for providing sustainable access for public needs and experiences. When conflicts between travel and resources exist within this area, travel would be constrained by the needs of the resource(s). Such a decision would result in a beneficial impact to the comprehensive trail and travel management goal of protecting natural resources, but would result in an adverse impact to visitor access.
- The minimum standard for providing sustainable access for public needs and experiences is planning for route densities and locations in consideration of primary travelers. Travel management to enhance access beyond the minimum objective is considered an increased

access focus. Areas with an increased access focus will be managed to meet minimum standards for protecting resources. When conflicts between travel and resources exist within this area, impacts to resources may occur (within the limitations of existing laws and policies) to accommodate access. Such a decision would result in a beneficial impact to the comprehensive trail and travel management goal of providing access, but would result in an adverse impact to the protection of resources.

4.6.4.1. Summary of Impacts

Table 4.24, “Travel Designations by Alternative” (p. 1049), Table 4.25, “Areas Closed to Motorized Vehicles by Alternative” (p. 1050), Table 4.26, “Acres Designated for Over-Snow Travel” (p. 1050) and Table 4.27, “Acres Designated for Mechanized (Bicycle) Travel” (p. 1050) list travel designations by alternative. In addition to the impacts discussed in the introduction section of this section; areas closed or limited to a specific type of travel represent an adverse impact to that mode of travel. The overall impact to travel management from such decisions may be offset due to the fact that a closure may benefit another form of travel, such as a closure to motorized travel which would beneficially impact nonmotorized travel. The tables below summarize the travel designations by alternative for all forms of travel.

Table 4.24. Travel Designations by Alternative

Trails and Travel Management	Alternative A	Alternative B	Alternative C	Alternative D
Acres open to cross-country travel	0	0	0	0
Acres limited to existing routes ¹	2,226,504	2,128,741	2,337,958	2,213,081
Acres limited to designated routes	163,075	193,704	50,776	154,772
Acres limited seasonally	111,002	116,805	0	110,530
Acres closed to motorized vehicle use	5,923	71,761	5,472	26,357
Total Planning Area Acres	2,394,210	2,394,210	2,394,210	2,394,210

Source: BLM 2012a

¹This designation is an interim designation until route-specific planning can occur, at which time motorized travel in the area will be limited to designated roads and trails.

Table 4.25. Areas Closed to Motorized Vehicles by Alternative

Location	Alternative A Acres Closed	Alternative B Acres Closed	Alternative C Acres Closed	Alternative D Acres Closed
Castle Gardens	78	8,469	0	Same as Alternative C
Copper Mountain Wilderness Study Area	0	6,936	0	Same as Alternative B
Dubois Badlands	4,561	4,561	0	Same as Alternative B
Lankin Dome	0	6,347	0	Same as Alternative A
Miller Spring	0	6,697	0	Same as Alternative A
Savage Peak	0	7,178	0	Same as Alternative A
Split Rock	0	13,964	0	Same as Alternative A
Sweetwater Canyon	0	9,135	0	Same as Alternative A
Whiskey Mountain	0	519	0	Same as Alternative B
Bus @ Baldwin Creek	0	1,159	0	Same as Alternative B
Dubois Mill Site	0	608	0	Same as Alternative B
Johnny Behind The Rocks (Cedar Rim)	0	5,594	0	Same as Alternative B
Sinks Canyon Climbing	0	139	0	Same as Alternative B
Little Red Creek Complex	0	5,490	0	4,954
Baldwin Creek Canyon	0	2,349		Same as Alternative B
Total (Percent of Planning Area)	0.2	3	0	1

Source: BLM 2012a

Table 4.26. Acres Designated for Over-Snow Travel

Designation	Alternative A	Alternative B	Alternative C	Alternative D
Closed	14,729	181,173	0	70,425
Limited	0	0	0	0
Open	2,379,481	2,213,037	2,394,210	2,323,785

Source: BLM 2012a

Table 4.27. Acres Designated for Mechanized (Bicycle) Travel

Designation	Alternative A	Alternative B	Alternative C	Alternative D
Closed	0	63,379	0	7,660
Limited	0	201,064	0	166,789
Open	2,394,210	2,129,767	2,394,210	2,219,622

Source: BLM 2012a

4.6.4.2. Methods and Assumptions

This section analyzes potential impacts to public access and travel from management actions and allowable uses under the various programs. Travel designations support resource management programs and are designed to help achieve other program objectives. The land use emphasis for each area guides travel designations. Therefore, proposed travel designations will adhere to the management prescriptions under each alternative, while also aligning with the theme of each

alternative. Impacts to other resources and resource uses from trails and travel management are addressed in resource-specific sections of this chapter.

As explained in Chapter 2, this RMP classifies all BLM-administered lands as open, limited, or closed to motorized travel activities. For areas classified as limited, the RMP designates: the modes of travel (e.g., foot, horseback, mechanized, and motorized); limitations on time or season of use; limitations to certain types of vehicles (i.e., OHVs, motorcycles, all-terrain vehicles; mechanized defined as mountain bikes only); limitations to licensed or permitted vehicles or users; limitations to BLM administrative use only; or other types of limitations. The following discussion of impacts on trails and travel management focuses on management actions and allowable uses that restrict or facilitate travel opportunities. Management actions for the following programs would have the potential to impact travel opportunities: lands with wilderness characteristics, fish and wildlife, VRM, cultural resources, recreation, and special designations.

Methods and assumptions used in this impact analysis include the following:

- All types and modes of travel, designations, and limitations associated with public access are analyzed.
- The proposed travel designations would not affect ROW holders, permitted uses, county or state roads, or other valid existing rights. Travel closures/limitations apply only to public access.
- The demand to increase travel routes on BLM-administered lands will continue to increase throughout the planning period, especially near communities.
- The incidence of resource damage and conflicts among mechanized, motorized, and nonmotorized activities would increase with increasing use of BLM-administered lands.
- A travel management plan is not intended to provide evidence bearing on or addressing the validity of any Revised Statute (R.S.) 2477 assertions. R.S. 2477 rights are adjudicated through a separate judicial and administrative process entirely independent of the BLM planning process. Consequently, travel management planning will not consider R.S. 2477 assertions or evidence. Travel management planning will be founded on independently determined purpose and need that is based on resource uses and associated access to public lands and waters. At such time as a decision is made on R.S. 2477 assertions, the BLM will adjust its travel routes accordingly.
- Impacts to travel management occur from both limitations (e.g., wildlife stipulations, special designations, and cultural resources) and permitted uses (e.g., oil and gas development, livestock grazing, and mining).
- Due to substantial increases in use and the development of new vehicle technologies, designation of large areas as open to cross-country travel is no longer a viable management strategy. There is no motorized/mechanized cross-country travel in areas designated as limited or closed (excluding game-retrieval carts). Exceptions for motorized cross-country travel can be included in the terms and conditions of a lease or permit or by separate written authorization.
- In areas with limited-travel designations, motorized/mechanized travel is allowed up to 300 feet from designated motorized/mechanized routes for direct, not cross-country, access to dispersed campsites, provided no resource damage occurs, no new routes are created, and such access is not otherwise prohibited by the BLM Field Manager.
- Foot and horse (equestrian) access will not be restricted by travel designations that limit or prohibit motorized/mechanized travel, and foot and horse access will be allowed on all routes open to motorized and mechanized uses, unless otherwise specified.

- Administrative use authorizations are granted on a case-by-case basis, with approval from the BLM Authorized Officer.
- New routes, reroutes, or closures to the travel network in the limited areas will be changed through activity-level planning with site-specific NEPA analyses.

4.6.4.3. Detailed Analysis of Alternatives

4.6.4.3.1. Impacts Common to All Alternatives

Program management actions identified as common to all alternatives would impact trails and travel management. Small closure areas (such as Rocky Ridge), limiting the distance allowed for big game carcass retrieval, and not allowing motorized travel on groomed nonmotorized winter trails would enhance the protection of resources, enhance visitor safety, enhance nonmotorized recreation, and minimize motorized vehicle conflicts with nonmotorized users. These actions also would result in reduced motorized access in small areas and on random occasions where topography is conducive (such as flat terrain and unsaturated soils) to carcass retrieval with a motorized vehicle.

In addition, several actions common to all alternatives provide for flexibility in the travel management program. These actions will allow the program to be responsive to public needs and emerging issues in the planning area.

All travel management areas in the planning area will provide route densities, locations, and/or visitor information to promote the safety of public land users and minimize resource use/user conflicts. This would allow the travel program to minimize conflicts among the various users of BLM-administered lands and promote the safety of public land users. These objectives could result in some instances where access is limited; however, this will occur through project planning and access impacts would be mitigated wherever possible.

Under all alternatives, impacts to travel would be minor and short-term along unpaved travel routes (i.e., improved roads, single-track routes, mechanized trails) that require road-surfacing-related dust abatement measures. Travelers encountering these measures in process could experience some travel delays or rerouting around the affected road sections during dust abatement and maintenance projects.

Across all alternatives at the implementation level, new route construction and existing route maintenance will be limited by design features to reduce the impacts of surface-disturbing activities on resources, resulting in some restrictions to transportation planning and access. Prohibition of surface-disturbing activities and NSO, CSU, and TLS stipulations would limit the ability of the travel program to develop a travel system that meets resource protection and resource use needs. These stipulations would narrow the options and flexibility in the travel program. In addition, TLS stipulations would restrict maintenance operations to periods when activities would be less effective due to dryer temperatures and dry soils. It is assumed that travel management decisions will reflect and benefit resource values in most areas. Therefore it is assumed that exceptions will be granted to allow for a travel system that meets planning objectives. Despite exceptions for travel management actions to protect resources, it is assumed that allowable use stipulations would limit travel planning options and flexibility to address user conflicts and/or enhance recreation opportunities. This limitation on options and flexibility will occur and correspond with areas where there are moderate and major constraints for oil and

gas development, in addition to areas closed to oil and gas development (with the exception of SRMAs managed for enhanced recreation opportunities).

Limitations on motorized vehicle use and closures would reduce motorized access to the areas where these decisions are applied to protect resources or enhance nonmotorized recreation experiences. Reductions in motorized access also would result in reduced access and opportunities for handicapped or physically challenged individuals. This would especially affect individuals who depend on motorized vehicles for participation in activities. These adverse impacts would be offset somewhat by the recreation management action that would allow individuals possessing a valid WGFD disabled hunter permit or disabled hunter companion permit to use cross-country motorized travel (in all areas except those closed to motorized travel) to retrieve big game carcasses. In addition, management decisions exempt from travel management restrictions (outside closed areas) scooters or wheelchairs used by holders of valid permits.

4.6.4.3.2. Alternative A

4.6.4.3.2.1. Program Management

Based on travel management objectives for specific areas, Alternative A would result in travel management systems that provide an increased resource protection focus over 185,253 acres, or approximately 8 percent of the planning area (Table 4.28, “Travel Management Focus under Alternative A” (p. 1053)). In contrast, management objectives for the remainder of the planning area would result in travel management systems that provide increased access focus on 2,208,957 acres, or 92 percent of the planning area. The assignments of these objectives is based primarily on program needs to protect resources or enhance resource uses. In addition, the assignment of acres for increased resource protection focus recognizes intensive commitments of financial and operational resources for implementation. It is feasible that as implementation was finalized on the 185,253 acres, additional acres within the 2,208,957 acres would move toward an increased resource protection focus.

Table 4.28. Travel Management Focus under Alternative A

Alternative A Travel Management Area Focus	Acres
Increased Access Focus and Minimum Standard for Resource Protection	2,208,957
Increased Resource Protection Focus and Minimum Standard for Access	185,253
Source: BLM 2012a	

In areas not identified as closed or limited to designated roads and trails, this alternative allows for cross-country motorized travel to perform necessary tasks. This would compromise enforcement of travel decisions, placing on the BLM the burden to prove that travel management violations are not occurring to facilitate a necessary task. In addition, this allowance was developed during a period when motorized vehicle use typically involved trucks. Today motorized vehicle use involves a multitude of different vehicles, resulting in variable impacts to resources. Finally, this allowance prevents the BLM from knowing where and when the use occurs, resulting in a situation in which resource impacts are not monitored or ever fully quantified or understood. For these reasons, Alternative A travel management would not meet the travel management goals of enhancing sustainable access or protecting resources.

Alternative A program management closes the Red Canyon area to over-snow travel, including motorized (year-round) and nonmotorized (seasonal). This results in enhanced resource protection but reduced access. In contrast, this alternative opens the rest of the planning area to motorized over-snow travel. Open designations would result in increased access but minimal resource protection. In addition, Alternative A does not restrict over-snow travel to a specific snow depth, which would result in increased access but would not protect resources.

Alternative A does not restrict or limit nonmotorized and mechanized travel.

4.6.4.3.2.2. Resources

As a result of resource-oriented management actions under Alternative A, a total of 70 percent of the planning area has restrictions that would limit flexibility and options in the travel management program. Primarily, these restrictions would limit BLM ability to create new roads, maintain/enhance existing roads, or implement other travel management mitigation measures. It is assumed that conflicts among resources and travel planning would be limited to solutions and mitigation options that would result in priority being given to resource protection. These restrictions would limit travel planning options and new road development, but would not change the amounts and types of access currently available in the planning area.

Specific wildlife management actions identified to protect resources from motorized vehicle travel include closing/reclaiming unnecessary roads to reduce road density and habitat fragmentation, and avoiding authorizing road development in big game crucial winter range and parturition areas. These management actions would result in travel systems that provide increased protections for these resources. The level access would be reduced as a result of these management actions is not quantifiable and access reductions would occur randomly across the planning area.

Alternative A manages 10.9 percent of the planning area as VRM Classes I and II. Impacts from this management would be similar to those described above because these VRM designations would not change the amounts and types of access currently available. VRM Classes I and II designations would limit travel planning options and new road development.

Alternative A does not include specific travel management designations (such as limited to designated) to support resource management. Instead such designations primarily correspond with management actions associated with ACECs and WSAs. Impacts from special designations to trails and travel management are discussed below.

4.6.4.3.2.3. Resource Uses

Resource uses are accommodated through leases, permits, or other management actions. In conducting activities associated with such authorizations, permit holders or lessees typically are authorized through the permit, lease, or ROW to perform activities outside existing travel management decisions and/or construct new roads to facilitate activities. Sometimes newly constructed ROWs are not available for general public access, but on most occasions in the planning area they are open to the public through the life of the project. Limitations on these activities come from stipulations on surface-disturbing activities, not the travel management designations. Therefore, resource uses in open (with standard stipulations) areas would be the most likely to adversely impact travel management. Alternative A opens 30 percent of the planning area to resource uses under standard stipulations.

The efficiency of travel planning and management in these areas would be limited, because more ROWs and authorizations for motorized vehicle use outside the travel designations would compromise enforcement capabilities and render travel planning ineffective due to a constant increase in new motorized routes. These actions would enhance access, but would not allow travel planning in these areas to provide enhanced resource protection.

SRMAs are areas where recreation opportunities and outcomes are sustained through several management decisions, including travel management. Therefore, management in SRMAs would have the potential to affect travel management and access in these areas. Alternative A includes three SRMAs, but no travel management decisions associated with these areas, therefore no impact to access would result from these allocations.

4.6.4.3.2.4. Special Designations

Alternative A designates nine ACECs, and includes travel management decisions for five of these ACECs to support management of the relevant and important values in these areas. These areas total 107,495 acres where travel planning would be focused on enhanced resource protection and minimum standards for access.

This alternative specifically restricts over-snow travel in the Red Canyon ACEC, but allows cross-country over-snow travel in the rest of the planning area. This would result in decreased resource protections and enhanced motorized vehicle access during periods when these areas would be accessible via over-snow travel.

Alternative A manages motorized travel in all WSAs (except Dubois Badlands, which is closed) to the minimum travel management decision allowed in WSAs. The management action to allow motorized and mechanized travel only on designated roads and trails that were identified during the inventory phase of the wilderness review would result in 55,338 acres managed for enhanced resource protection and minimum standards for access.

4.6.4.3.3. Alternative B

4.6.4.3.3.1. Program Management

Travel management objectives for specific areas under Alternative B would result in travel management systems that provide an increased resource protection focus over 276,338 acres, or approximately 12 percent of the planning area (Table 4.29, “Travel Management Focus under Alternative B” (p. 1056)). In contrast, objectives for the remainder of the planning area would result in travel management systems that provide increased access on 2,117,822 acres, or 88 percent of the planning area. This alternative allocates more acres to resource protection through travel management planning than Alternative A, and therefore would result in fewer acres allocated to an increased access focus. These objectives are based primarily on program needs to protect resources or enhance resource uses. In addition, the assignment of acres for an increased resource protection focus recognizes intensive commitments of financial and operational resources for implementation. It is feasible that as implementation was finalized on the 276,338 acres, additional acres would move to enhanced resource protection standards. This would occur more under Alternative B than Alternative A because Alternative B identifies more areas for protective management than Alternative A. Several of these areas were left in the increased access assignment because implementation of route designation process was

either viewed as too demanding on limited resources, limited feasibility due to terrain, or lower in priority than other areas.

Table 4.29. Travel Management Focus under Alternative B

Alternative B Travel Management Area Focus	Acres
Increased Access Focus and Minimum Standard for Resource Protection	2,117,822
Increased Resource Protection Focus and Minimum Standard for Access	276,338
Source: BLM 2012a	

In areas not identified as closed or limited to designated roads and trails, Alternative B provides for the standard travel management exceptions as granted by existing law and policy. This would allow for better enforcement of travel decisions than Alternative A. Finally, Alternative B only allows permitted cross-country travel. Requiring a permit for cross-country travel would ensure the BLM knows where and when the use occurs, which allows resource impacts to be monitored and quantified. For these reasons, compared to Alternative A, Alternative B would improve progress toward reaching travel management goals of enhancing sustainable access or protecting resources.

Alternative B manages over-snow vehicles the same as other motorized wheeled vehicles, and requires users of these vehicles to abide by all (seasonal and year-round) closures, stay on existing roads on 2,117,822 acres, and travel only on designated roads on 10 acres. Compared to Alternative A, Alternative B increases the level of travel management, which would result in enhanced resource protections but reduce access. This alternative manages motorized over-snow travel the same as motorized wheeled vehicles; therefore, the rest of the planning area would be closed to motorized over-snow travel. This designation would increase resource protections and decrease access compared to Alternative A.

Nonmotorized and mechanized travel is somewhat restricted or limited under Alternative B. A total of 63,379 acres are closed to mechanized travel to protect resources.

4.6.4.3.3.2. Resources

As a result of resource oriented management actions, Alternative B imposes restrictions on more acres than Alternative A that would limit flexibility and options in the travel management program. Primarily, these restrictions would limit BLM ability to create new roads, maintain/enhance existing roads, or implement other travel management mitigation measures. It is assumed that in these areas, conflicts among resources and travel planning would be limited to solutions and mitigation options that would result in priority being given to resource protection. These restrictions would limit travel planning options and new road development, but would not change the amounts and types of access currently available in the planning area.

Alternative B manages 56 percent of the planning area as VRM Classes I and II. Impacts from this management would be similar to those discussed above because these VRM designations would change the amounts and types of access currently available in the planning area. The VRM Class I and II designations would limit travel planning options and new road development.

Specific wildlife management actions identified to protect resources from motorized vehicle travel include closing and reclaiming unnecessary roads to reduce road density and habitat fragmentation, and avoiding authorizing road development in big game crucial winter range and

parturition areas. These management actions would result in travel systems that provide increased protections for these resources. The level of access restrictions that would result from these management activities is not quantifiable and access reductions would occur randomly across the planning area.

Alternative B closes 5,490 acres of non-WSA lands with wilderness characteristics to motorized vehicles in the Little Red Creek Complex to protect wilderness characteristics. Alternative A does not specially manage lands with wilderness characteristics. Therefore, Alternative B would increase the area where this allocation would impact travel. This would result in travel planning that increases resource protections and minimizes nonmotorized vehicle user conflicts with motorized vehicle users. Conversely, the decision to close the area to motorized vehicles would result in decreased motorized access.

With the exception of non-WSA lands with wilderness characteristics, this alternative does not include specific travel management area designations (such as limited to designated). Instead, these designations primarily correspond to management actions associated with ACECs and WSAs. Impacts from special designations to trails and travel management are described below.

4.6.4.3.3.3. Resource Uses

Resource uses are accommodated through leases, permits, or other management actions. In conducting activities associated with such authorizations, permit holders or lessees typically are authorized through the permit, lease, or ROW to perform activities outside existing travel management decisions and/or construct new roads to facilitate activities. Sometimes newly constructed ROWs are not available for general public access, but on most occasions in the planning area these are open to the public through the life of the project. Limitations on these activities come from stipulations on surface-disturbing activities, not the travel management designations. Therefore, resource uses in areas open (with standard stipulations) to these uses would be the most likely to adversely impact travel management. Alternative B opens fewer acres than Alternative A to resource uses under standard stipulations. The efficiency and enforcement capability of travel management in these areas would be degraded due to a constant increase in new motorized vehicle routes that result from authorizations for motorized vehicle use outside travel designations. These actions would result in increased access but would not allow travel planning in these areas to increase resource protections. These impacts would occur at a lower rate under Alternative B than under Alternative A.

SRMAs are areas where recreation opportunities and outcomes are sustained through several management decisions, including travel management. Therefore, management in SRMAs would have the potential to impact travel management and access in these areas. Alternative B includes seven SRMAs totaling 307,183 acres. To support SRMA management, Alternative B closes 7,500 acres to benefit nonmotorized recreation. This would result in decreased conflicts among motorized and nonmotorized vehicle users, and enhance nonmotorized recreation opportunities and experiences. The remaining SRMA open acreage would result in travel management that would enhance recreational opportunities and experiences.

4.6.4.3.3.4. Special Designations

Alternative B designates 15 ACECs and makes travel planning decisions in 7 of these ACECs to support management of the relevant and important values in these areas. These areas total

127,749 acres where travel planning focuses on enhanced resource protection and minimum standards for access. This is an increase over Alternative A.

Alternative B closes all WSAs and proposed eligible and suitable WSRs to motorized and mechanized travel. This management action would result in 55,338 acres managed for an increased resource protection focus but reduced (compared to Alternative A) access. The alternative would also result in decreased (compared to Alternative A) conflicts among nonmotorized and motorized vehicle users by providing more areas where nonmotorized vehicle users can go without encountering impacts from motorized vehicle users.

4.6.4.3.4. Alternative C

4.6.4.3.4.1. Program Management

Table 4.30, “Travel Management Focus under Alternative C” (p. 1058) display the acres under Alternative C managed for increased access and increased resource protection.

Table 4.30. Travel Management Focus under Alternative C

Alternative C Travel Management Area Focus	Acres
Increased Access Focus and Minimum Standard for Resource Protection	2,337,958
Increased Resource Protection Focus and Minimum Standard for Access	56,247
Source: BLM 2012a	

4.6.4.3.4.2. Resources

Based on travel management objectives for specific areas, Alternative C would result in travel management systems that provide an increased resource protection focus only in WSAs totaling 56,247 acres, or 2 percent of the planning area (Table 4.30, “Travel Management Focus under Alternative C” (p. 1058)). In contrast, objectives for the rest of the planning area would result in travel management systems that provide an increased access focus on 2,337,958 acres, or 98 percent of the planning area. This alternative allocates more acres to increased access (through travel management planning) than Alternative A, and fewer acres to increased resource protection. Under alternatives A, B, and D it can be assumed that as the BLM finalizes implementation of travel management decisions more acres would move to enhanced resource protection standards. This would not occur under Alternative C because it identifies WSAs as the only areas where travel management would result in enhanced resource protection.

In areas not identified as closed or limited to designated roads and trails, Alternative C allows for cross-country motorized travel to perform necessary tasks. This management would compromise enforcement of travel decisions, placing on the BLM the burden to prove that travel management violations are not occurring to facilitate a necessary task. In addition, this allowance was developed during a period when motorized vehicle use typically involved trucks. Today, motorized vehicle use involves a multitude of different vehicles and results in variable impacts to resources. Finally, this allowance would prevent the BLM from knowing where and when the use occurs, resulting in a situation in which resource impacts are not monitored or ever fully quantified or understood. For these reasons, alternatives A and C would not meet the travel management goals of enhancing sustainable access or protecting resources.

Alternative C program management does not close areas to over-snow travel. The alternative allows cross-country over-snow travel (motorized and nonmotorized) anywhere in the planning during periods when snow is at least 12 inches deep or recognized as a groomed trail. If these conditions do not exist, motorized over-snow vehicles are required to stay on existing roads. This would result in enhanced access but reduced resource protections. Alternative C would result in the most (compared to alternatives A and B) acres of access for motorized over-snow travel, but the fewest (compared to alternatives A and B) resource protections. The minimum snow requirements and definition for over-snow travel would provide limited resource protections over Alternative A, which does not include any definition or snow-depth requirement for over-snow travel.

Alternative C does not restrict or limit nonmotorized and mechanized travel.

4.6.4.3.4.3. Resource Uses

Resource uses are accommodated through leases, permits, or other management actions. In conducting activities associated with such authorizations, permit holders or lessees typically are authorized through the permit, lease, or ROW to perform activities outside existing travel management decisions and/or construct new roads to facilitate activities. Sometimes newly constructed ROWs are not available for general public access, but on most occasions in the planning area these are open to the public through the life of the project. Limitations on these activities come from stipulations on surface-disturbing activities, not the travel management designations. Therefore, resource uses in areas open (with standard stipulations) to these uses would be the most likely to adversely impact travel management. Alternative C opens more acres to resource uses under standard stipulations than alternatives A and B. The efficiency of travel planning and management in these areas would be limited, because more ROWs and authorizations for motorized vehicle use outside travel designations would compromise enforcement capabilities and render travel planning ineffective due to a constant increase in new motorized routes. These actions would increase access, but would not allow travel planning to facilitate increased resource protections.

SRMAs are areas where recreation opportunities and outcomes are sustained through several management decisions, including travel management. Therefore, management in SRMAs would have the potential to impact travel management and access in these areas. Alternative C includes one SRMA totaling 608 acres, and makes no travel management decisions associated with SRMAs. As with Alternative A, this would result in increased conflicts among motorized and nonmotorized vehicle users, and decreased (compared to Alternative B) nonmotorized recreation opportunities and experiences.

4.6.4.3.4.4. Special Designations

Alternative C does not include ACECs, which would increase motorized access and limit resource protections.

As with Alternative A, Alternative C manages motorized travel in all WSAs (except Dubois Badlands) to the minimum travel management decision allowed in WSAs. The management action to allow motorized and mechanized travel only on designated roads and trails that were identified during the inventory phase of the wilderness review would result in 55,338 acres managed for an increased resource protection focus and minimum standards for access. This would be the same as Alternative A.

4.6.4.3.5. Alternative D

4.6.4.3.5.1. Program Management

Program management under Alternative D would result in impacts similar to those under Alternative B.

4.6.4.3.5.2. Resources

Impacts from resource oriented management actions under Alternative D would be similar to impacts under Alternative B.

Alternative D manages 34 percent (which is more than Alternative A but less than Alternative B) of the planning area as VRM Classes I and II. Impacts associated with VRM Classes I and II are detailed under Alternative B.

This alternative closes 4,954 acres (which is more than Alternative A but less than Alternative B) to motorized vehicles in the Little Red Creek Complex to support wilderness characteristics in non-WSA lands with wilderness characteristics. Alternative A does not specifically manage for lands with wilderness characteristics; therefore, Alternative D would result in more impacts to travel from this allocation. This would result in travel planning that increases resource protections and minimizes nonmotorized vehicle user conflicts with motorized vehicle users. Conversely, the decision to close the area to motorized vehicles would decrease motorized access.

With the exception of non-WSA lands with wilderness characteristics identified above, this alternative does not include area-specific travel management designations (such as limited to designated). Instead, these designations primarily correspond to management actions associated with ACECs and WSAs. Impacts from special designations to trails and travel management are described below.

4.6.4.3.5.3. Resource Uses

Resource uses are accommodated through leases, permits, or other management actions. In conducting activities associated with such authorizations, permit holders or lessees typically are authorized through the permit, lease, or ROW to perform activities outside existing travel management decisions and/or construct new roads to facilitate activities. Sometimes newly constructed ROWs are not available for general public access, but on most occasions in the planning area these are open to the public through the life of the project. Limitations on these activities come from stipulations on surface-disturbing activities, not the travel management designations. Therefore, resource uses in areas open (with standard stipulations) to these uses would be the most likely to adversely impact travel management. Alternative D opens fewer acres than Alternative A to resource uses under standard stipulations. Impacts to travel management and planning from opening areas to resource uses under standard stipulations are described under Alternative B. These impacts would occur at a lower rate under Alternative D than under Alternative A.

SRMAs are areas where recreation opportunities and outcomes are sustained through several management decisions, including travel management. Therefore, management in SRMAs would have the potential to impact travel management and access in these areas. Alternative C includes seven SRMAs totaling 294,541 acres. To support SRMA management, Alternative D closes

5,195 acres to benefit nonmotorized recreation. This would result in decreased conflicts among motorized and nonmotorized vehicle users, and enhance nonmotorized recreation opportunities and experiences. The remaining acreage of SRMAs would result in travel management that would provide enhanced recreational opportunities and experiences.

4.6.4.3.5.4. Special Designations

Impacts from ACECs to travel management under Alternative D would be the same as under Alternative B.

Alternative B closes the following areas to motorized travel: Dubois Badlands WSA, Copper Mountain WSA, Whiskey Mountain WSA, and the WSRs recommended as eligible and suitable for inclusion in the NWSRS. This management would result in 15,276 acres (which is more than Alternative A and less than Alternative B) managed for increased resource protections, but reduced (compared to Alternative A) access. Alternative D would also result in decreased (compared to Alternative A) conflicts among nonmotorized and motorized vehicle users by providing areas where nonmotorized vehicle users can go without encountering impacts from motorized vehicle users.

4.6.5. Livestock Grazing Management

Adverse impacts to livestock grazing management result from management actions that limit, reduce, or prohibit livestock grazing or AUMs in the planning area. In addition, management actions that degrade rangeland health (e.g., the condition of soils, watersheds, and vegetation communities) and livestock forage or that restrict the placement, construction, or maintenance of range improvement projects would result in adverse impacts. Management actions beneficial to livestock grazing include those that increase AUMs, decrease restrictions on livestock grazing, improve rangeland health or livestock forage, distribute or disperse livestock in ways that increase access to forage, or reduce the cost associated with livestock grazing management.

Direct impacts to livestock grazing result from management actions that change AUM allocations or restrict livestock grazing. Indirect impacts to livestock grazing result from management actions that affect rangeland health and productivity or that result in a change in livestock grazing management on BLM-administered public lands in the planning area.

4.6.5.1. Summary of Impacts

Alternative B would result in the greatest adverse impacts to livestock grazing; Alternative C would result in the greatest beneficial impacts. Alternative B places the most restrictions on livestock use of forage and the placement and construction of range improvements, and places the most limitations on grazing for the protection of resources. In addition, Alternative B closes lands in elk and bighorn sheep crucial winter range in the Dubois area, which would result in adverse impacts from the loss of approximately 1,043 AUMs. Overtime, Alternative B would result in the most reduction of AUMs; since range infrastructure projects would not be available as a tool to achieve progress towards rangeland health, authorized use would need to be reduced (either in number of animals or time on the allotment) resulting in a reduction in livestock use. Alternative C places the fewest restrictions on livestock grazing management and expands the areas where range improvements can be placed for use by grazing livestock. Impacts to livestock grazing under Alternative A would generally fall somewhere between the other alternatives, and

this alternative is the most likely to apply management on a case-by-case basis. Alternative D would result in a greater reduction in AUMs than Alternative C over the planning period, and authorizes rangeland infrastructure only through the development of a Comprehensive Grazing Strategy. Under Alternative D, the development of comprehensive grazing strategies first evaluates the stocking rate of an allotment and the season of use prior to evaluating the need for additional range infrastructure. Additional range improvement projects are considered when compatible with other resources. Alternative D avoids the development of new rangeland infrastructure unless a Comprehensive Grazing Strategy is considered where benefits to rangeland health outweigh the adverse impacts.

4.6.5.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- Livestock grazing is managed to meet the Wyoming Standards for Healthy Rangelands.
- Grazing management practices such as season of use, kind of livestock and stocking level modification, rest or rotational grazing, and temporary closures can maintain or improve rangeland health to meet Wyoming Standards for Healthy Rangelands requirements.
- When range improvement projects are used to improve rangeland health and/or facilitate more efficient and effective livestock management, they would be appropriately implemented in a manner that does not conflict with other resource values, (e.g., riparian-wetland habitats, wildlife, greater sage-grouse, wild horses, and trails). The alternatives vary in the types of projects authorized. Alternative B authorizes primarily non-infrastructure improvements such as vegetative treatments and lowered stocking rates, while Alternative C emphasizes infrastructure such as fences and water developments.
- Under all alternatives, the BLM does not define livestock grazing as a surface-disturbing activity; therefore, livestock grazing is not precluded in areas closed or avoided for surface-disturbing activities. However, range improvement projects are surface-disturbing activities and subject to surface disturbance limits.
- Any changes in grazing management, including changes in grazing preference, are based on rangeland monitoring and documented field observations, in accordance with grazing regulations (43 CFR 4110.3).
- Surface disturbances as a result of range improvement construction, such as water developments increases the likelihood of the introduction and spread of INNS that degrade rangeland health and adversely impact forage quality and quantity.
- Grazing use levels may be adjusted during times of drought, or when rehabilitation plans are being implemented after a wildfire or prescribed burn.
- Management actions for other resource uses can affect livestock grazing allocation management, both adversely and beneficially.
- Reductions in public land grazing could increase the likelihood of fencing of private and state lands.
- The placement of supplements can affect the distribution of livestock grazing in grassland and shrubland communities. All alternatives require that supplements not be placed in riparian-wetlands, although the buffer varies by alternative.
- Rangeland health assessments of all allotments within high priority watersheds will be completed within 10 years. An average of 10 percent of the public lands will be assessed each year during the life of this plan.
- Demand for public land grazing use will remain static. Changing economics associated with livestock grazing are not expected to change the demand to use public lands for livestock grazing.

- Areas are identified as open or closed to livestock grazing rather than available or not available. All alternatives close areas such as the granite rock areas of Sweetwater Rocks to livestock grazing because of site-specific issues. Under all alternatives, 69,276 acres have not been available for grazing since before 1987, including lands that are unsuitable, such as rock outcroppings or road ROWs, and lands closed for wildlife habitat, such as Whiskey Mountain. These acres do not vary by alternative and are not further analyzed. These acres are not included in the following analysis of open and closed areas.
- For each alternative, the number of baseline AUMs available and reductions in AUMs is adjusted for the ratio of actual use to permitted use. Active AUMs are the portion of permitted use on a permit/lease that can be used in any given year provided the forage is available. Actual AUMs are the AUMs actually billed for and paid for each year by the permittee/lessee. It is assumed that livestock grazing actual use at the beginning of the planning period would be approximately 73 percent of permitted use, which is the historical average use over the last 20 years. While the ratio of actual use to permitted use is projected to remain constant over the life of the plan under alternatives A, C, and D, under Alternative B the ratio is projected to increase gradually over the life of the plan to 95 percent because of substantial decreases in the number of permitted AUMs, due primarily to adjustments to meet rangeland health standards.

4.6.5.3. Detailed Analysis of Alternatives

4.6.5.3.1. Impacts Common to All Alternatives

Under all management programs, dust reduction that improves air quality reduces adverse impacts to vegetation, which ultimately affects the palatability of the forage available for livestock. Long-term adverse impacts associated with dust can shift the plant community to a different type and reduce species that livestock prefer. In general, the greater the reduction of dust the less adverse impact to livestock grazing. In addition, increased dust from activities far removed from the planning area can adversely impact vegetation and is a contributor to adverse impacts associated with global climate change.

Management actions to prevent or mitigate soil loss generally result in beneficial impacts to vegetation, which would increase livestock forage production and quality. All alternatives maintain existing watershed improvement projects. Projects designed to enhance watershed health enhance vegetative resources by reducing erosion and improving water quality, thereby increasing forage and water for livestock over the long term. However, adjustments in livestock management potentially needed to meet or maintain riparian-wetland habitat requirements, PFC, and water quality objectives could result in short-term adverse impacts to livestock grazing. Surface disturbance associated with the implementation of watershed enhancement projects would also result in short-term site-specific adverse impacts to vegetative cover and livestock forage. The greater the benefits to soil and water, the greater the long-term benefits to livestock grazing would be.

Water can be a limiting factor for livestock grazing management, especially during drought, and affects livestock health and distribution. Water developments designed to provide new water sources for livestock would result in beneficial impacts to livestock grazing through increased water availability. New water sources might also promote improved distribution of livestock by opening areas to grazing where a lack of water was previously the limiting factor, so long as a Comprehensive Grazing Strategy is in place. The alternatives vary in the extent to which water developments are authorized. The development of new water sources on previously undeveloped

upland rangeland sites could result in resource conflicts such as with pronghorn and greater sage-grouse, due to increased use and distribution of livestock. Although climate change could impact the availability of water for irrigation of private lands that support the livestock grazed on public lands, that impact is not within the scope of this analysis, which does not address private lands issues.

Wildland fire and fuels management result in varying impacts to livestock grazing, depending on fire size, intensity, and climatic factors. Wildland fire can result in short-term adverse impacts such as the spread of INNS, the destruction of range improvements, the displacement of livestock, and short-term impacts to livestock forage. With proper stabilization and rehabilitation, long-term impacts of wildland fire are generally beneficial due to improvements in forage quality, quantity, and availability following fires. For a period after a fire in shrubland communities, enhanced forage production occurs as herbaceous vegetation temporarily becomes the dominant type of vegetation in these plant communities.

Vegetation treatments designed to reduce fuel hazards, improve wildlife habitat, enhance vegetation production or plant community health, or regenerate plant communities would result in long-term beneficial impacts to livestock grazing by increasing forage availability. Vegetation treatments that require rest for establishment could also result in short-term reductions in forage available to livestock, however, in the long term, vegetation treatments generally result in an increase in palatable forage for livestock. Management actions designed to improve riparian-wetland vegetation and promote biodiversity would result in long-term beneficial impacts because these systems would meet PFC. The long-term beneficial impact is that these systems would improve water quality, quantity and forage for livestock.

The presence and extent of INNS in an area is a factor in rangeland health and forage productivity. INNS displace native vegetation and, because they typically are unpalatable to livestock and wildlife, often remain ungrazed. INNS can spread or become established as a result of surface-disturbing activities, motorized vehicle use, or dispersal by grazing animals. Surface-disturbing activities include mechanical disturbance, such as construction of well and wind tower pads, roads, pits, reservoirs, pipelines, vegetative treatments, mining, and powerlines. Even when reclamation occurs, allotments where surface-disturbing activities have occurred could experience increased INNS infestations over both the short and long term. The prevention and treatment of areas infested with INNS is required under all alternatives; management of INNS could temporarily displace livestock and reduce available forage, but would also maintain or improve rangeland health and forage quality over the long term. Beneficial impacts to livestock grazing when using a different kind of animal to manage INNS would ultimately benefit the economic picture of the permittee/lessee and the vegetative resource. By grazing leafy spurge with domestic goats or sheep, not only the native vegetation benefits by reduced competition from INNS, but the permittee benefits from being authorized to use the INNS with a kind of animal that favors leafy spurge.

INNS have a direct adverse impact on livestock grazing. In the case of INNS invading rangeland and displacing native vegetation, invasive plant species are typically unpalatable to livestock and might even be poisonous. INNS such as halogeton can be introduced via roadways or pipelines and then gradually spread to adjacent native vegetation, resulting in an adverse impact to available forage for livestock. This can eventually become costly in terms of control, not only for the BLM but also for the permittees/lessees in lost forage production. Another impact would be from insects like grasshoppers. In years when grasshopper populations are at their peak, they can

devastate available livestock forage. Although grasshoppers tend to be a short-term impact for a given year, INNS can result in long-term adverse impacts lasting multiple years.

Wildlife winter range and special status species habitat management adversely impact livestock grazing by restricting the placement of range improvement projects and potentially affecting the ability to implement grazing management practices using infrastructure. Management of greater sage-grouse habitat affects the location, required mitigation, design standards and installation, and cost of range improvements. In addition, the maintenance of sagebrush and understory diversity in crucial seasonal greater sage-grouse habitat could result in an adverse impact by reducing the time livestock could graze in an area, change seasons of use, and, in some cases, result in temporary removal of livestock until vegetation treatments are in place or have succeeded. All alternatives prioritize the management of greater sage-grouse in Dubois, Red Canyon, Lander Slope, Green Mountain and greater sage-grouse Core Area, resulting in the potential for reductions in AUMs to maintain adequate nesting cover and to maintain a higher degree of residual forage in areas preferred by livestock such as riparian-wetland areas.

Wild horses and livestock generally rely on the same resources. The appropriate management level for the Muskrat Basin, Rock Creek Mountain, Conant Creek, Dishpan Butte, and Green Mountain Wild Horse HMAs was established under the Lander Resource Area 1993 ROD. For Crooks Mountain and Cyclone Rim/Antelope Hills HMAs, the appropriate management level was established under the May 1994 ROD and Approved Rawlins RMP. All alternatives assume that wild horse populations will be maintained within the appropriate management level through periodic gathers and the use of fertility control practices. Should these gathers and fertility treatments not occur, an increase in wild horse populations could impact livestock grazing and availability of wildlife forage. Ultimately a high number of wild horses exceeding appropriate management level could potentially affect rangeland health.

Management of cultural and paleontological resources could adversely impact livestock grazing through the removal of forage during site excavations, or through restrictions on the design and placement of range improvements. For example, the BLM requires avoidance of surface-disturbing activities in areas near significant paleontological resource sites, which could affect the placement of range improvements where infrastructure is the management technique employed. VRM could also affect the location or design of range improvements in visually sensitive areas or where the project does not meet VRM objectives.

Adverse impacts to livestock grazing are generally the result of activities that affect forage quantity/production or quality in grazing allotments, such as vegetation treatments, and management that constrains or enhances livestock grazing management. Surface-disturbing activities such as fire and fuels management and vegetation treatments, INNS management, grazing and surface disturbance restrictions intended to protect resources, and proactive management actions, result in adverse impacts to livestock grazing in the planning area. Impacts from these activities could be adverse to livestock grazing in the very short term but should result in beneficial impacts through improvement in vegetation condition in the long term.

Mining of locatable, leasable, and salable minerals affects soils and vegetation communities, and results in a loss of forage in developed areas. Surface-disturbing and surface-disruptive activities associated with all types of mineral and geophysical exploration and development are subject to application of the Wyoming Standards for Healthy Rangelands, which helps to reduce impacts to livestock forage through the application of standard mitigation. Compared to the other minerals, oil and gas, followed by uranium mining, results in the largest acreage of surface disturbance

and would result in the greatest short-term and long-term adverse impacts to available livestock forage. Areas where leasable fluid minerals have been developed can be reclaimed more closely to predisturbance conditions than areas where leasable solid minerals have been developed or where locatable minerals have been developed using conventional mining techniques.

All alternatives include revegetation of areas disturbed during oil and gas drilling and other operations and would reduce the long-term adverse impacts to forage associated with those operations. There could be a permanent loss of available livestock forage in the form of limited or lost access to grazing areas from road and industrial facility development. This could result in temporary or long-term closure of affected allotments or reductions in the authorized number of AUMs where there are large developed or producing gas fields, ISR uranium mining, or open-pit extractive operations. Construction and improvement of roads associated with minerals development could provide livestock operators with better access to livestock and enhance their ability to maintain range improvements where infrastructure is used. Disturbed areas associated with nonproducing wells would result in short-term impacts, because they would be reclaimed quickly and most forage production would be restored. Although utilization levels could vary from year to year, utilization levels that remain consistently high would not be expected to meet watershed and vegetative management objectives. Adjustments in livestock management to meet these objectives could result in short-term adverse impacts, and would result in long-term adverse impacts if interim reclamation was not possible.

Land disposals or exchanges result in adverse or beneficial impacts to livestock grazing depending on whether they reduce or increase the available acres to be grazed in the form of AUMs in active grazing allotments. Typically, land disposals occur on small, isolated parcels of BLM-administered land, with the goal being the consolidation of land ownership to enhance management of resource values as, for example, the Finley 3 (No. 2102) and the Wiggins Fork (No. 2129) allotments. BLM surface acres exchanged are no longer authorized for livestock grazing. Exchange is the preferred method for all land tenure adjustments, and changes in AUMs resulting from any exchange would be site-specific and depend on the qualities of both the disposal and acquisition parcels. However, because the land acquired is often some distance from the disposal parcels, there could be adverse impacts to individual allotments due to AUM loss. However, if lands are acquired to consolidate holdings, there could be beneficial impacts to livestock grazing by facilitating access.

The development of ROWs results in both short-term and long-term reductions in forage. ROW authorizations for permanent facilities or roads result in long-term reductions in forage. Areas where ROW authorizations include only initial disturbance are reclaimed to reduce long-term adverse impacts to livestock grazing from reductions in forage.

Allowing motorized vehicle use and recreational use and development results in adverse impacts to livestock grazing through damage to soils and livestock forage, but would beneficially impact grazing management activities through improved access. Adverse impacts from allowing motorized vehicles could include gates being left open, the displacement of livestock from heavily used areas, a reduction in forage palatability from the spread of INNS along travel corridors, and an increase in dust on forage near areas of heavy motorized vehicle use. Administrative access can be given to areas closed to motorized travel where necessary.

The intent of any grazing management practice and range improvement project is to maintain or improve the quality or quantity of forage, thereby enhancing operational flexibility. As a result of implementing these practices, grazing permittees might see an increase in costs associated

with more livestock herding and maintenance of range improvements. Under all alternatives, appropriate grazing management practices will be implemented to address rangeland health objectives in the planning area. This will be accomplished in cooperation, consultation, and coordination with grazing permittees and lessees and other interested parties.

Livestock grazing management actions are designed to maintain or enhance rangeland health, improve forage for livestock, and to meet other multiple-use objectives. Implementation of these actions is also expected to continue implementing the allotment categorization process used in the 1987 RMP. Some allotments might need to be recategorized from their current classification (Maintain, Improve, or Custodial) over time. Allotment boundaries will be managed to facilitate grazing strategies that will help achieve rangeland health objectives. These actions could include combining allotments and changing pasture boundaries.

Changes in kinds of livestock, numbers of livestock, and season of use are used as tools to meet Wyoming Standards for Healthy Rangelands. These actions beneficially impact vegetative resources and ultimately provide an abundance of healthy, vigorous forage for livestock and other grazing animals. Forage supplements placed on BLM-administered lands are required to be safe for all classes of animals, including wild horses and wildlife. Stock driveways continue to be authorized in the planning area. Long-term grazing strategies recognize the need for successful reclamation objectives and are used to meet these objectives. Successful reclamation ensures that vegetation will be established as soon as site-specific conditions allow and will be placed back into production and available for livestock grazing.

All alternatives allow the development of range improvement projects (e.g., fences and spring developments) in portions of the planning area, but Alternative B severely restricts such projects. Rangeland improvement projects allow livestock managers and permittees/lessees to better implement grazing management practices and manage the distribution and movement of livestock within allotments. Adverse impacts associated with the construction of fencing, stock-water pipelines, and other rangeland improvements include long-term impacts to forage surrounding the project, and could include undesirable changes to livestock grazing patterns and distribution within an allotment, congregation of livestock around new water sources and fence lines, and changes in livestock trailing patterns that alter vegetation or affect rangeland health. Any long-term adverse impacts from rangeland improvements would be site-specific.

Table 4.31, “Estimated Reduction in AUMs by Alternative” (p. 1068) provides a summary of initial AUMs and total AUMs lost over the life of the plan.

Table 4.31. Estimated Reduction in AUMs by Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
Permitted AUMs				
Initial Permitted AUMs	280,813	280,813	280,813	280,813
Permitted AUMs Lost (over the life of the plan)	1,414	152,054	30,222	51,808
Net Permitted AUMs in 2027	279,399	128,759	250,491	229,005
Actual AUMs				
Initial Actual AUMs	204,993	204,993	204,993	204,993
Actual AUMs Lost (over the life of the plan)	1,031	82,672	22,135	37,820
Net Actual AUMs in 2027	203,962	122,321	182,858	167,173
Source: BLM 2011b Note: Permitted AUMs are AUMs that are allowed on a permit/lease that can be used on any given year provided the forage is available. Actual AUMs are the AUMs actually billed for and paid for each year by the permittee/lessee. The ratio of historical average authorized use to permitted use in the planning area is 73 percent. As noted in <i>Methods and Assumptions</i> , the ratio of actual use to permitted used under Alternative B is projected to increase gradually over the life of the plan to 95 percent. See the Appendix L (p. 1583) for further discussion regarding the methodology used to estimate AUM loss. AUM Animal Unit Month				

4.6.5.3.2. Alternative A

4.6.5.3.2.1. Program Management

Under Alternative A, 2,324,934 acres, or 99 percent of all surface acres in the planning area are open to livestock grazing; no acres are closed to grazing, although, as under all alternatives, approximately 69,276 acres are unavailable to grazing. Management of livestock grazing is designed to provide for protection or enhancement of other resource values. Areas excluded from livestock grazing total 2,056 acres and include campgrounds and certain riparian-wetland and vegetation monitoring exclosures. However, those acres are not considered closed under Alternative A. As indicated in the above table, Alternative A would authorize the greatest number of AUMs, both in the short term and over time.

Range improvements are important to grazing livestock under Alternative A. The range improvements that are in disrepair or not functioning as originally planned would be abandoned and reclaimed. However, this could adversely impact livestock grazing by removing a water source or fencing that might be needed to facilitate grazing management. If water was removed, livestock grazing pressure would shift to other areas in an allotment, causing higher utilization in some areas. This could essentially reduced available forage for livestock and could require a stocking rate adjustment.

Alternative A requires that range improvement projects be designed to meet allotment management objectives on a case-by-case basis. The focus of these projects under Alternative A is to meet multiple-use objectives. Continued placement of these improvement projects considers other resource values, but the emphasis is on opening areas not previously grazed by livestock.

Some projects, such as water developments, would still experience impacts from livestock congregating around these water sources. If a grazing management plan is not established or is not successful, then these impacts could be adverse to the surrounding vegetation through trampling and congregation of animals.

On a case-by-case basis, forage utilization levels by livestock are established to benefit and promote healthy, sustainable rangeland ecosystems. Forage utilization levels limit forage consumed by livestock in sensitive areas, such as riparian-wetland areas. Forage utilization levels are generally measured using forage height/weight criteria based on height/weight curves. Placement of salt or mineral supplements would continue, and these would be placed no closer than ¼ mile to water. There would be more impacts to riparian-wetland systems with this minimal distance, but it would provide some relief from the impacts of livestock.

This alternative does not include forage reserve allotments, which would reduce the flexibility of providing alternative forage options to permittees whose allotments are rested following rangeland restoration activities or temporarily closed to livestock grazing due to severe drought conditions.

4.6.5.3.2.2. Resources

Alternative A management actions to prevent or mitigate soil loss generally result in beneficial impacts to vegetation, which increases livestock forage production and quality. This alternative maintains existing watershed improvement projects, uses BMPs to reduce runoff, soil erosion, and sediment yield, and subjects all surface-disturbing activities associated with mineral and geophysical exploration and development to application of the Wyoming Standards for Healthy Rangelands. Projects designed to enhance watershed health enhance vegetation resources by reducing erosion and improving water quality, thereby increasing forage and water for livestock over the long term. However, adjustments in livestock management that might be needed to meet or maintain riparian-wetland habitat requirements, PFC, and water quality objectives could result in temporary adverse impacts. Surface disturbance associated with the implementation of such watershed enhancement projects would also result in short-term site-specific adverse impacts to vegetative cover and livestock forage.

Vegetation treatments would also result in short-term reductions in forage amount, though they may improve forage quality, even though they are designed and conducted in accordance with the rangeland health requirements in the Wyoming Standards for Healthy Rangelands. Vegetation treatments designed to reduce fuel hazards, improve wildlife habitat, enhance vegetation production or plant community health, or regenerate plant communities result in long-term beneficial impacts to livestock grazing by increasing forage availability. Silvicultural treatments, which are authorized under this alternative, would move areas toward a different seral stage make more forage available for livestock grazing by stimulating herbaceous plant growth in the forest and woodland understory.

Alternative A wildlife and special status species habitat management would affect livestock grazing by continuing to restrict the placement of range improvement projects to the smallest footprint on the land; such decision would be made on a case-by-case basis. Approvals for new fences approval, fence modifications, or fence removals are decided case by case so as to not affect big game migration corridors or cause other wildlife displacement. Restrictions on fencing adversely impact livestock grazing by reducing the distribution of livestock in some areas, but these decisions are made case by case. Under Alternative A, the BLM anticipates projects would

continue to be built at the same rate as in the past 20 years, with approximately 43 acres of new disturbance each year.

Alternative A management of special status plant species could adversely affect livestock grazing if a new special status plant species is discovered and it is determined that grazing would impact that species. Grazing acreage could be lost to protect the plant and its habitat.

Special status species management under Alternative A would result in a minor adverse impact to livestock grazing. Seasons of use in grizzly bear and wolf habitat might need to be adjusted, but this would be only a minor inconvenience to the permittees rather than an adverse impact to grazing management. A more substantial adverse impact would result from management for the protection of greater sage-grouse. Alternative A closes a ¼-mile buffer around greater sage-grouse leks to surface disturbance, including water development and other range improvement projects. However, only 785 acres within the ¼-mile buffer are not already served by a water development project. Other than seasonal limitations on when range improvement projects can be built, Alternative A does not limit projects in greater sage-grouse nesting areas.

Cultural and paleontological resources management under Alternative A allows development with restrictions to protect these resources. These programs require surveys and inventories on acres of proposed rangeland improvement projects, which could adversely impact grazing management by requiring relocation of projects to avoid conflicts. Surveys and inventories would determine whether a range improvement project could be placed in a desired location to facilitate livestock grazing. Site-specific mitigation measures are applied when necessary. Under this alternative the grazing program would continue to benefit from rangeland improvements that are placed to avoid or mitigate adverse impacts to cultural and paleontological resources.

Depending on their visibility, range improvement projects in areas managed as VRM Class I or II might need to be designed to minimize their contrast with the surrounding landscape or placed in locations where they would be less likely to attract the attention of viewers. In Class I and II areas, this could result in adverse impacts to grazing management through additional costs to permittees and restrictions on the placement of range improvements. Acres of VRM Classes I and II are identified in the *Visual Resources* section. All range improvement projects must be analyzed against the VRM criteria to determine if there would be conflicts; VRM Classes III and IV allow more contrast.

4.6.5.3.2.3. Resource Uses

Resource uses under Alternative A are projected to result in approximately 12,439 acres of surface disturbance on BLM-administered land in the long term. This disturbance would result in the loss of approximately 1,414 permitted AUMs over the life of the plan. Appendix T (p. 1641) lists the projected surface disturbance for each alternative by the source of the disturbance.

Locatable minerals, leasable minerals, and mineral materials disposals activities adversely affect livestock grazing because of direct forage loss. Short-term impacts of immediate forage loss results from land being explored for oil and gas, bentonite, phosphate, gold, and uranium (see the Final Mineral Occurrence and Development Potential Report for the Lander Field Office Planning Area [BLM 2009b] and Chapter 3 for a discussion of the minerals in the planning area). If the exploration does not yield sufficient potential for development, then the land is reclaimed and put back into forage production for livestock grazing. If development of the mineral resource goes forward, there are long-term adverse impacts to grazing in terms of lost

acres for livestock grazing. These long-term adverse impacts are from installation of production facilities, permanent oil/gas pads, access roads, and open-pit mining activity to harvest mineral commodities. Beneficial impacts to grazing from minerals activities can be the discharge of produced water, in some cases improving distribution of grazing animals in the area or allotment where the produced water is available.

Land tenure can adversely impact livestock grazing if lands are disposed of through sale or exchange and the grazing allotment is now privately owned. Historically, land tenure has not caused adverse impacts to grazing permittees. Most of the public lands within the planning area are contiguous and land exchanges are few. A reduction in cattle and/or sheep numbers would impact permittee/lessee income levels from a loss in total number of livestock that the permittee/lessee could graze on public land. However, in the case of land exchange, land can be “blocked” to make larger more manageable units where livestock grazing would be authorized. This authorization would beneficially impact permittees and lessees by creating a larger, more viable grazing operation. Decisions about whether acquired lands would be available to livestock grazing would be made on a case-by-case basis.

Under Alternative A, 2,113,512 acres are open for industrial wind-energy development (as opposed to test sites or meteorological towers) subject to site-specific analysis. Adverse impacts to livestock grazing from wind-energy development are the surface-disturbing activities to develop pads, powerlines, and roads to operate wind-energy areas and to transmit the generated electricity. In areas of winter grazing, large ice crystals can build up on turbine blades and can be launched several hundred feet from the turbine, potentially killing or injuring livestock that graze in these areas. Small-scale solar and wind-energy projects to supply power for range improvement projects are analyzed and authorized through the range programs and are not considered under the lands and realty program.

Impacts from ROWs can affect livestock grazing when reclamation is not successful, particularly those involving linear features such as pipelines. In some cases, these ROWs might need to be fenced to protect seedlings from livestock. Fencing could prevent distribution of livestock by blocking travel corridors that cattle use to access water and forage. In addition, new seedlings attract livestock to new succulent growth of immature plants. To achieve successful reclamation, livestock might need to be temporarily removed from the allotment the ROW corridor runs through, which would adversely impact the permittee/lessee.

Under Alternative A, recreation management on public lands would not impact livestock grazing. Recreationists are able to use public lands as designated without any substantial conflicts between them and livestock use. Alternative A closes approximately 5,923 acres to motorized vehicle use. However, administrative access for permittees is available even in closed areas to access to livestock and range improvements, so this would not result in an adverse impact to livestock grazing.

4.6.5.3.2.4. Special Designations

Under Alternative A, special designations, including WSRs and ACECs, generally would not result in adverse impacts to livestock grazing. All areas historically open to grazing are open under this alternative. Livestock grazing management prescriptions for acquired lands in the Lander Slope, Red Canyon, Dubois, East Fork, Beaver Rim, Green Mountain, Cedar Ridge, Castle Gardens, Sweetwater Rocks and Government Draw/Upper Sweetwater Sage-Grouse ACECs are determined on a case-by-case basis. However, special designations adversely impact

livestock grazing because range improvement projects and salt and mineral supplement sites must be at least ¼ mile away from each side of designated portions of NHTs and Regional Historic Trails, or hidden from the visible horizon, whichever is closer. To protect the historic setting of NHTs, rangeland developments might need to be relocated, which would adversely impact livestock grazing because it could limit or preclude locating the development in the most optimal place for proper livestock management.

4.6.5.3.3. Alternative B

4.6.5.3.3.1. Program Management

Under Alternative B, 2,312,095 acres, or 98 percent of the planning area, are open to livestock grazing and management is designed to provide for protection or enhancement of other resource values. Areas closed to livestock grazing are associated with campground, riparian-wetlands and other exclosures, and the following five allotments: Bear Creek No. 2112, CM Ranch No. 2126, Lime Kiln Gulch No. 2103, Spence 23 No. 2114, and Sweetwater Canyon Pasture within Silver Creek Common Allotment No. 1903. These five areas comprise a total of 12,839 more acres (less than ½ percent of the total) closed to grazing under Alternative B but not closed under Alternative A. The 2,056 acres of campgrounds and exclosures closed under Alternative B are the same locations excluded, but not closed, under Alternative A. As indicated in the above table, Alternative B would authorize the fewest AUMs both in the short term and increasingly over time as monitoring indicates a need to reduce grazing use in order to meet rangeland health.

Alternative B uses non-infrastructure livestock grazing management to maintain and enhance rangeland health, including reduced utilization and lower AUMs. Treatments of vegetation such as prescribed fires, mowing, and herbicide treatments enhance forage for livestock grazing. Adverse impacts to livestock grazing would be short-term immediately following a treatment. Long-term beneficial impacts to livestock grazing would outweigh the short-term impacts of treatment.

Adverse impacts to livestock grazing under this alternative would result from a prohibition on new range improvements if they would cause adverse impacts to other resource values. Installation of range improvements in greater sage-grouse habitat or in crucial winter range could adversely impact these resources. The development and installation of new fences, for example would not be authorized in areas that are traditional migration corridors for big game animals and wild horses.

Alternative B removes or modifies existing fences and cattleguards to enhance other resource values where there are opportunities to do so. For example woven wire fences designed for domestic sheep grazing on allotments no longer grazed by sheep would be converted to fences that effectively manage cattle, but reduce impacts to wildlife (i.e., pronghorn). Beneficial impacts include the ability of livestock to use high-quality forage throughout the allotment without fences restricting their movements. Conversely, forage-use levels in sensitive areas such as riparian-wetlands would be reached faster unless active livestock herding is utilized, which would be an adverse impact to grazing because it would require removing the cattle sooner than planned.

Under Alternative B, on an allotment-by-allotment basis, stocking rates would be established to achieve an adequate residual cover for wildlife and wild horses with a likelihood that utilization would not exceed 21 to 40 percent, or light use. This use level would be adverse to livestock grazing because utilization would need to be monitored to ensure that utilization levels did not exceed this range. An adverse impact would occur to the permittee/lessee from a reduction in grazing time on the allotment, causing a reduction in forage consumption by their livestock.

and likely to lead to greatly reduced AUMs over time. Another adverse impact to grazing permittees/lessees would occur as a result of permittees/lessees having to spend more time herding their livestock than what has traditionally happened. This would mean the permittee/lessee would need to find alternative pasture or forage for the livestock if they are required to come off the BLM grazing allotment. A beneficial impact from light use would be that it would provide higher quality forage to livestock. It would also provide an increase in soil moisture, resulting in a greener, healthier forage later into the grazing season. Overall, light use under Alternative B would result in more adverse impacts to livestock grazing management than moderate use under Alternative A. To achieve light use, numbers of livestock would need to be adjusted or livestock would need to be moved more frequently to avoid a higher use level.

Salt and mineral supplements can be placed no closer than ½ mile to water, riparian-wetlands, and early highways and historic trails, twice the distance of Alternative A. Also, no supplements can be placed within 0.6 mile of a greater sage-grouse lek. No salt or mineral supplements would be placed on areas being reclaimed or within 3 miles either side of a National Historic or Scenic Trail. These distances are greater than under Alternative A and would result in more adverse impacts to livestock as they would have to travel further to reach the salt and mineral supplements. A benefit of this would be increased livestock distribution and utilization of forage.

Alternative B establishes and manages forage reserve allotments as opportunities arise on a voluntary basis, resulting in beneficial impacts to livestock grazing. Forage reserve allotments increase management flexibility and the ability to rest allotments following vegetation treatments, allowing more intensive vegetation treatments and the temporary removal of livestock for more effective rangeland recovery. Intensive vegetation treatments contribute to vegetation class diversity and greater long-term forage production, but also temporarily decrease forage in treated areas. Forage reserve allotments would also be used during severe droughts, providing relief to grazing operators on those allotments affected by severe drought that require rest. Additionally, forage reserve allotments would be used to provide forage for livestock permittees who have experienced wildfire on their allotment and cannot graze them until the recovery period is over. In this regard, Alternative B would result in more beneficial impacts to livestock grazing and management than Alternative A.

4.6.5.3.2. Resources

Alternative B prohibits surface-disturbing activities such as range improvements on slopes greater than 15 percent. This would result in a greater adverse impact to livestock grazing than Alternative A (which prohibits such activities on slopes greater than 25 percent) to the extent it limits using infrastructure so livestock could access additional acres of forage. This management would be more beneficial than Alternative A by improving water and air quality through reducing the amount of surface disturbance over Alternative A. Although the use of native plants could slow reclamation time, the vegetative cover requirements under this alternative would result in greater long-term beneficial impacts to livestock than Alternative A by requiring native species that will help meet the Wyoming Standards for Healthy Rangelands for wildlife. Long-term beneficial impacts to forage quality and stability would also result from the reestablishment of native plant communities.

Avoiding surface-disturbing and disruptive activities under Alternative B would affect more acreage than the other alternatives, and would result in more adverse impacts to the construction of range improvements and the management of livestock. Under this alternative, these activities could not occur in groundwater recharge areas, which would adversely impact the livestock

grazing program because avoidance might require the redesign of a project to eliminate any potential adverse impacts to water quality from the activity. This management prescription would result in an adverse impact to grazing that would not result under Alternative A.

Vegetation treatments to reduce hazardous fuels are projected to be highest under Alternative B, which would result in the greatest projected beneficial impact to long-term forage production. Funds Alternative A utilizes for range infrastructure projects are available under Alternative B for vegetation treatments. To the extent that these funds were used for fuels reduction, risk of forage loss due to landscape-level wildfires would be reduced. However, other fire management under Alternative B would be less beneficial than Alternative A because Alternative B reintroduces fire into its historic role in the ecology of the planning area. This would have the potential to increase the likelihood of landscape-level fires, which would result in a short-term adverse impact to livestock, with the potential for long-term adverse impacts if soil resources and seed bed are damaged. However, short-term adverse impacts could be followed by long-term beneficial impacts from vigorous regrowth.

Alternative B includes the most acreage of vegetation treatments. Because a large number of allotments do not currently meet the Wyoming Standards for Healthy Rangelands, Alternative B would result in the greatest beneficial impact toward improving vegetation conditions through vegetative treatment to achieve or make progress toward achieving rangeland health in all grasslands and shrublands. This alternative would be the most effective at moving these vegetative communities toward a transitional state within the ecological site where improved forage for livestock and other beneficial impacts to rangeland health described under Alternative A would be greater. However, unless a forage reserve is available for livestock in any rest period following treatment, there would be a short-term adverse impact to grazing associated with more vegetation treatment.

Requiring livestock operators to withhold placing their livestock on BLM-administered lands for a period of 72 hours (flushing) to reduce the spread of INNS would adversely impact grazing permittees/lessees on a short-term basis. This requirement is difficult to implement because holding livestock prior to grazing public land is stressful on calves and lambs and would require hauling drinking water if the holding areas did not have water. It also could be difficult to obtain certified weed-free hay, especially in spring when hay is costly and in short supply. Impacts to livestock grazing management would be the construction of holding facilities throughout the planning area to ensure livestock do not transport INNS seed onto public lands. However, if the holding facilities were located on private lands, this would not be an impact for BLM-administered lands within the planning area. The beneficial impacts of implementing this strategy would be an overall net reduction in the spread of INNS on BLM-administered lands, and insulating permittees/lessees who manage their private lands to avoid the spread of INNS from less careful permittees. Long term, public land grazing permittees would have an incentive to reduce INNS on their private lands to avoid the costs associated with flushing before moving their livestock onto BLM-administered lands, which would be a long-term beneficial impact to livestock grazing.

Impacts from allowing the natural healing capacity of the land to make progress toward meeting PFC objectives would result in a substantially short-term adverse impact to livestock grazing. This progress would be accomplished primarily by managing the season of use and avoiding hot-season grazing (mid June through mid September) to successfully allow the land to heal. This would require that livestock be herded away from riparian-wetland areas, deferred from use, or other forms of grazing management to avoid adverse impacts to these systems. Moreover, it is possible that the identified natural community could not be established: many ecological sites

have state and transition pathways that show that no management may not heal the land and that only intervention with livestock or physical means may improve land health, such as a dominant cheatgrass site that has lost perennial grass species.

However, reductions in AUMs or change of season would occur only after monitoring and rangeland health assessments are completed. It is estimated that 5 percent of the allotments per year will be assessed, so any reductions would be incremental and would occur only on allotments that did not meet Wyoming Standards for Healthy Rangelands. Similarly, beneficial impacts to livestock grazing from improvements in rangeland health would also be achieved at a rate of 5 percent per year, which could be slower than under Alternative A. Restricting the placement of salt or mineral supplements would result in greatest beneficial impact under Alternative B, because the buffer width under Alternative B is $\frac{1}{2}$ mile from water and riparian-wetlands, would improve livestock distribution and utilization of upland vegetation. Additional long-term beneficial impacts include the reestablishment of healthy rangelands that provide sustainable livestock use into the future.

Compared to Alternative A, wildlife management actions under Alternative B would result in more adverse impacts to livestock grazing. Under Alternative B, the BLM does not authorize the construction of new fences and may remove existing fences to reduce habitat fragmentation. Although fences would be removed only as opportunities arise, no new fences are likely to be built under Alternative B, whereas the historic rate for building new fences would continue under Alternative A. While on a long-term basis livestock grazing would benefit by improvements in rangeland health through lower livestock use, the immediate impact following implementation of this alternative would be adverse as stocking places would be reduced.

Alternative B prohibits range improvement projects within $\frac{1}{2}$ mile of BLM sensitive plant species habitat, unless a benefit to plant species would be achieved, which would result in more adverse impacts to the grazing program than Alternative A, which does not include such prohibitions. However, these adverse impacts would be of little quantitative importance because very few sensitive status species plants have been located or mapped, and some plants are in areas inaccessible to livestock, particularly Barneby's clover.

Other impacts to livestock grazing under Alternative B that would not occur under Alternative A are that forage allocations are implemented to meet big game herd requirements. By allocating forage to wildlife, there would be an adverse impact to livestock grazing through a reduction in available AUMs or forage available for livestock grazing. This would result in direct adverse impacts to the ability of permittees/lessees to maximize the use of public lands for grazing.

Greater sage-grouse management under Alternative B would result in substantially more adverse impacts to livestock grazing than under Alternative A. Alternative B does not adopt the Core Area concept, but instead buffers all leks by 0.6 mile and closes all greater sage-grouse nesting habitat to water developments. Approximately 56 percent of the planning area, some 1,339,609 acres, are in greater sage-grouse nesting habitat. However, most of this area is already served by water development projects. Only 225,833 acres (17 percent of nesting habitat) are more than 2 miles from a water development project, the maximum distance livestock will walk to obtain water. In addition, 16,283 acres (0.7 percent) of nesting habitat is within $\frac{1}{4}$ mile of the perimeters of leks, which are closed to surface disturbance, including water development projects, under Alternative A.

For the Dubois area, Alternative B implements changes in season of use to avoid conflicts with grizzly bears, which would result in an adverse impact to livestock grazing. This change in season

of use likely would occur on or about June 1. Changing the turnout date would result in short-term adverse impacts to livestock operations in the Dubois Area. Permittees/lessees would not be able to move livestock off of their hay meadows until June 1, thus affecting annual hay production. This would also impact livestock nutritional needs, since animals that need to consume green grass at that time of year to aid in the production of milk for their growing calves would not have access to pastures on BLM-administered land. Grazing permittees would not be able to take advantage of the high-protein that new forage offers in spring. Beneficial impacts to rangeland vegetation and reduction in conflict with grizzly bears, currently a threatened and endangered species and BLM sensitive species, would be long-term. Vegetation would be able to achieve near mature growth and bears will have dispersed from hibernation dens and will have followed elk and their calves, rather than livestock. Managing to support grizzly bears would help support bear populations and thereby avoid more adverse management associated with grizzly population recovery. On a long-term basis, livestock grazing strategies that resulted in “take” of grizzly bears would need to be resolved in the bears' favor with adverse consequences to livestock grazing.

Impacts from wild horse management under Alternative B would be similar to Alternative A, except that fences would be removed or modified on a case-by-case basis to reduce impacts to wild horses in HMAs. Reduction of fences would adversely impact livestock grazing because livestock would not distribute properly and would congregate in some riparian-wetland areas. Livestock could move outside their traditional use areas and might even cross allotment boundaries if fences were removed or modified. This would adversely impact vegetation in areas where livestock congregate and thus adversely impact livestock grazing.

Impacts to livestock grazing from management of cultural and paleontological resources under Alternative B would be similar to Alternative A, except there would be minor additional adverse impacts in site-specific locations where Alternative B prohibits range improvement projects.

4.6.5.3.3. Resource Uses

Resource uses under Alternative B are projected to result in approximately 7,503 acres of surface disturbance on BLM-administered land in the long term. This disturbance would result in the loss of approximately 853 permitted AUMs over the life of the plan, the least of any alternative. Appendix T (p. 1641) lists the projected surface disturbance for each alternative by the source of the disturbance.

Under Alternative B, impacts to livestock grazing from locatable and leasable minerals development and mineral materials sales would be similar to Alternative A, although more beneficial as there would be fewer surface disturbances from these activities under Alternative B. Because Alternative B closes many more areas to surface disturbance, there would be direct beneficial impacts to vegetation and therefore benefits to livestock grazing. It is not possible to quantify on a planning area basis whether these beneficial impacts would exceed the adverse impacts of restrictions on new infrastructure.

Alternative B closes approximately 71,761 acres of BLM-administered land to motorized vehicle use, a sizeable increase from the 5,923 acres under Alternative A, which would beneficially impact rangeland health and forage palatability for livestock grazing than the other alternatives.

Alternative B closes the Sweetwater Canyon pasture of the Silver Creek Allotment to livestock grazing because of conflicts with recreational use. The impact to livestock grazing would be adverse because approximately 1,074 permitted AUMs would be cancelled in the planning area.

This would cause an adjustment on an allotment-wide basis for the loss in the Sweetwater Canyon Pasture. This would impact income and the ability of permittees/lessees to meet operating costs.

4.6.5.3.3.4. Special Designations

Only 12,839 acres that are specially designated are closed to livestock grazing, which would result in very little additional adverse impact than that described under Alternative A. For all ACECs except South Pass, Alternative B prohibits new range improvement projects; this would adversely impact livestock grazing compared to Alternative A, which considers range improvement projects on a case-by-case basis.

Alternative B closes the area within 2 miles of the RHT&EHs to range improvement projects, which would result in more adverse impacts than Alternative A, which generally applies a ¼-mile buffer. However, only 47,618 acres in the 4-mile wide buffer are farther than 2 miles from water, so it is not clear how much more adverse this management would be to livestock grazing compared to Alternative A. In addition, Alternative B does not allow range improvement projects that do not meet VRM objectives within 2 to 5 miles of the ACEC.

Alternative B management of Congressionally Designated Trails would be substantially more adverse to livestock grazing than Alternative A management because Alternative B closes a much larger area around the trails to range improvement projects. However, all but 84,711 acres in the trails buffer is in the Government Draw/Upper Sweetwater Sage-Grouse ACEC, which is closed to range improvement projects under Alternative B. Of the areas within trails buffers but outside the ACEC, only 33,335 acres are more than 2 miles from water; therefore those would be the only locations the Alternative B prohibition on water developments would adversely impact livestock grazing management. In addition, fencing would not be allowed on these areas.

Alternative B management would also adversely impact the construction of range improvements along recommended eligible and suitable WSRs, but these are considered on a case-by-case basis depending on whether they enhance outstanding values and do not adversely impact WSRs. Thus, Alternative B would result in impacts to livestock grazing from this type of special designation similar to Alternative A.

4.6.5.3.4. Alternative C

4.6.5.3.4.1. Program Management

Under Alternative C, 2,324,934 surface acres are available for livestock grazing; no areas are closed to grazing. The alternative excludes, but does not close, campgrounds and other exclosures totaling 2,056 acres.

Management under Alternative C would be more beneficial to livestock grazing due to its focus on maximizing livestock forage use through the maximum implementation of range improvements instead of the protection or enhancement of other resource values, than Alternative B but likely to authorize fewer AUMs than Alternative A. (Note: all alternatives must meet rangeland health standards.) However, the alternative presents the greatest risk of adverse impacts from failure of high-intensity grazing systems and the greatest risk of managing livestock grazing so as to contribute to the listing of the greater sage-grouse under the ESA.

Range improvement projects under Alternative C are designed to maximize livestock forage and distribution. All infrastructure and non-infrastructure improvements are utilized to maintain, enhance, and achieve rangeland health. This would provide the maximum acres possible throughout the planning area for livestock grazing. Installing more range improvement projects on the land could increase available AUMs over actual use under Alternative A and still meet the Wyoming Standards for Healthy Rangelands. Such an increase would require extraordinarily successful grazing on every acre through implementation of a large-scale range improvement program under which 150 new water projects, 735 miles of riparian-wetland fencing, and 220 miles of pasture division fencing would be installed during the planning period, or 100 acres per year of surface disturbance. It is likely that this level of infrastructure would support the AUMs identified in the above table.

On an allotment-by-allotment basis in permit renewals, residual vegetation following livestock grazing would be similar to Alternative A with a likelihood that utilization levels would be 41 to 60 percent, or moderate use, in areas livestock prefer. This action would ensure more forage for livestock than Alternative B and would be a beneficial impact to livestock grazing, at least in the short term. Impacts from salt or mineral supplement sites would be similar to those under Alternative A. Acquired lands are open to grazing. This would provide additional or new acreage for a permittee/lessee to apply for grazing use.

Alternative C does not establish forage reserves. Not having a forage reserve would reduce flexibility for livestock operators to graze other areas if they were not able to use their allotment due to landscape-level fire, vegetative treatments, or reclamation activities. Compared to Alternative B, Alternative C would adversely impact livestock grazing by reducing flexibility for the permittee/lessee to use forage reserves.

4.6.5.3.4.2. Resources

Alternative C requires avoidance of surface-disturbing activities on slopes greater than 25 percent unless no resource damage would result, generally the same as Alternative A and with fewer adverse impacts to livestock grazing than Alternative B. This provides more acreage available for installation of range improvement projects in areas with steeper slopes. Compared to Alternative B, Alternative C would make more acres of forage available for livestock grazing, but would present a greater risk of adverse impacts to soil, and therefore, vegetation in both the short term and long term. These would be indirect adverse impacts to livestock grazing.

Alternative C management of produced water and riparian-wetland areas would beneficially impact livestock grazing more than Alternative A or Alternative B. Surface disposal of produced water under Alternative C would result in a more beneficial impact to livestock grazing than Alternative A because Alternative C requires that discharged water be put to a beneficial use (e.g., for livestock watering). This alternative has fewer adverse impacts to grazing than Alternative B because there are fewer protections of floodplains or riparian-wetland areas, potentially increasing permittee/lessee flexibility in the placement of range improvements to maximize livestock grazing use in these areas.

Alternative C uses range betterment funds for infrastructure, and to a lesser extent vegetative treatments. Therefore, there would be fewer fire and fuels treatments under Alternative C, increasing the risk of forage loss due to landscape-level wildfires and increasing stress related to finding pasture for livestock following wildfires similar to Alternative A. However, this would be less beneficial than Alternative B, which uses range improvement funds for vegetation treatments

rather than emphasizing infrastructure development and establishes forage reserves. Rest and deferment of treated areas would continue under Alternative C, which would result in a short-term adverse impact but a long-term beneficial impact to livestock grazing.

Alternative C includes less acreage of vegetation treatments to improve vegetation conditions and increase forage production than Alternative B, because it allocates funds for fences, water developments, and other grazing management infrastructure. Alternative C relies on intense grazing management to produce usable forage for livestock grazing, thereby benefiting the livestock grazing management if successful. This would be more beneficial to livestock grazing than the Alternative B management toward achieving historical community structure and composition of the vegetation.

Like Alternative A, there is less fire and fuels treatment under Alternative C, which would result in a greater risk of forage loss due to landscape-level wildfires, and additional stress related to finding pasture for livestock following wildfires compared to Alternative B, which uses range improvement funds for vegetation treatments rather than infrastructure and establishes forage reserves. Rest and deferment of treated areas would continue under Alternative C; however, Alternative C places more emphasis on using short-term methods, such as electric fencing, of deferring or resting areas from livestock grazing because forage reserves would not be available under Alternative C. Forest and woodlands management under Alternative C would result in the greatest beneficial impact to forage for livestock. Alternative C allows the most timber harvesting of any alternative, and earlier precommercial thinning and larger clear-cuts than Alternative A, which would improve these areas for livestock grazing. Alternative C also manages juniper and limber pine stands to enhance livestock grazing. Activities that control juniper encroachment or stimulate herbaceous growth in the forest and woodland understory would result in a beneficial impact to grazing from increased forage production. As under all alternatives, the lack of local market demand for forest products is a factor that limits BLM ability to successfully manage forest products.

Under this alternative, the intensity and frequency of wildfires would be less than under other alternatives because there would be less fine fuels due to a higher level of livestock forage utilization. However, over the long term, heavier grazing would slowly change the composition of vegetation to a less desirable mix of plant species as described in the NRCS's Ecological Site Guides and Transition Models. This would be similar to impacts under Alternative A and more impacts than under Alternative B, which allows only light use.

Salt or mineral supplements would be placed in historically unused areas to maximize livestock forage use. Although this would allow livestock greater use of upland vegetation, it would likely adversely impact upland vegetation because cattle would congregate in the areas. These adverse impacts to livestock grazing would be direct, because cattle would congregate and focus on salt or mineral supplement sites and riparian-wetland areas and not properly distribute across the landscape. This would cause lower livestock weights and place additional stress on concentrated animals; however, salt or mineral supplements, where they increase livestock distribution, will increase available forage and nutrition.

Alternative C does not require livestock flushing to prevent the spread of INNS. This action would beneficially impact permittees with INNS problems on their private lands by reducing operating costs and allowing more flexibility to move herds without the need to quarantine them. However, it could result in long-term adverse impacts by increasing the potential for establishment and

spread of INNS, which could reduce forage and impact permittees who maintain INNS-free forage on their private lands.

Alternative C management of riparian-wetland resources utilizes all management tools, including rangeland improvements, to make progress toward achieving PFC. These management tools would beneficially impact livestock grazing because more projects would be made available to improve livestock distribution away from riparian-wetland systems and likely would result in the most rapid improvement of riparian-wetland areas, so long as herbivory is excluded. In some cases, this would not provide additional acres of livestock forage that might have been grazed by livestock previously. Over the planning period, approximately 735 miles of new riparian-wetland fence would be built to benefit riparian-wetland areas. In contrast, it is not likely that there would be new fences under Alternative B. New fence construction under Alternative C would beneficially impact livestock grazing by creating more pastures through which operators could rotate their livestock and provide approximately 150 new water projects. These new water projects, in conjunction with additional fencing, would increase flexibility for livestock grazing permittees/lessees throughout the planning area. However, permittee/lessee operational costs would increase considerably under this alternative because of the increase in the number of range projects that would need to be constructed and maintained.

Wildlife management actions under Alternative C would be the least restrictive to livestock grazing management. Alternative C increases the development of range improvements and gives priority to livestock in terms of allocating forage. Like Alternative A, Alternative C allows new fences in migration corridors, but considers habitat fragmentation. This would result in many fewer adverse impacts to livestock grazing than Alternative B, which prohibits new fences and removes some existing fences to reduce habitat fragmentation and to support big game migration. In areas of parturition and crucial winter range, Alternative C manages vegetation primarily to benefit livestock grazing. These impacts would be beneficial to grazing permittees/lessees because livestock use would be spread over a larger area and at a higher level of use. Development of range improvements facilitates livestock grazing in areas where grazing is not occurring because of limited water availability. Alternative C is less restrictive than Alternative B and, in many cases, less restrictive than Alternative A.

Alternative C management of special status species would result in adverse impacts similar to Alternative A. Alternative B management is more favorable to special status species and less favorable to livestock grazing because of the protections and special management requirements for other resource values.

Alternative C management of wild horses is similar to Alternative A, except that it would be more beneficial to livestock grazing because there would be greater displacement of wild horses with the construction of more fencing and water developments, thus reducing competition from wild horses. Alternative B wild horse management would be the least beneficial to livestock grazing because it includes little to no fencing.

Alternative C management of cultural and paleontological resources is similar to Alternative A. However, with the construction of additional range improvements, the number of conflicts would be expected to increase to protect cultural resources (e.g., cattle tend to walk fence lines and congregate near and around water wells and tanks, thereby increasing the risk of impacts to cultural resources), thus reducing the number of potential range improvement projects installed.

Alternative C impacts to range improvements from the management of visual resources would be similar to those under Alternative A. However, if additional fences and water developments are

proposed along the historic trails, a higher level of mitigation would be required compared to Alternative A.

4.6.5.3.4.3. Resource Uses

Resource uses under Alternative C are projected to result in approximately 60,632 acres of surface disturbance on BLM-administered land in the long term. This disturbance would result in the loss of approximately 6,890 permitted AUMs over the life of the plan, the most of any alternative. Appendix T (p. 1641) lists the projected surface disturbance for each alternative by the source of the disturbance. The projected surface disturbance under Alternative C would result in the greatest long-term and short-term adverse impacts to AUMs of any of the alternatives.

Alternative C closes approximately 5,472 acres of BLM-administered land to motorized vehicle use, a decrease of approximately 8 percent compared to Alternative A. Alternative C would result in the fewest adverse impacts to permittee/lessee access, but the most potential impact to rangeland health and forage palatability of any alternative by increasing the likelihood of INNS spread.

Recreation management under Alternative C would be the same as Alternative A as it relates to livestock grazing, except that recreation management under Alternative C does not guarantee current use and emphasizes motorized recreation over nonmotorized. This would result in a trend toward a more urban industrial setting and away from the primitive setting, which would adversely impact livestock grazing. Alternative C would be less adverse than Alternative B management of closing the Sweetwater River pasture of the Silver Creek Allotment, but the beneficial impact of keeping these 1,074 permitted AUMs would be minor compared to the beneficial impacts of the Alternative B trend away from an urban industrial setting toward a more primitive setting.

4.6.5.3.4.4. Special Designations

Alternative C management does not include ACECs or recommend eligible and suitable WSRs and does not close areas to livestock grazing in such areas as under other alternatives. Therefore, Alternative C would not result in impacts to livestock grazing from management of these areas. Impacts from the management of NHTs and other trails would be similar to those under Alternative A. Special designations that protect vegetative resources or limit surface disturbance would result in beneficial impacts to livestock grazing management in those areas.

4.6.5.3.5. Alternative D

4.6.5.3.5.1. Program Management

Under Alternative D, 2,317,368 surface acres are open for livestock grazing and 7,566 allotment acres are closed to livestock grazing. Alternative D also includes the closure of 4,021 allotment acres not being grazed. Areas such as campgrounds and exclosures not being grazed total 2,056 acres and comprise 239 AUMs. Alternative D would result in fewer AUMs than Alternative C, particularly over time, as additional rangeland infrastructure would be limited to those that are part of a grazing strategy. The development of comprehensive grazing strategies will focus first on the stocking rates and season of use associated with grazing allotments prior to the incorporation of range improvement projects into a grazing system. Additionally, the strategy will be to incorporate rest and/or deferment into the grazing systems to make progress toward and meet Wyoming Standards for Healthy Rangelands.

Management under Alternative D will be focused on managing livestock to achieve Wyoming Standards for Healthy Rangelands and will look at other resource values. As allotments are assessed and permits/leases renewed, available AUMs in Alternative D would be less than Alternative C. This would be less beneficial to livestock grazing than Alternative C. Alternative D focuses on development and installation of range improvement projects necessary to implement comprehensive grazing strategies leading to improved rangeland health, or to enhance successful grazing management strategies already in place. Beneficial impacts associated with the projected improvement in rangeland health should exceed the impacts associated with the project infrastructure installed. Projects would be avoided that expand livestock grazing on the landscape without a clear link to a Comprehensive Grazing Strategy and consideration of other resources. Alternative D allows range improvement projects only as part of a Comprehensive Grazing Strategy to improve or enhance rangeland health; Alternative C focuses on management to maximize livestock forage use instead of the protection or enhancement of other resource values. However, while Alternative D would present some of the risks of adverse impacts resulting from a failure of high-intensity grazing systems as Alternative C, it would present less risk because of the requirement for a Comprehensive Grazing Strategy.

Like Alternative C, Alternative D uses both infrastructure and non-infrastructure improvements to maintain, enhance, and achieve rangeland health. Range improvement projects under Alternative D are designed to improve or enhance rangeland health. Beneficial impacts associated with any range improvement project must exceed the adverse impacts of the project. Alternative D avoids projects that would expand grazing across the landscape unless there is a clear link to the Comprehensive Grazing Strategy and consideration of other resources. In certain ACECs designated for the benefit of wildlife, range improvement projects are authorized only if they enhance the important resource values of the ACEC.

Alternative D establishes requirements for residual forage that are the same as alternatives A and C which when applied on an allotment-by-allotment basis, would likely lead to utilization that would not exceed 50 percent, or moderate use, in areas livestock prefer. This utilization would allow greater forage use by livestock than Alternative B, and would be a beneficial impact for livestock, particularly in the short term. However, in areas where the Wyoming Standards for Healthy Rangelands are not being met as a result of current livestock grazing practices, Alternative D would likely result in utilization objectives of 30 to 35 percent in areas preferred by livestock to make significant progress toward meeting the Wyoming Standards for Healthy Rangelands. The placement of salt or mineral supplements is similar to alternatives A and C with regard to distance from riparian-wetland areas, which would result in similar impacts as A and C in this regard. However, Alternative D is more restrictive with regard to the greater sage-grouse Core Area and NHTs where the impacts would be more adverse than under alternatives A and C. Acquired lands are open to grazing on a case-by-case basis, thus benefiting permittees/lessees. It is likely that AUMs under this alternative would be the second fewest of the alternatives.

Under Alternative D, forage reserves will be established as opportunities arise. Using forage reserves increases the flexibility for livestock operators to graze other areas if they are not able to use their allotment due to catastrophic events or vegetative treatments, or if reclamation activities could not be accomplished following a disturbance. This would be a beneficial impact to livestock grazing over Alternative C by increasing flexibility for the permittee/lessee.

4.6.5.3.5.2. Resources

Alternative D requires avoidance of surface-disturbing activities on slopes greater than 25 percent. This would result in impacts to livestock grazing similar to Alternative A, with fewer adverse impacts than under Alternative B, and with slightly more than under Alternative C. Reduced slope limitations provide more acreage for the installation of range improvement projects in those areas. Compared to Alternative B, Alternative D would result in more acres of available livestock forage, but would result in a greater risk of adverse impacts to soil (and therefore vegetation) in both the short term and the long term. Adverse impacts to soil and vegetation would be indirect adverse impacts to livestock grazing.

Forest and woodland management under Alternative D would result in less beneficial impact to forage for livestock than Alternative C, which authorizes more active forest management. Alternative D manages juniper and limber pine stands to enhance all uses. This would result in a beneficial impact to livestock grazing, but would be less beneficial than Alternative C. Activities that control juniper encroachment or stimulate herbaceous growth in the forest and woodland understory would result in a beneficial impact to grazing from increased forage production. As under all alternatives, the lack of local market demand for forest products limits BLM ability to successfully manage forest products.

Under this alternative, with comprehensive grazing strategies the intensity and frequency of wildfires would be similar to that described under Alternative B due to the presence of more fine fuels caused by shorter use periods and longer rest periods that may be implemented in the comprehensive management strategies. However, in some areas the intensity and frequency of wildfires could be about the same as under alternatives A and C, with the same levels of forage utilization by livestock. However, unlike alternatives A and C, over the long term, light to moderate grazing pressure combined with comprehensive grazing strategies would prevent a slow change to a less desirable mix of plant species. If successful, the plant mix would remain desirable for livestock grazing, as it would under Alternative B.

Alternative D includes fewer acres of vegetation treatments to improve vegetation conditions and increase forage production than Alternative B. Alternative D allocates more funds for fences, water developments, and other infrastructure, although less than in Alternative C. Alternative D relies on grazing management to produce usable forage for livestock, thereby benefiting livestock grazing management where successful, although less so than Alternative C. Alternative D may result in more opportunities for biological diversity but would result in fewer beneficial impacts to livestock grazing than Alternative C, which manages for forage production.

Salt or mineral supplements would be placed in historically unused areas to maximize livestock forage use, if part of the comprehensive management strategy. Adverse impacts to upland vegetation that could result from this placement (and other strategies to disperse cattle from riparian-wetlands) could be acceptable under Alternative D if the net beneficial impacts to the riparian-wetland areas outweighed adverse impacts to upland vegetation from livestock grazing use in these areas. Increasing livestock use on historically unused areas would also create user conflicts with wildlife species such as greater sage-grouse, pronghorn, and other big game species, but these potential adverse impacts would be considered in evaluating the Comprehensive Grazing Strategy.

Like Alternative B, Alternative D could require livestock flushing, which would result in a short-term adverse impact to grazing, but have a potential long-term benefit by reducing the

spread of INNS. This action, if implemented, would adversely impact permittees/lessees with INNS problems on their private lands by increasing operating costs and allowing less flexibility to move herds without the need to quarantine or drylot them. This could result in long-term beneficial impacts by increasing the potential for establishment and spread of INNS, which reduces forage and burdens permittees who maintain INNS-free forage on their private lands.

Alternative D riparian-wetland resources management utilizes all management tools, including rangeland improvements, to make progress toward PFC, but only as part of a comprehensive management strategy. These management tools benefit livestock grazing because more projects would be made available to improve livestock distribution away from riparian-wetland systems and likely would result in the most rapid improvement of riparian-areas. In some cases, this would provide for additional forage in areas that might have never or only seldom been grazed by livestock to become available. This additional forage would be less than that under Alternative C, because the additional acres made available must have a clear link to the grazing strategy and consider adverse impacts to other resources. Unlike Alternative C, Alternative D prevents the development of new range improvement projects without an associated Comprehensive Grazing Strategy, thereby reducing expansion of grazing across rangelands without a clear link to improving rangeland health and consideration of other resources. Over the planning period, the BLM anticipates that the construction of rangeland improvement projects under Alternative D would result in approximately 42 acres of disturbance each year, including new fence construction and water projects. Due to the constraints on range improvement projects under Alternative D, such as buffering around greater sage-grouse leks, the disturbance associated with range improvement projects, particularly fences, are anticipated to increase as a result of the need to avoid resource conflicts. New fence construction would beneficially impact livestock grazing operators by creating more pastures through which to rotate their livestock. New water projects, in conjunction with additional fencing, would increase flexibility for livestock grazing permittees throughout the planning area and would encourage an overall strategy to achieve Wyoming Standards for Healthy Rangelands. However, permittee/lessee operational costs would increase considerably under this alternative due to the increased number of range projects that would need to be constructed and maintained.

Wildlife management actions under Alternative D would result in the next most adverse impacts to livestock grazing after Alternative B, but not much more than Alternative A or Alternative C. Alternative D includes the continued development of range improvements, but focuses them as tools to implement the Comprehensive Grazing Strategy in consideration of adverse impacts to wildlife and other resources. Moreover, the adverse impacts cannot outweigh the beneficial impacts of the projects. Although Alternative D does not give priority to livestock in terms of use of forage as does Alternative C, under Alternative D this would happen by default because of the utilization levels. However, Alternative D will consider wildlife and special status species such as greater sage-grouse when considering forage use. This consideration will be incorporated into the comprehensive grazing strategies through stocking rate evaluations that allow for appropriate residual forage to meet the needs of big game and hiding cover for greater sage-grouse. In many cases, this could result in a reduction in stocking rate to meet resource objectives associated with wildlife.

Wildlife management under Alternative D would result in slightly more adverse impacts to livestock grazing than under alternatives A and C because fencing would not be used in identified big game migration corridors. However, when critical to the success of a Comprehensive Grazing Strategy and compatible with a migration corridor, fencing would be considered. Similarly, Alternative D would result in slightly more adverse impacts than Alternative A or Alternative C

because it authorizes water developments beneficial to livestock grazing in areas of parturition and crucial winter range only if the project is critical to the success of a Comprehensive Grazing Strategy. To reach a Finding of No Significant Impact, impacts from fencing and water development under alternatives A, C, and D must be mitigated. Therefore, the increased adverse impacts under Alternative D over alternatives A and C would be from the requirement that range improvement projects in migration corridors, crucial winter range, and parturition areas be part of a Comprehensive Grazing Strategy. All three alternatives would result in substantially fewer adverse impacts than the Alternative B prohibition of range improvement projects. Allowing range improvement projects in big game areas would be beneficial to grazing permittees/lessees because livestock grazing use would be spread over a larger area than before and at a higher level of use. The development of range improvements would facilitate livestock grazing in areas where grazing is not occurring because of limited water availability.

Management of special status species under Alternative D would result in impacts similar to Alternative A, although slightly more restrictive, which would result in substantially fewer adverse impacts to livestock grazing than Alternative B. Alternative D is more favorable to special status species and less favorable to livestock grazing, but would result in fewer adverse impacts than Alternative B because Alternative D adopts the Core Area approach to management for the benefit of greater sage-grouse. As a result, only the leks in the Core Area are buffered from surface disturbance by 0.6 mile, which would allow range improvement projects on an additional 8,801 acres. This would result in fewer adverse impacts to livestock grazing than Alternative B, but more than Alternative A or Alternative C. Although seasonal limitations on surface-disturbing or disruptive activities are applied over a greater area under Alternative D than under alternatives A and C, and less than Alternative B, this would not result in adverse impacts to livestock grazing, although it would reduce the time available for implementing range improvement projects. Potential range improvements might need to be modified to avoid and buffer greater sage-grouse habitat to mitigate impacts of increased livestock use in the area.

Management of wild horses under Alternative D is more favorable than Alternative C. Construction of fencing and water developments limited to those needed for a Comprehensive Grazing Strategy, wild horses would be displaced and there would be less competition from wild horses than under Alternative A or Alternative C. Alternative B wild horse management would be the least beneficial to livestock grazing because there would be no fencing allowed that would adversely impact wild horses. Any limitations on water development outside the HMAs designed to keep wild horses in the HMA would adversely impact livestock grazing.

Management of cultural and paleontological resources under Alternative D would result in impacts similar to Alternative A, and fewer adverse impacts than Alternative C. Alternative D would create conflicts because a large number of range improvement projects would be built and use would increase (e.g., cattle tend to walk fence lines and congregate near and around water wells and tanks, thereby increasing the risk of impacts to cultural resources). Under Alternative D, these adverse impacts would be allowed if offset by the beneficial impacts of the projects to the Comprehensive Grazing Strategy.

There would be few adverse impacts to livestock grazing from management of visual resources under Alternative D, because VRM is based on meeting objectives rather than any artificial geographic scale. Adverse impacts to visual resources could be authorized under Alternative D if the impacts were outweighed by beneficial impacts from a Comprehensive Grazing Strategy.

4.6.5.3.5.3. Resource Uses

Resource uses under Alternative D are projected to result in approximately 11,453 acres of surface disturbance on BLM-administered land in the long term. This disturbance would result in the loss of approximately 1,301 permitted AUMs over the life of the plan. Appendix T (p. 1641) lists the projected surface disturbance for each alternative by the source of the disturbance.

Alternative D closes approximately 26,357 acres of BLM-administered land to motorized vehicle use, a decrease of approximately 65 percent compared to Alternative B, but 329 percent more than Alternative A. Alternative C closes 5,472 acres to motorized vehicle use. Closing areas to motorized vehicle use would result in a beneficial impact to livestock grazing; it would improve rangeland health and forage palatability by decreasing the likelihood of INNS spread. Approximately 9 percent of the land closed to motorized travel under Alternative D is also closed to livestock grazing.

Impacts to livestock grazing from recreation management under Alternative D would be the same as under Alternative B, except that Alternative D opens the Sweetwater River Pasture of the Silver Creek Allotment to grazing. This would beneficially impact livestock grazing by maintaining 1,074 permitted AUMs. On a planning area basis, this would be a minor adverse impact. Both alternatives B and D trend less away from the primitive setting toward a more urban setting, and therefore would result in more beneficial impacts to livestock grazing than Alternative C.

4.6.5.3.5.4. Special Designations

Alternative D would result in fewer adverse impacts to livestock grazing from special designation management than Alternative B, but more than Alternative C. Alternative D designates 243,838 acres as ACECs. Alternative D closes 7,566 acres to livestock grazing (these are the same closures discussed above, not duplicative), which would result in, on a planning area-wide basis, inconsequentially more adverse impacts to livestock grazing than alternatives A and C. For wildlife ACECs, such as Lander Slope and Red Canyon, Alternative D authorizes new range improvement projects if the purpose is to enhance the values in the ACEC. These projects also could result in beneficial impacts to livestock grazing, but would require site-specific analysis to determine impacts. In other ACECs, range improvement projects would be authorized on a case-by-case basis, as under Alternative A. In this regard, Alternative D would result in more adverse impacts than Alternative C, which does not manage any areas for ACEC values and would allow range improvement projects regardless of benefits to other resource values.

Alternative D would result in fewer adverse impacts to livestock grazing than Alternative B because range improvement projects within ½ mile of RHT&EHs are authorized if they meet VRM objectives and are not otherwise limited. This management would result in the same minor adverse impacts to livestock grazing as alternatives A and C (which, although Alternative C, like alternatives A and D, does not designate the RHT&EH as ACECs, must still meet NHPA requirements).

Alternative D management of Congressionally Designated Trails would result in substantially more adverse impacts to livestock grazing than Alternative C. Alternative D manages a much larger area around trails with VRM objectives, which could result in adverse impacts to livestock grazing through the location of range improvement projects and the closing of trail corridors to ROWs (except in identified locations). However, these adverse impacts would be somewhat offset by beneficial impacts to grazing through limitations on surface disturbance in trail corridors

to meet VRM objectives. Management actions that limit surface disturbance would indirectly benefit livestock grazing by improving vegetation and preventing the spread of INNS.

Alternative D would also adversely impact the construction of range improvements along eligible and recommended suitable WSRs, which would be considered on a case-by-case basis, depending on whether they would enhance the outstanding values of the waterways. Therefore, Alternative D would result in impacts to livestock grazing from WSR-related management similar to alternatives A and B.

4.6.6. Recreation

The following impact definitions (characterizations) apply to this analysis:

- Impacts to the recreation setting of important recreation areas that result from resource and resource use management actions constitutes a direct adverse impact to recreation.
- Closing areas to a specific recreation activity has a direct adverse impact on the specific activity that is precluded.
- Closing areas to motorized vehicles and precluding energy development will cause areas to trend toward a primitive recreation setting. In general, settings that trend toward primitive have a beneficial impact to nonmotorized recreation and adverse impact to motorized recreation. Primitive settings typically have a high degree of naturalness, with few human disturbances on the landscape. The acres of recreation setting trending toward primitive was calculated based upon the amount of area precluded from energy development and closed to motorized vehicle use.
- Areas precluded from energy development but not closed to motorized vehicles will demonstrate a recreation setting that is unchanged or maintained at existing condition. These areas would continue to benefit the diversity of recreation opportunities that currently exist across the planning area. The acres of recreation setting maintained at existing conditions is equal to the area precluded from energy development.
- Areas with high and moderate potential for energy and mineral resources (and not precluded from development) would experience increased development, causing the recreation setting in the area to trend toward urban/industrial. This trend would adversely impact most recreationists, with the exception of those who specifically enjoy motorized recreation in a modified environment. The acres of recreation setting trending toward urban/industrial was calculated based on an overlay of those areas not precluded from development with high and moderate potential for the various energy resource.
- Managing areas as SRMAs can have a direct beneficial impact to: individuals, communities, economies, and/or the environment. These beneficial impacts are assigned within the management objectives of SRMAs.
- Management actions that benefit wildlife and wildlife habitat would benefit recreation. In addition, actions that restrict habitat losses and adverse changes in recreation setting in WGFD hunt units managed for special criteria would benefit recreation. The acres of area enhanced for wildlife dependent recreation is calculated based upon an additive of the areas precluded from development and the acres of area where wildlife dependent recreation is specifically targeted within a recreation management objective. The percent of WGFD special hunt units maintained to facilitate trophy/high quality hunting opportunities was calculated by dividing the amount of special hunt units precluded from energy development by the total area of special hunt units.
- Management actions to support resources that limits energy development would limit changes to the area, thus indirectly benefitting recreation settings.

This section focuses on analyzing impacts to recreation management outside Congressionally Designated Trails. See the *Congressionally Designated Trails – Recreation and Visual Resources* section for impacts to recreationists and the recreational setting along Congressionally Designated Trails.

4.6.6.1. Summary of Impacts

Table 4.32, “Impacts to Recreation Setting by Alternative” (p. 1088) summarizes impacts to the recreation environment (setting) across alternatives. Recreation management under the alternatives reflects the diversity of visitor demand in the planning area. Recreation management also reflects the fact that accommodating specific visitor demand is contingent on restrictions in other BLM management programs (e.g., energy development). Therefore, the range of management actions in the recreation program heavily influences the level of impact to recreationists and the recreation setting under each alternative. For these reasons, Table 4.32, “Impacts to Recreation Setting by Alternative” (p. 1088) summarizes both the impacts of program management and impacts to the overall recreation setting.

Table 4.32. Impacts to Recreation Setting by Alternative

Anticipated Recreation Setting Trend	Alternative A	Alternative B	Alternative C	Alternative D
Acres of recreation setting trending toward primitive	5,923	71,761	5,472	26,357
Acres of recreation setting maintained at existing conditions	146,717	1,739,972	16,330	714,824
Acres of recreation setting trending toward urban/industrialized at an increased scale and pace	2,241,570	582,477	2,372,408	1,653,961
Source: BLM 2012a				

Visitors also express very diverse preferences for recreation activities. The general recreation groupings in this analysis are consumptive, non-consumptive, motorized, and nonmotorized. Some management actions under alternatives could restrict opportunities to participate in these recreational activities. Closures to activities adversely impact recreationists who participate in those activities. However, closures to one activity could benefit other recreationists when the area is closed to a conflicting activity. Table 4.33, “Acreage Available to Consumptive, Non-Consumptive, Motorized, and Nonmotorized Recreation Activities” (p. 1089) displays the acreage in the planning area open or closed to consumptive, non-consumptive, motorized, and nonmotorized recreation activities.

Table 4.33. Acreage Available to Consumptive, Non-Consumptive, Motorized, and Nonmotorized Recreation Activities

Activities	Alternative A (acres)		Alternative B (acres)		Alternative C (acres)		Alternative D (acres)	
	Open	Closed	Open	Closed	Open	Closed	Open	Closed
Consumptive	Entire planning area	0	Entire planning area	0	Entire planning area	0	Entire planning area	0
Non-consumptive	Entire planning area	0	Entire planning area	0	Entire planning area	0	Entire planning area	0
Motorized	2,388,287	5,923	2,322,449	71,761	2,388,738	5,472	2,367,853	26,357
Nonmotorized	Entire planning area	0	Entire planning area	63,379 (closed to mechanized only)	Entire planning area	0	Entire planning area	0

Source: BLM 2012a

Accommodating visitor demand for beneficial outcomes is limited and affected by the actions or restrictions in other BLM management programs. For example, accommodating visitor demand for specific recreation benefits would be almost impossible in an area targeted for heavy energy development. Conversely, management objectives for SRMAs specifically target beneficial outcomes resulting from recreation use. Table 4.34, “Recreation-Specific Beneficial Outcomes by Alternative” (p. 1089) lists the acres of recreation-specific beneficial outcomes and the recreation sectors that would benefit.

Table 4.34. Recreation-Specific Beneficial Outcomes by Alternative

Recreation Area (Priority Activities)	Beneficial Outcomes to:	Acres by Alternative Managed for Beneficial Outcomes			
		Alternative A	Alternative B	Alternative C	Alternative D
Johnny Behind the Rocks (Horseback Riding, Mountain Biking, Hiking, Trail Running, Wildlife Viewing)	Local Individuals, Lander Community, and the Environment	0	5,594	0	4,828
Sinks Canyon Climbing Area (Climbing, Hiking)	Local Individuals, Lander Community, and the Environment	0	139	0	Same as Alternative B
Bus @ Baldwin Creek (Horseback Riding, Trail Running, Mountain Biking, Hiking)	Local Individuals, Lander Community, and the Environment	0	1,159	0	Same as Alternative B
Dubois Mill-Site (Hiking, Walking, Running, Wildlife Viewing, Horseback Riding, (Motorized Trail Riding Alternative C Only)	Individuals, Dubois Community, (Environment Alternative B Only)	0	608	608	Same as Alternative B

Recreation Area (Priority Activities)	Beneficial Outcomes to:	Acres by Alternative Managed for Beneficial Outcomes			
		Alterna- tive A	Alterna- tive B	Alterna- tive C	Alterna- tive D
Sweetwater Canyon (Hiking, Backpacking, Horseback Riding, Hunting, Fishing, Wildlife Viewing)	Individuals, Environments, and Regional Economics	0	9,136	0	Same as Alternative B
Sweetwater Rocks (Climbing, Hiking, Backpacking, Horseback Riding, Hunting, Wildlife Viewing)	Individuals, Environments, and Regional Economics	0	49,727	0	41,806

Source: BLM 2012a

During workshops, cooperators identified the need to accommodate hunting heritage and conserve wildlife. To that end, cooperators identified objectives, several of which also provide indicators to analyze alternatives. Acres where wildlife-dependent recreation is enhanced and acres where the BLM can facilitate trophy/high-quality hunting opportunities in WGFD hunt units managed under special management criteria not only reflects direct impacts but also recognizes the causal link between wildlife, associated habitat, and recreation. Table 4.35, “Wildlife-Dependent Recreation Acreage by Alternative” (p. 1090) lists the acres of area where management actions would enhance wildlife-dependent recreation, and the percent of WGFD special hunt units where management actions would limit habitat losses and changes to the recreation setting.

Table 4.35. Wildlife-Dependent Recreation Acreage by Alternative

Wildlife Dependent Recreation	Alternative A	Alternative B	Alternative C	Alternative D
Acres of area enhanced for wildlife dependent recreation	146,717	1,890,599	16,330	1,564,484
Percent of Wyoming Game and Fish Department special hunt units maintained to facilitate trophy/high quality hunting opportunities	Antelope: 11% Mule Deer: 4%	Antelope: 94% Mule Deer: 86%	Antelope: 8% Mule Deer: 4%	Antelope: 55% Mule Deer: 32%

Source: BLM 2012a

4.6.6.2. Methods and Assumptions

This analysis focuses on the indicators (recreation setting, activities, beneficial outcomes, and wildlife-dependent recreation) described above. In addition, the analysis compares impacts to the following important (as identified by visitor demand) recreation areas under the alternatives: Agate Flats, Beaver Creek Nordic Ski Area, Muskrat Basin, Dubois Mill Site, Johnny Behind the Rocks, Sinks Canyon, the Bus @ Baldwin Creek, Sweetwater Canyon, Sweetwater Rocks, Castle Gardens, Copper Mountain WSA, Dubois Badlands WSA, Coalmine/Government Draw, Green Mountain, Lander Slope/Red Canyon, and Whiskey Mountain/Eastfork.

Methods and assumptions used in this impact analysis include the following:

- Visitors have specific preferences for recreation settings. The recreation setting is an integral supply component of the recreation environment because settings “not only affect the experiences and benefits,” but also help to “define what type of activities might occur in an area” (Pierskalla et al. 2004).

- Beneficial outcomes realized by recreationists and communities will occur across the planning area as specified in the outcome objectives for each alternative. While outcomes could be realized anywhere in the planning area, specifically targeted outcomes will be realized at a much higher rate because the BLM and its partners will actively develop management actions and provide a recreation setting that facilitates these outcomes (Driver 2008). In addition, allowable use decisions will sustain and enhance recreation outcomes throughout the planning period (Hopkins 2008).
- All areas (SRMAs and ERMAs) will be managed to meet statutory requirements to ensure resource protection, human health and safety, reduce conflicts, and achieve other program planning objectives.
- Limiting the amount of group use, limiting destructive activities, influencing behaviors, concentrating use, utilizing or creating hardened sites, and shielding areas from use reduces environmental impacts from recreation (Cole 1993). These options will be considered the primary management actions available to alleviate impacts to resources from recreation.
- Sanderson et al. (Sanderson et al. 1986) found that, as livestock management intensities (including level of fencing or other range improvements) increased, visitor demand or enticement for an area decreased.
- Sanderson, et al. (Sanderson et al. 1986) found that customer or visitor preference for a landscape decreased as grazing intensity increased.
- Visitor experience-inhibiting encounters with livestock include cows near camps, manure on trails, and cows or impacts near water sources (Wallace et al. 1996).
- The most important characteristics for determining the impacts to the environment from recreation are (1) the amount of use, (2) the type of recreation activity, (3) the behavior of recreationists, (4) the spatial distribution of use, and (5) the temporal distribution of use (Cole 1993).
- Allowable use decisions that protect wildlife habitat would also benefit wildlife-dependent recreation. In addition, areas specifically identified for management to enhance wildlife-dependent recreation would benefit this management.

4.6.6.3. Detailed Analysis of Alternatives

4.6.6.3.1. Impacts Common to All Alternatives

Recreation management decisions will limit some recreation activities. Specifically, the 14-day campsite occupancy limit would impact recreationists who desire to camp for longer periods. This demand is especially high during the fall hunting season that runs approximately 60 to 80 days, depending on the species pursued and weapon choice. This impact would occur across the planning area and during any season recreationists desire to camp for more than 14 days.

Recreation management will increase access and provide additional hunting opportunities for handicapped individuals. These decisions would enhance wildlife-dependent recreation for all participants.

Several resource management actions common to all alternatives would impact recreation settings and activities. First, standard wildlife and special status species stipulations (such as seasonal limitations on surface-disturbing and surface-disruptive activities) would limit recreation activities and/or recreation permit holders. These impacts would be seasonal and not result in permanent closures. Second, activities to gather wild horses would continue to temporarily introduce undesirable amounts of noise and activity to the recreation setting. Wild

horse roundup activities also displace wildlife; therefore, these impacts would especially affect wildlife-dependent recreation if roundup activities are performed during fall hunting seasons. Finally, standard cultural resources stipulations (resource protection actions) would continue to limit new recreation developments and visitor services. These stipulations rarely preclude projects, but could result in project relocation or modification. Impacts to recreation settings and activities from management under other resource programs would be seasonal and occur randomly, locally, and in relatively small portions of the planning area.

Resource use management actions common to all alternatives would impact recreation settings and activities. Areas identified as having high and moderate potential for oil and gas would continue to demonstrate trends toward urban/industrial recreation settings. In addition, development of these areas would continue to reduce opportunities for wildlife-dependent recreation because habitats and recreation settings would be altered. Several travel management decisions common to all alternatives would restrict the use of motorized and over-snow vehicles. In particular, cross-country motorized vehicle use would be limited to 300 feet to retrieve harvested big game animals. This and other limitations would adversely impact motorized vehicle users, but would beneficially impact nonmotorized recreationists. Continuing to authorize the current amounts, kinds, and season of livestock grazing use would continue to impact recreationists and important recreation areas. Visitor encounters with livestock such as cows near camps, manure on trails, and cows or impacts near water sources would affect visitor experiences (Wallace et al. 1996). In addition, areas with high-intensity grazing or that trend toward increasing grazing intensity would experience a decrease in visitor preference (Sanderson et al. 1986). Impacts to recreation from resource use programs would occur year-round and across the planning area. The intensity of impacts from oil and gas development and livestock grazing would depend on the intensity of use resulting from these programs.

Several resource management actions common to all alternatives would enhance recreation activities, recreation settings, and wildlife dependent recreation. Several management actions related to wildlife and special status species would promote healthy wildlife populations and habitats, and mitigate impacts to wildlife from authorized activities. In addition, the biological resources management actions include: reintroduction of native species on a case-by-case basis. These actions would enhance wildlife-dependent recreation opportunities by simply promoting more wildlife. Ensuring VRM Class I and II objectives are met through allowable use decisions would beneficially impact recreationists who enjoy scenic environments. These beneficial impacts would occur across the planning area, but primarily in identified winter ranges protected under seasonal stipulations, when reintroduction of native species (such as bighorn sheep) actually occurs, and/or in areas identified as Class I and II.

Continued management of WSAs under BLM Manual 6330, *Management of Wilderness Study Areas* would enhance primitive and nonmotorized recreation opportunities. These areas also would enhance nonmotorized wildlife-dependent recreation opportunities by protecting wildlife and habitats.

4.6.6.3.2. Alternative A

4.6.6.3.2.1. Program Management

Visitor services under Alternative A will be a function of actions to protect resources, mitigate use and user conflicts, and protect human health and safety. That is, visitor services under this

alternative will focus on accommodating the priorities of other BLM programs rather than accommodating visitor demand. This would adversely impact recreationists because it is not responsive to visitor demands for recreation settings, activities, and/or outcomes.

Program management under Alternative A protects several existing developed recreation sites, but does not include any allowable use decisions to protect important recreation areas. Protections under this alternative would maintain existing investments, but does not include decisions that would allow for future development of new recreation sites or maintenance and enhancement of important recreation areas. Program management under this alternative would not sustain or enhance the recreation settings of important recreation areas to supply specific visitor demand for recreational opportunities (activities and outcomes).

4.6.6.3.2.2. Resources

Alternative A closes 5,923 acres to motorized vehicles year-round to protect resources. The year-round closures would result in 5,923 acres trending toward primitive. This trend would reduce opportunities for motorized recreation activities and enhance nonmotorized activities. In addition, without allowable use decisions to sustain or enhance recreation opportunities, stipulations on resources (e.g., wildlife and cultural resources) could conflict with recreation settings and opportunities in important recreation areas. This conflict would be random and local; therefore, it is not possible to predict the scale and locations of the impacts.

Development associated with resource uses increases road densities, decreases naturalness, and increases contacts with other humans (setting trending toward urban/industrial). Overall, allowable use decisions to protect resources (e.g., wildlife) would limit development associated with resource uses. Therefore, most allowable use decisions associated with resources would result in the maintenance of recreation settings, a beneficial impact to recreation management.

The maintenance of existing recreation settings as a result of allowable use decisions to protect resources would facilitate a diversity of recreation opportunities. In addition, allowable use decisions to protect resources would reduce the potential for setting change in important recreation areas, and resource use decisions to protect wildlife and wildlife habitat would enhance and maintain opportunities for wildlife-dependent recreation. As a result of allowable use decisions associated with wildlife, cultural resources, and visual resources, 146,717 acres of recreation setting across the planning area would be maintained. Development in the following important recreation areas is precluded or restricted under Alternative A: Castle Gardens, Coalmine/Government Draw, Dubois Badlands WSA, Dubois Mill Site, Sinks Canyon Climbing Area, the Bus @ Baldwin Creek, and Whiskey Mountain/Eastfork. Finally, allowable use decisions associated with resources would maintain or enhance wildlife-dependent recreation on 146,717 acres, and 7 percent of WGFD special hunt units would be maintained/enhanced to facilitate trophy/high-quality hunting opportunities.

4.6.6.3.2.3. Resource Uses

Because of authorized uses associated with mineral and energy resources, Alternative A would result in 2,241,570 acres of recreation setting trending toward urban/industrial. This would adversely impact recreationists seeking to recreate in areas with low road density, high degree of naturalness, and few people. Conversely, these impacts would benefit recreationists who enjoy recreating in a motorized/high road density environment with numerous human disturbances and other users.

Under Alternative A, authorized uses associated with mineral and energy resources would impact several important recreation areas in the planning area (see Table 4.36, “Energy-Related Impacts to Recreation Areas under Alternative A” (p. 1094)).

Table 4.36. Energy-Related Impacts to Recreation Areas under Alternative A

Important Recreation Area	Impacts
Agate Flats	Wildcat exploration and small-scale development in support of oil and gas extraction will continue primarily in the western (near Beaver Rim/Tin Cup Mountain) portion of the area. Wind-energy development would occur throughout the landscape. Several ROWs would continue to show disturbance across the landscape. These activities would result in the Agate Flats area demonstrating an overall trend toward urban/industrial setting. In addition, these activities would impact wildlife-dependent recreation and the WGFD Antelope hunt areas in the area.
Copper Mountain WSA	Wind-energy development outside the WSA would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA.
Green Mountain	Alternative A impacts to Green Mountain would occur outside the existing ACEC designated to protect elk parturition and winter ranges. Wildcat exploration and small-scale development in support of oil and gas extraction would continue in the northern and southern portions of this area. Wind-energy development would occur across the entire area. Extensive uranium development also could occur across most of the area. These activities would result in the Green Mountain area demonstrating a major trend in setting change toward urban/industrial. These actions also would reduce wildlife-dependent recreation opportunities, reduce wildlife habitats, and alter recreation settings in several WGFD Antelope hunt areas managed under special criteria.
Johnny Behind The Rocks	Wildcat exploration and small-scale development in support of oil and gas extraction would continue throughout the area. Alternative A management of this important recreation area focuses on the sole purpose of extracting bentonite. Bentonite exploration requires complete stripping of vegetation and removal of multiple feet of soil on slopes and ridge tops in the area. A bentonite mine in the Johnny Behind The Rocks area would preclude recreation in the area.
Lander Slope/Red Canyon	Alternative A management of the Lander Slope focuses on the sole purpose of extracting phosphate. Phosphate exploration requires complete stripping of vegetation and removal of multiple feet of soil on slopes and ridge tops in the area. A phosphate mine on the Lander Slope would preclude recreation in the area.
Muskrat Basin	Wildcat exploration and small-scale development in support of oil and gas extraction would continue throughout the area. Wind-energy development would occur on top of Beaver Rim and several prominent ridges (such as Signor Ridge). In addition, phosphate mining could occur in an isolated portion of this area. These activities would result in the Muskrat Basin area demonstrating a trend toward urban/industrial setting. These actions also would reduce wildlife-dependent recreation opportunities, reduce wildlife habitats, and alter recreation settings in several WGFD Antelope hunt areas and a mule deer hunt area managed under special criteria.
Sweetwater Canyon	Wind-energy development outside the WSA would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA.
Sweetwater Rocks	Wind-energy development and granite mining outside the WSA would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA.
ACEC Area of Critical Environmental Concern ROW right-of-way WGFD Wyoming Game and Fish Department WSA Wilderness Study Area	

Most of the planning area is open to ROW authorizations under this alternative. Impacts from these actions would be random and differ in scale. Locating ROWs in existing disturbed areas would not alter the recreation setting. New disturbances associated with ROWs under this alternative would result in recreation settings trending toward urban/industrial. Important

recreation settings precluded from most ROW development include Sweetwater Rocks, Lander Slope/Red Canyon, and the Dubois Millsite.

Alternative A allows for continued development of range projects and existing levels of livestock grazing intensities, which in some areas is heavy (greater than 60 percent). Areas with new range projects would see a decrease in visitor preference, visitors would continue to show reduced preference toward areas with existing range improvements, and areas demonstrating high levels of utilization would not be favored by recreationists (Sanderson et al. 1986). Visitor encounters with livestock such as cows near camps, manure on trails, and cows or impacts near water sources (Wallace et al. 1996) would continue across the planning area and in all important recreation areas including Sweetwater Canyon. This would inhibit visitor experiences.

4.6.6.3.2.4. Special Designations

Because ACEC designations are a function of protecting relevant and important resources, impacts to recreation from the designation of ACECs are captured above. Secondary impacts to recreation from management of these special designations (e.g., trail viewshed protections that also limit development in important recreation areas) is also described above. See the *Congressionally Designated Trails – Recreation and Visual Resources* section for impacts to recreation from the management of Congressionally Designated Trails and the *Wild and Scenic Rivers* section for impacts to recreation from the management of WSRs.

4.6.6.3.3. Alternative B

4.6.6.3.3.1. Program Management

Alternative B closes 7,500 acres to motorized activities to meet specific customer demand in the Johnny Behind the Rocks, the Bus @ Baldwin Creek, and the Dubois Mill Site areas. In addition, this alternative closes 18,251 acres in important wildlife-dependent recreation areas (Green Mountain and Red Canyon) to ensure a diversity of wildlife-dependent recreation opportunities. The year-round closures would result in 15,751 acres trending toward primitive setting as a direct result of actions to enhance nonmotorized recreation. This trend would reduce opportunities for motorized recreation activities and enhance opportunities nonmotorized activities.

Program management under this alternative is responsive to customer demand. Compared to Alternative A, Alternative B increases visitor services in all important recreation areas and provides allowable use decisions that ensure the future recreational enjoyment of these areas.

Alternative B manages seven important recreation areas (totaling 307,183 acres) as SRMAs. In SRMAs, the recreation setting is managed to meet visitor demand for specific activities, experiences, and benefits. Under Alternative B, allowable uses (limits on other BLM programs) and management actions are specifically developed to sustain and/or enhance the entire recreation setting. The following important recreation areas will be in SRMAs to meet specific visitor demand: Dubois Mill Site, Johnny Behind the Rocks, Sinks Canyon, Sweetwater Canyon, and the Sweetwater Rocks.

Alternative B also manages several important recreation areas (not in SRMAs) in a manner that meets a less specific/more diverse visitor demand in concert with wildlife program objectives. Alternative B manages these areas as distinct ERMA. Distinct ERMA are areas where management focuses on providing a diversity of recreation opportunities, within the confines

of both recreation and non-recreation program objectives. In distinct ERMA, allowable uses and management actions address recreation and tourism issues, activities, and conflicts and/or single important attributes (such as remoteness) of the area. Compared to Alternative A, the Alternative B focus on harmonizing visitor services, diversifying recreation opportunities, and other program priorities constitutes an increased level of visitor services. Alternative B manages the remainder of important recreation areas as distinct ERMA, including Agate Flats, Beaver Creek Nordic Ski Area, Castle Gardens, Coalmine/Government Draw, Copper Mountain WSA, and Dubois Badlands WSA,

Program management in Alternative B would protect more existing developed recreation sites than Alternative A. In addition, the alternative would protect future developed sites and investments. Alternative B would apply allowable use decisions to protect more important recreation areas than Alternative A.

Program management under Alternative B also identifies several actions to enhance wildlife-dependent recreation, including:

1. Specifically identifying the Agate Flats, Green Mountain, Lander Slope/Red Canyon, and Muskrat Basin distinct ERMA for wildlife-dependent recreation,
2. Increasing visitor services in these distinct ERMA to facilitate wildlife-dependent recreation,
3. Identifying seasonal restrictions in the Agate Flats and Muskrat Basin areas so as not to authorize surface-disturbing activities during the hunting season of several WGFD hunt areas managed under special criteria,
4. Managing the Dubois Mill Site, Johnny Behind the Rocks, Sweetwater Canyon, and Sweetwater Rocks SRMA to enhance specific recreation opportunities, including wildlife-dependent recreation, and
5. Applying allowable use decisions in the above SRMA to sustain/enhance the recreation setting to provide specific recreation opportunities associated with wildlife-dependent recreation.

4.6.6.3.3.2. Resources

Alternative B closes 71,761 acres to motorized vehicles year-round to protect resources. The year-round closures would result in 71,761 acres trending toward primitive setting. This trend would reduce opportunities for motorized recreation activities and enhance nonmotorized activities. Stipulations for resources (e.g., wildlife and cultural resources) could conflict with recreation settings and opportunities in important recreation areas. Conflict would be local and random, and occur at a lower rate than Alternative A.

Allowable use decisions to protect resources (e.g., wildlife) would limit development associated with resource uses, such as increased road densities, decreased naturalness, and increased contacts with other humans (settings trending toward urban/industrial). Therefore, most allowable use decisions associated with resources would result in the maintenance of recreation settings.

The maintenance of existing recreation settings as a result of allowable use decisions to protect resources would continue to facilitate a diversity of recreation opportunities. In addition, allowable use decisions to protect resources would reduce the potential for setting changes in important recreation areas, and resource use decisions to protect wildlife and wildlife habitat would enhance and maintain opportunities for wildlife-dependent recreation. As a result of allowable use decisions associated with wildlife, cultural resources, and visual resources,

1,739,972 acres of recreation setting across the planning area would be maintained. Alternative B precludes or restricts development in all important recreation areas. Finally, allowable use decisions associated with resources would maintain or enhance wildlife-dependent recreation on 1,890,599 acres, and 90 percent of WGFD special hunt units would be maintained and enhanced to facilitate trophy and high-quality hunting opportunities.

4.6.6.3.3. Resource Uses

Because of authorized uses associated with mineral and energy resources, Alternative B would result in 582,477 acres of recreation setting trending toward urban/industrial. This would adversely impact recreationists who seek to recreate in areas with low road densities, high levels of naturalness, and few people. Conversely, these impacts would beneficially impact recreationists who enjoy recreating in a motorized/high road density environment with numerous human disturbances and other users. All of these impacts would be outside important recreation areas, because Alternative B closes important recreation areas to mineral and energy development.

Alternative B opens most of the planning area to ROW authorizations and land actions. Impacts from these actions would be random and differ in scales. Locating ROWs in existing disturbed areas would not alter the recreation setting. New disturbances associated with ROWs under this alternative would result in recreation settings trending toward urban/industrial. This alternative precludes all important recreation areas from most ROW development.

Alternative B closes the entire planning area to new range improvement projects that conflict with other values. This would result in a decrease in the intensity and occurrence of range improvements from Alternative A. Compared to Alternative A, this would increase visitor demand and enticement across the planning area.

In addition, Alternative B manages for light grazing intensity across the planning area, which would increase visitor preference for the area. Visitor experience inhibiting encounters with livestock such as cows near camp, manure on the trail, and cows or impacts near water sources would occur at a lower rate than under Alternative A across the planning area. Alternative B closes Sweetwater Canyon, the Dubois Millsite, and portions of the Whiskey Mountain/Eastfork area to livestock grazing, which would remove any potential for visitor encounters with livestock.

4.6.6.3.4. Special Designations

Because ACEC designations are a function of protecting relevant and important resources, impacts to recreation from the designation of ACECs are captured above. Secondary impacts to recreation from management of these special designations (e.g., trail viewshed protections that also limit development in important recreation areas) are also described above. See the *Congressionally Designated Trails – Recreation and Visual Resources* section for impacts to recreation from the management of Congressionally Designated Trails and the *Wild and Scenic Rivers* section for impacts to recreation from the management of WSRs.

4.6.6.3.4. Alternative C

4.6.6.3.4.1. Program Management

Alternative C program management is not responsive to visitor demands for recreation settings, activities, and/or outcomes in most of the important recreation areas. Visitor services under this alternative will be a function of actions to protect resources, mitigate use and user conflicts, and protect human health and safety. That is, visitor services under this alternative will focus on accommodating priorities of other BLM programs rather than accommodating visitor demand. This alternative also relocates or removes developed recreation sites or trails to accommodate mineral and energy development activities.

Program management under Alternative C does not provide protections for several existing developed recreation sites, and does not include any allowable use decisions to protect important recreation areas. Protections under this alternative would not maintain existing investments, and would not facilitate future development of new recreation sites or maintenance and enhancement of important recreation areas.

Program management under this alternative would not sustain or enhance the recreation settings of most of the important recreation areas, but focuses instead on mitigating adverse impacts from other resource uses. This would result in several instances where visitor services are removed or relocated to less than desirable locations to accommodate resource uses.

Alternative C manages the Dubois Mill Site (608 acres) as a SRMA. In SRMAs, the recreation setting is managed to meet visitor demand for specific activities, experiences, and benefits. Within these important areas, allowable uses (limits on other BLM programs) and management actions are specifically developed to sustain and/or enhance the entire recreation setting. This alternative does not identify any allowable use decisions for the Dubois Millsite. Therefore substantial visitor service efforts would be initiated to mitigate impacts from other resource uses.

4.6.6.3.4.2. Resources

Alternative C does not close areas or limit motorized travel seasonally. As a result, no settings in the planning area would trend toward primitive. Compared to Alternative A, this would result in fewer opportunities for nonmotorized recreation activities and provide more acreage for motorized activities. In addition, without allowable use decisions to sustain or enhance recreation opportunities, standard stipulations on resources (e.g., wildlife and cultural resources) could conflict with recreation settings and opportunities in important recreation areas. These conflicts would be local and random; therefore, it is not possible to predict the scale and locations of the impacts.

Alternative C does not include ACECs and limits resource protections to standard management. Therefore, stipulations associated with resource protections would result in minor benefits to recreation and would protect fewer acres than Alternative A. Development associated with resource uses includes increased road densities, decreased naturalness, and increased contacts with other humans (settings trending toward urban/industrial).

As a result of allowable use decisions associated with wildlife, cultural resources, and visual resources, 16,330 acres of recreation setting across the planning area would be maintained. Alternative C resource decisions would not preclude development in any of the important

recreation areas. Four of the important recreation areas without future development potential might not show much change from Alternative A, which includes Beaver Creek Nordic Ski Area, Castle Gardens, Coalmine/Government Draw, and Sinks Canyon. Finally, allowable use decisions associated with resources would maintain or enhance wildlife-dependent recreation on 16,330 acres and 6 percent of WGFD special hunt units would be maintained/enhanced to facilitate trophy/high-quality hunting opportunities.

4.6.6.3.4.3. Resource Uses

Because of authorized uses associated with mineral and energy resources, this alternative would result in 2,372,408 acres of recreation setting trending toward urban/industrial. This would adversely impact recreationists who seek to recreate in areas with low road densities, high levels of naturalness, and few people. Conversely, these impacts would beneficially impact recreationists who enjoy recreating in a motorized/high road density environment with numerous human disturbances and other users.

Under Alternative C, authorized uses associated with mineral and energy resources would impact 12 of the 16 important recreation areas (see Table 4.37, “Energy-Related Impacts to Recreation Areas under Alternative C” (p. 1099)).

Table 4.37. Energy-Related Impacts to Recreation Areas under Alternative C

Important Recreation Area	Impacts
Agate Flats	Increased levels of wildcat exploration and small-scale development in support of oil and gas extraction would impact the western (near Beaver Rim/Tin Cup Mountain) portion of the area. Wind-energy development would occur throughout the landscape. Several ROWs would continue to show disturbance across the landscape. These activities would occur at a higher rate under Alternative C than under Alternative A and result in the Agate Flats area demonstrating an overall setting trend toward urban/industrial. In addition, these activities would impact wildlife-dependent recreation and the WGFD Antelope hunt areas in the area.
Copper Mountain WSA	Wind-energy development outside the WSA would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA at an increased rate over Alternative A.
Dubois Badlands WSA	Wind-energy development outside the WSA would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA at an increased rate over Alternative A.
Dubois Mill Site	Increased wildcat exploration and small-scale development in support of oil and gas extraction would occur across the area. Wind-energy development adjacent to the area would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA at an increased rate over Alternative A.
Green Mountain	Impacts to Green Mountain under Alternative C would occur across the entire mountain because this alternative does not include an ACEC in this area. Increased wildcat exploration and small-scale development in support of oil and gas extraction would occur across the area. Wind-energy development would occur across the entire area. Extensive uranium development could also occur across most of the area. These activities would result in the Green Mountain area demonstrating a major change in setting trending toward urban/industrial. This trend would occur across more of the landscape than under Alternative A. These actions also would reduce wildlife-dependent recreation opportunities, reduce wildlife habitats, and alter recreation settings in several WGFD Antelope hunt areas managed under special criteria.

Important Recreation Area	Impacts
Johnny Behind The Rocks	Impacts to this area would be similar to those under Alternative A, with more areas available for wildcat exploration and small-scale development in support of oil and gas extraction throughout the area. Management of this important recreation area under Alternative C focuses on the sole purpose of extracting bentonite. Bentonite exploration requires complete stripping of vegetation and removal of multiple feet of soil on slopes and ridge tops in the area. A bentonite mine in the Johnny Behind The Rocks area would preclude recreation in the area.
Lander Slope/Red Canyon	Alternative C management of the Lander Slope/Red Canyon area focuses on the sole purpose of extracting phosphate. The potential for impacts to recreation from phosphate development would be much higher under Alternative C than under Alternative A because Alternative C does not include ACEC protections for the area. Phosphate exploration requires complete stripping of vegetation and removal of multiple feet of soil on slopes and ridge tops in the area. A phosphate mine on the lander slope would preclude recreation use in the area.
Muskrat Basin	Wildcat exploration and small-scale development in support of oil and gas extraction would continue throughout the area at a higher rate than under Alternative A. Wind-energy development would occur at a higher rate than under Alternative A. In addition, phosphate mining could occur in an isolated portion of this area. These activities would result in the Muskrat Basin area demonstrating a major change in setting trending toward urban/industrial. These actions also would reduce wildlife-dependent recreation opportunities, reduce wildlife habitats, and alter recreation settings in several WGFD Antelope hunt areas and a mule deer hunt area managed under special criteria.
Sweetwater Canyon	Wind-energy development outside the WSA would dominate the view of recreationists participating in activities in the WSA. Such development would be in view from numerous locations in the WSA and at an increased level over Alternative A.
Sweetwater Rocks	Wind development and granite mining outside of the WSA would dominate the view of recreationists participating in activities within the WSA. Such development would be in view from numerous locations within the WSA.
Bus @ Baldwin Creek	Without the Lander Slope ACEC encompassing this area, the probability of change to this landscape from energy and mineral development would be higher under Alternative C than under Alternative A.
Whiskey Mountain/Eastfork	Without the ACECs encompassing this area, wind-energy development would be likely. Wind-energy development in the area would alter the naturalness of the landscape.
ACEC Area of Critical Environmental Concern ROW right-of-way WGFD Wyoming Game and Fish Department WSA Wilderness Study Area	

Alternative C opens most of the planning area to ROWs and land actions. Impacts from these actions would be random and differ in scale. Locating ROWs in existing disturbed areas would not alter the recreation setting. New disturbances associated with ROWs under this alternative would result in recreation settings trending toward urban/industrial. Designated corridors under this alternative would impact the following important recreation areas: Green Mountain, Agate Flats, Muskrat Basin, Lander Slope/Red Canyon, and Sweetwater Rocks. Alternative C does not preclude any important recreation areas from ROW development.

Compared to Alternative A, Alternative C would result in increased development of range improvement projects to support livestock grazing therefore visitor demand or enticement for these areas would decrease. In addition, areas with high intensity grazing or an increasing trend toward higher intensity grazing use would show a decrease in visitor preference. Alternative C provides for grazing intensity that would continue to decrease visitor preference for numerous

areas across the planning area. Visitor encounters with livestock such as cows near camps, manure on trails, and cows or impacts near water sources would continue across the planning area and in all important recreation areas, including Sweetwater Canyon. This would inhibit visitor experiences.

4.6.6.3.4.4. Special Designations

Alternative C does not include ACECs. The impacts to recreation associated with excluding ACECs is captured above. Additionally, impacts to recreation from the management of Congressionally Designated Trails and WSRs are discussed in the *Congressionally Designated Trails – Recreation and Visual Resources* and *Wild and Scenic Rivers* sections. Secondary impacts to recreation from not managing these special designations (e.g., trail viewshed protections that also limit development in important recreation areas) are described above.

4.6.6.3.5. Alternative D

4.6.6.3.5.1. Program Management

Program management under this alternative is very similar to Alternative B, with the following differences: Alternative D closes 6,595 (as opposed to 7,500) acres to motorized activities to meet specific visitor demands in the Johnny Behind the Rocks, the Bus @ Baldwin Creek, and the Dubois Mill Site areas. In addition, the alternative closes fewer acres than Alternative B in important wildlife-dependent recreation areas (Green Mountain and Red Canyon) to ensure a diversity of wildlife-dependent recreation opportunities. The year-round closures would result in fewer acres than Alternative B but more acres than Alternative A or C trending toward primitive settings as a direct result of actions to enhance nonmotorized recreation. This trend would reduce opportunities for motorized recreation activities and enhance opportunities for nonmotorized activities.

Program management under Alternative D is responsive to visitor demands. The alternative increases (more than Alternative A but less than Alternative B) visitor services in most (10 of the 12) important recreation areas and provides for allowable use decisions that ensure the future recreational enjoyment of these areas.

As with Alternative B, Alternative D manages 6 important recreation areas (totaling 10 acres fewer acres than Alternative B) as SRMAs. In SRMAs, the recreation setting is managed to meet visitor demands for specific activities, experiences, and benefits. In these important areas, allowable uses (limits on other BLM programs) and management actions are specifically developed to sustain and/or enhance the entire recreation setting. The following important recreation areas would be in SRMAs to meet specific visitor demands: Dubois Mill Site, Johnny Behind the Rocks, the Bus @ Baldwin Creek, Sinks Canyon, Sweetwater Canyon, and Sweetwater Rocks.

Alternative D also manages four important recreation areas (not SRMAs) in a manner that meets a less specific/more diverse visitor demand in concert with other program (wildlife) objectives. Four of the important recreation areas will be managed as distinct ERMA. Distinct ERMA represent areas where management focuses on providing a diversity of recreation opportunities, within the confines of both recreation and non-recreation program objectives. In distinct ERMA, allowable uses and management actions address recreation/tourism issues, activities, and conflicts and/or single important attributes (such as remoteness) of the area. This focus on harmonizing

visitor services, recreation opportunity diversity, and other program priorities constitutes an increased level of visitor services over Alternative A. Four of the 12 important recreation areas will be managed as distinct ERMA (Beaver Creek Nordic Ski Area, Green Mountain, Lander Slope/Red Canyon, and Whiskey Mountain/Eastfork).

Program management under Alternative D would protect more existing developed recreation sites than Alternative A. Alternative D would protect future developed sites and investments in the Green Mountain area only. The alternative will apply allowable use decisions to protect more important recreation areas than Alternative A.

Under Alternative D, SRPs would not be issued for activities in Core Area that would adversely impact greater sage-grouse, and the BLM would apply Required Design Features that would limit adverse impacts to greater sage-grouse from authorized activities.

Program management under Alternative D identifies actions (more than Alternative A but fewer than Alternative B) to enhance wildlife-dependent recreation, including:

1. Specifically identifying Green Mountain and Lander Slope/Red Canyon as distinct ERMA for wildlife-dependent recreation.
2. Increasing visitor services in these distinct ERMA to facilitate wildlife-dependent recreation.
3. Managing the Dubois Mill Site, Johnny Behind the Rocks, Sweetwater Canyon, and Sweetwater Rocks SRMA to enhance specific recreation opportunities, including wildlife-dependent recreation.
4. Applying allowable use decisions in the above SRMA to sustain/enhance the recreation setting to provide specific recreation opportunities associated with wildlife-dependent recreation.

4.6.6.3.5.2. Resources

Alternative D closes 26,357 acres to motorized vehicles year-round to protect resources. The year-round closures would result in 26,357 acres trending toward primitive settings. This trend would reduce opportunities for motorized recreation activities and enhance opportunities for nonmotorized activities. Stipulations on resources (e.g., wildlife and cultural resources) could conflict with recreation settings and opportunities in important recreation areas. These conflicts would be local and random and would occur at a much lower rate than under Alternative A.

Allowable use decisions to protect resources (e.g., wildlife) would limit development associated with resource uses, including increased road densities, decreased naturalness, and increased contacts with other humans (setting trending toward urban/industrial). Therefore, most allowable use decisions associated with resources would result in the maintenance of recreation settings. This would be particularly true in Core Area, but would also apply to protections for the benefit of other resources, including wildlife and historic trails. The Required Design Features that would reduce road densities and require reclamation of unnecessary roads would have adverse impacts on recreation similar to impacts under Alternative B.

As a result of allowable use decisions associated with wildlife, cultural resources, and visual resources, 714,824 acres of recreation setting across the planning area would be maintained. Alternative D precludes or restricts development in all important recreation areas, except those listed in Table 4.38, "Energy-Related Impacts to Recreation Areas under Alternative D" (p. 1103). Finally, allowable use decisions associated with resources would maintain or

enhance wildlife-dependent recreation on 33 percent of WGFD special hunt units which would be maintained/enhanced to facilitate trophy/high-quality hunting opportunities.

4.6.6.3.5.3. Resource Uses

Because of authorized uses associated with mineral and energy resources, this alternative would result in 1,653,961 acres of recreation setting trending toward urban/industrial. This would adversely impact recreationists who seek to recreate in areas with low road densities, high levels of naturalness, and few people. Conversely, these impacts would beneficially impact recreationists who enjoy recreating in a motorized/high road density environment with numerous human disturbances and other users. Most of these impacts would be outside important recreation areas, except for the areas listed in Table 4.38, “Energy-Related Impacts to Recreation Areas under Alternative D” (p. 1103).

Table 4.38. Energy-Related Impacts to Recreation Areas under Alternative D

Important Recreation Area	Impacts
Agate Flats	Similar to Alternative C, with fewer impacts due to more restrictions to support Congressionally Designated Trails and the Sweetwater Rocks SRMA
Copper Mountain WSA	Same as Alternative A.
Muskrat Basin	Same as Alternative C.
SRMA Special Recreation Management Area WSA Wilderness Study Area	

Alternative D opens most of the planning area to ROWs and land actions. Impacts from these actions would be random and differ in scale. Locating ROWs in existing disturbed areas would not alter the recreation setting. New disturbances associated with ROWs under this alternative would result in recreation settings trending toward urban/industrial. This alternative precludes all important recreation areas from most ROW development.

Impacts to recreationists as a result of livestock grazing would be similar to Alternative C.

4.6.6.3.5.4. Special Designations

Because ACEC designations are a function of protecting relevant and important resources, impacts to recreation from the designation of ACECs are described above. Secondary impacts to recreation from management of these special designations (e.g., trail viewshed protections that also limit development in important recreation areas) are also described above. See the *Congressionally Designated Trails – Recreation and Visual Resources* section for impacts to recreation from the management of Congressionally Designated Trails and the *Wild and Scenic Rivers* section for impacts to recreation from the management of WSRs.

4.7. Special Designations

4.7.1. Congressionally Designated Trails – Cultural and Historic Resources

In the 1970s and 1980s, Congress designated the Oregon, Mormon Pioneer, California, and Pony Express NHTs. These historic trails are some of the most significant in the nation; they are prime examples of the 19th Century expansion of the United States and the mass migration west

across the continent. Spanning the western half of the United States, the four NHTs all pass through Wyoming on their way to South Pass, the crossing of the Continental Divide. In the planning area, the NHTs follow essentially the same route as they wind through the Sweetwater Valley. The landscape the trails traverse in this area is little changed from the mid-1800s, with few modern developments. Because the NHTs retain excellent historical settings in this area, the National Park Service (NPS) has designated the entire route in the planning area as a High Potential Segment, which the National Trails System Act defines as a trail resource most worthy of protection and preservation.

In the late 1990s and 2000s, public use of the NHTs increased, primarily because of an increase in interest by groups from the Church of Jesus Christ of Latter-day Saints. Their interest in commemorating and experiencing what their pioneer ancestors went through led to reenactments of handcart and wagon treks along the NHTs. At one point during the early 2000s, as many as 12,000 people per year with handcarts and support vehicles, walked parts of the NHTs in the planning area. This activity adversely impacted the trails and their settings. Restrictions on the number of trekkers were eventually instituted, and impacts are now more under control.

Adverse impacts to NHTs typically result in a loss of integrity of the resource, or in some cases a loss of archeological information. Adverse impacts to significant trail resources on BLM-administered lands occur for several reasons, including actions that physically damage or destroy all or parts of an NHT; actions that alter a significant element of a trail; actions that introduce visual, atmospheric (air), or audible (noise) elements that can diminish the historical integrity of an NHT; and a lack of action, which, in certain cases, can allow a trail resource to deteriorate. Adverse impacts can also occur to NHTs from increased access to areas with trail resources, resulting in increased use, erosion, looting, and vandalism.

The four NHTs are all highly significant for their associations with important events in American history. In the planning area, these NHTs are also significant for their good to excellent historical settings, which help visitors imagine what it was like along these trails in the 1800s. Adverse impacts to these values can result for the reasons described above, and would be both short-term and long-term because some adverse impacts can be reversed while others cannot.

In some cases, NHT resources are also significant for their scientific data potential, especially at historic sites along the NHTs. Actions that cause physical damage or destruction, or the lack of action and neglect, can result in adverse impacts to these resources. These impacts would be long-term because, once a resource is damaged or disturbed, the impact cannot be reversed.

Beneficial impacts to NHTs occur from management actions that enhance the quality of that resource. Stabilization and repair of historic structures at Giles Pie Place, fencing around standing structures and gravesites along the trails, and erosion control measures are examples of actions that result in beneficial impacts. Most of these beneficial impacts would be long-term, but eventually, adverse natural and/or human influences would require more measures to keep these resources from degrading.

Congressional designation of a trail as part of the National Trails System signifies that the resource is of exceptional scenic, recreational, and/or historic value.

4.7.1.1. Summary of Impacts

Impacts to NHTs vary by alternative in the following ways: (1) alternatives A and C are similar in their protections, but Alternative A generally affords more protections than Alternative C; (2)

alternatives A and C focus on protecting the immediate area around NHTs, but do not address visual impacts farther away from the trails; (3) Alternative B provides much better protection for NHTs and protects historic settings to a high degree; (4) Alternative D is far more protective than either Alternative A or Alternative C, and somewhat less protective than Alternative B.

4.7.1.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- NHTs, especially High Potential Sites and Segments, are managed and protected in accordance with the National Trails System Act, Section 106 of the NHPA, the National Landscape Conservation System Act, Executive Order 13195, and BLM IM Washington Office-2009-215 (BLM 2009i). Additional guidance is being updated as this EIS is being written to provide more specific management options.
- Activities occurring on private lands will not be affected by any BLM management prescriptions unless those activities involve federal assistance or require a federal license. For instance, if a landowner or land user wishes to have a privately-funded, privately-licensed development (e.g., and oil and gas well, a wind tower, a livestock reservoir, a cabin, etc.) built on private land, there is no BLM involvement. However, if the development involves federal assistance or requires a federal license, then BLM would be required to take into account the development's impacts upon important cultural resources, including the NHTs.
- Direct and indirect impacts can result from a variety of natural and human-caused actions, such as those that physically alter, damage, or destroy all or part of the trail; improved access, which brings increased use to an area, altering characteristics of the surrounding environment that contribute to trail importance; the introduction of visual or audible elements out of character with the trail or that alter its historic setting; and neglect of the trail to the extent that it deteriorates or is destroyed.
- The BLM encourages opportunities to cooperate with private landowners to minimize or eliminate disturbance to NHTs.
- Recognizing that historic trails often comprise numerous routes rather than a single trace, all protective zones are measured from the outer edges of the trails rather than at a centerline.
- Programmatic management for units of the NLCS, including Congressionally Designated Trails, is ¼ mile from the edges of the trails plus such additional distance to avoid or mitigate adverse effects as defined by the NHPA. However, more recent guidance identifies management based on trail setting and the nature and purpose of trail management.
- Certain projects, due to size or topography, could require consideration of visual intrusions into the setting beyond the foreground or middleground zones to avoid or mitigate adverse effects as defined by the NHPA.
- Recreational or heritage tourism use of the NHTs will increase over time. Overuse of NHTs on public lands will be controlled through permitting mechanisms and special use permits.
- Without allowable use decisions along the NHTs and associated landscapes, future actions/authorizations will continue to conflict with the enabling legislation and supporting documentation of the NHTs.
- The direction in the enabling legislation and supporting documentation will be better achieved through complementary allowable use decisions (e.g., NSO for oil and gas).
- Alternatives that protect a larger landscape around trails will better achieve the direction contained in the enabling legislation and supporting documentation associated with the NHTs.

4.7.1.3. Detailed Analysis of Alternatives

4.7.1.3.1. Impacts Common to All Alternatives

Standard procedures have been developed over the years to help address potential adverse impacts to NHT resources. Because they are Congressionally Designated Trails, priority is given to avoiding or mitigating impacts from development and use. Standard management and protection procedures, guided by the National Trails System Act and the NHPA, include avoidance, screening projects from the trails behind natural features, innovative redesign or camouflaging of projects, and using existing disturbances along trails for placement of projects. These standard procedures have protected NHT resources from adverse impacts and damage in many cases. However, if total avoidance has not been feasible, mitigation measures designed to minimize impacts to the NHTs and their historic settings have been continually improved and implemented over the years. All of the alternatives are guided by these standard procedures.

However, the standard procedures have not always adequately protected the historic settings of NHTs. For example, large and visible projects some distance away have intruded on their intact historic settings. A modern powerline a few miles from the Oregon Trail has resulted in adverse impacts to its historical integrity.

Another type of adverse impact to NHT resources common to all alternatives is from increased public use of lands, which can occur for several reasons. One is improved access to formerly remote areas. This is common in areas where development allows for the creation of new roads. Another reason is the increased popularity and availability of OHVs, which also allows access to formerly remote areas. A third reason is increased public interest in specific historic sites or areas. This is an especially serious impact from users of the Mormon Pioneer NHT. As public use of lands increases from all these causes, so can the impact to NHT resources. As more use occurs, more NHTs are visited and walked or driven over. Some of these resources have been looted or vandalized. This impact would occur under any of the alternatives because access, OHV use, and public use and interest along the NHTs are all expected to increase.

A beneficial impact common to all alternatives is the indirect protection provided by the recent greater sage-grouse Core Area management policy. Approximately 75 percent of the NHTs and their surroundings are in the Core Area, and management to protect the Core Area should also reduce adverse impacts to the settings of the NHTs.

As discussed in other resource analyses, fire management is extremely limited in greater sage-grouse Core Area where annual precipitation is below 12 inches. Accordingly, analysis of the differences in impacts related to each alternative's fire management is limited to areas either outside Core Area or in areas that receive more than 12 inches of precipitation per year. Greater sage-grouse protections also require full suppression of wildfire in greater sage-grouse Core Area habitat. The portions of the NHT settings that are not in Core Area, such as parts of South Pass, would be managed for full suppression to protect other values.

There are also several NHT-related withdrawals that protect NHT resources (Devil's Gate, Martin's Cove, Split Rock, and Rocky Ridge) that offer protection from the impacts of mining. These are withdrawals that do not expire and do not vary by alternatives. Therefore, they are analyzed only to provide context to management that does vary by alternative.

4.7.1.3.2. Alternative A

4.7.1.3.2.1. Program Management

In 1986, the Wyoming BLM approved the *Oregon/Mormon Pioneer National Historic Trails Management Plan* (BLM 1986), which guided protection and management along BLM portions of these trails in Wyoming. In 1987, the Lander RMP used the 1986 plan as its basis for decisions affecting the NHTs. In 1999, the California and Pony Express trails, which followed the same route as the Oregon and Mormon trails in the planning area, were added to the NHTs and the same management prescriptions were adopted. This management includes restrictions on development within ¼ mile of the NHTs, and recommendations for making the trails more accessible and enjoyable for the public. Use on the NHTs has greatly increased since the late 1990s, and use restrictions were implemented in the 2000s to protect the trail from the impacts of heavy use. The protection and management procedures developed since the 1980s are still in use. Impacts to the NHTs from this management are beneficial.

4.7.1.3.2.2. Resources

Alternative A air quality management consists primarily of non-intervention, and would result in a neutral or slightly adverse impact to the NHTs. Efforts to maintain air quality around the trails would help maintain their important qualities, while degradation of air quality would adversely impact these resources by reducing the visibility of the trail setting. General air quality management under Alternative A allows degradation up to the point of concentrations allowed under the CAA. In general, this management would result a neutral or slightly adverse impact to the NHTs.

Fire and fuels management under Alternative A would have the potential to result in two kinds of adverse impacts to cultural resources: building fire lines with heavy equipment and allowing fires to burn without suppression. Fire lines impact NHTs through surface disturbance, and allowing fires to burn adversely impacts resources through burning or heating of NHT-related structures and artifacts. However, the fire and fuels program has been notified about the presence and location of the NHTs and their associated sites, and this should protect those resources from surface disturbance associated with fire suppression activities.

Alternative A designates the NHTs as VRM Class II for ¼ mile (and sometimes more) on each side. Outside this Class II area, VRM is Class IV. This management protects the immediate foreground of the NHTs, but does not protect the foreground, middle ground, or background of the NHTs outside this area. Therefore, the impacts from Alternative A would be beneficial for the first ¼ mile, and adverse thereafter. See the *Visual Resources* and *Recreation* sections for more information.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) under Alternative A provide additional protections for NHT resources. A total of 27,728 acres surrounding the trails, and additional acres identified on a site-specific basis, are protected from surface disturbances under this alternative.

4.7.1.3.2.3. Resource Uses

Alternative A provides some protections for NHTs from locatable mineral exploration. Alternative A does not withdraw any lands from locatable mineral development. Because the NHTs are within an ACEC, Plans of Operation are required for mining activities within ¼ mile of the trails. These plans require NHPA compliance for mining exploration, but do not prohibit those operations. However, outside the withdrawals and the ¼ mile each side Plan of Operations zone, there are no protections from locatable mineral exploration under 5 acres, and the historic settings of the trails are subject to adverse impacts due to development activities. This is especially true in areas of high potential for mining activity, such as the South Pass-Lewiston area. Current management provides some protections to the immediate foreground of the NHTs, but does not protect the historic settings of the NHTs outside this area. Therefore, impacts under Alternative A would be both beneficial and adverse. Chapter 2 describes management under each alternative and the number of acres affected by proposed land use decisions.

Under Alternative A, adverse impacts to the NHTs from leasable fluid and solid minerals, and mineral materials management would be similar to impacts from locatable minerals management. Within ¼ mile of the NHTs, NSO or closure-type stipulations are enforced to protect trail resources. However, outside the ¼ mile either side zone, there are no protections specific to development for the NHTs, and the historic setting of the trails is subject to adverse impacts. These impacts are currently managed on a case-by-case basis, and current protection measures usually focus on reducing impacts rather than preventing them. The most likely adverse impact to the NHTs would be from leasable phosphate minerals exploration, because potentially valuable phosphate outcrops cross the trails in the Upper Sweetwater River region above Sweetwater Station. Current management protects the immediate foreground of the NHTs, but is limited in protecting the historic settings of the NHTs outside this area. Therefore, impacts under Alternative A would be beneficial, but only within the ¼-mile buffer, and potentially very adverse to NHT setting.

Highly visible ROW projects, such as industrial wind-energy development, mines, gas plants, power plants, and large transmission lines, can adversely impact NHTs in substantial ways. For example, wind turbines rising to 400 or more feet or a gas plant near an NHT with good historical settings would seriously and adversely impact the trail's value as a historic resource. Alternative A includes no protections from these types of projects beyond standard NHPA measures. The most highly visible ROW projects anticipated along the NHTs are wind-energy developments and associated large transmission lines, due to high wind-energy potential in the area.

Under Alternative A, adverse impacts to the NHTs from range improvement projects would be similar to impacts from leasable fluid minerals, leasable solid minerals, and mineral material management, although likely on a lesser scale. Within ¼ mile of the NHTs, avoidance-type stipulations for range developments are typically enforced to protect trail resources. However, outside ¼ mile on either side, there are no RMP protections specific to development for the NHTs, and the historic setting of the trails would be subject to adverse impacts due to the introduction of infrastructure and livestock and the loss of vegetation often associated with these types of improvements. These adverse impacts would be managed on a case-by-case basis, and protection measures under Alternative A focus on reducing adverse impacts rather than preventing them. The most likely adverse impact to the NHTs would be from fencing projects that cross the NHTs, which are periodically proposed and sometimes allowed. Alternative A management protects the immediate foreground of the NHTs, but is limited in protecting the historic settings of the NHTs outside this area. Therefore, impacts under Alternative A would be both beneficial and adverse.

Recreational activities along the NHTs have increased substantially since the mid-1990s, and impacts to the trails have risen accordingly. Alternative A provides for the permitting of larger groups using the NHTs, which would help keep adverse impacts to the trails to a low level. This management has slowed impacts to the trails, but has not prevented them. As a result, there would be a low level of adverse impacts from recreation management impacts under Alternative A.

4.7.1.3.2.4. Special Designations

Under Alternative A, the NHTs are recognized as Congressionally Designated Trails and an ACEC. These designations come with protective measures, which were incorporated into the 1987 RMP. These protections beneficially impact the NHTs.

4.7.1.3.3. Alternative B

4.7.1.3.3.1. Program Management

Alternative B increases proactive management over Alternative A. Management under Alternative B provides much more focus and attention to the protection and recreational uses of the NHTs.

4.7.1.3.3.2. Resources

Alternative B specifies that air quality management reduce emissions and improve air quality. This action would beneficially impact NHTs more than Alternative A by improving trail settings.

Alternative B specifies that full suppression would be used near identified cultural sites, such as the NHTs, to protect them from the impacts of fire. Identifying the NHTs in advance, making firefighters aware of their locations, and planning for their protection would preserve important resources, and prevent impacts from fire suppression activities.

Alternative B manages more lands as VRM Class I and II visual resources than Alternative A; this would help protect NHT resources and their settings from the introduction of modern visual intrusions. The entire historic setting of the NHTs is in a VRM Class II area under Alternative B, which would provide substantially better protections for the historic settings of the trails than would Alternative A. See the *Congressionally Designated Trails – Recreation and Visual Resources* section for more information.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) are greatest under Alternative B, providing additional protections for NHT resources and reducing adverse impacts. This is particularly true in connection with protections for the benefit of greater sage-grouse nesting habitat and leks. Under Alternative B, 1,229,358 acres are within the 15-mile NHT protection buffer, and 89 percent of those acres are closed to surface disturbance primarily for the protection of greater sage-grouse.

4.7.1.3.3.3. Resource Uses

Unlike Alternative A, which proposes to withdraw no new lands from locatable mineral entry, Alternative B proposes to withdraw 1.6 million acres. This would protect NHT resources from potential disturbances that would adversely affect the NHTs because this area includes most of the historical setting of the NHTs. Although there are limited locatable minerals identified in this

area, exploratory activity does take place and involves surface-disturbing activities that adversely impact setting. Alternative B would result in the most substantial beneficial impacts in the South Pass-Lewiston area, where impacts from mining would be most likely to occur along the NHTs.

Alternative B closes or places major constraints on leasable fluid and solid minerals, and mineral materials exploration and development on much more land than Alternative A; this would protect NHTs from potential disturbances. Alternative B closes NHTs and almost all of their historical settings; this would provide much better protections than Alternative A and no adverse impacts to the NHTs would occur from these activities. This management would result in the most substantial beneficial impacts in the Upper Sweetwater River area, where impacts from phosphate mining would be most likely to occur along the NHTs. Although the areas closed under Alternative B have low or no potential for oil and gas, this management would ensure that the setting is protected even if technology changes over the next 20 years.

Alternative B restricts wind-energy development, powerlines, and gas plants, and large ROWs to a much greater extent than Alternative A (1,919,029 acres). This alternative closes the entire length of the NHTs from wind-energy development, large mines, and ROWs for a distance of approximately 15 to 20 miles; this would be much more protective to NHTs than Alternative A. These large projects are the most likely to adversely impact NHT settings because they provide a high level of contrast due to their size and design. Alternative B would result in more beneficial impacts than Alternative A because it limits perpendicular trail crossings to only a limited number of identified locations and therefore would prevent ROW intrusions on the NHTs.

Alternative B closes more areas to visible range improvement projects than Alternative A; this would protect NHTs from potential disturbances. NHTs and 3 miles either side are closed to visible range developments; therefore, Alternative B would provide much better protections than Alternative A. It is not possible to determine the number of acres closed to range improvement projects under Alternative B because that would depend on whether the project would be visible from the NHTs, which requires a site-specific analysis. However, it is likely that a project within 3 miles of the NHTs would be visible. This management would mostly affect fencing projects that would cross the NHTs.

Alternative B directs more recreational activities to the Auto Tour Route, and places more emphasis on trail protection on the Group Reenactment and Undeveloped sections of the trails. This would provide slightly to moderately more protections than Alternative A. Refer to the *Congressionally Designated Trails – Recreation and Visual Resources* section for an analysis of this impact.

4.7.1.3.3.4. Special Designations

Under Alternative B, the NHTs ACEC is expanded to five miles on each side of the trails. This would enhance the protection of NHTs by reducing the potential for adverse impacts to their intact historical settings. This alternative provides much greater protection for the NHTs compared to Alternative A. However, this management is somewhat redundant to the Alternative B withdrawal of 5 miles from locatable minerals since the main management tool that comes with ACEC designation is the requirement of a Plan of Operations for mining development less than 5 acres. Since Alternative B withdraws these lands there is no need for a Plan of Operations, except for locations where a claim has already been staked.

4.7.1.3.4. Alternative C

4.7.1.3.4.1. Program Management

Alternative C decreases proactive management as compared to Alternative B. The minimum actions necessary to comply with regulations will be applied to the NHTs, which would increase adverse impacts to all the NHTs in the planning area.

4.7.1.3.4.2. Resources

Alternative C manages air quality the same as Alternative A, and would result in the same marginally adverse impacts to the NHTs, compared to Alternative B, which would result in more beneficial impacts both from site-specific air resources management and overall air quality management.

Alternative C fire and fuels management would result in adverse impacts the same as Alternative A, and more than Alternative B.

Alternative C classifies less land as VRM Classes I and II than Alternative A, and substantially less than Alternative B, which would provide less protection for NHTs from visual modern intrusions. Alternative C designates a smaller area around NHTs as VRM Class II, and designates the surrounding areas as VRM Class III. Therefore, Alternative C would result in more adverse impacts than Alternative A or B because the historical setting of the NHTs would be degraded due to modern developments. See the *Congressionally Designated Trails – Recreation and Visual Resources* section for more information.

Because Alternative C places more emphasis on resource use, it includes fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations). Therefore, Alternative C would result in more adverse impacts to NHTs than alternatives A and B. These impacts are described in other resource sections. The most substantial difference between alternatives B, A, and C is the acreage are closed to surface disturbance for the protection of greater sage-grouse. Because much of the NHTs are in areas closed for this reason (approximately 89 percent of the 15 miles on either side of the NHTs are in areas closed under Alternative B), this sensitive species management would result in substantial beneficial impacts to NHTs that would be minimal under alternatives A and C.

4.7.1.3.4.3. Resource Uses

Alternative C provides almost no protection for NHTs from locatable mineral exploration. Locatable minerals mining regulations do not follow the standard protection measures described above and, unless the exploration disturbs more than 5 acres, NHTs are afforded little or no protection from the impacts of this type of mining. Because Alternative C does not include NHT and South Pass Historic Mining Area ACECs, lands in those ACECs under other alternative would not be subject to Plans of Operation protections under this alternative. Therefore, Alternative C does not protect NHTs from the adverse impacts of locatable mineral developments. This is especially true in areas of high potential for mining activity, such as the South Pass-Lewiston area.

Under Alternative C, adverse impacts to the NHTs from leasable fluid minerals, leasable solid minerals, and mineral materials management would be similar to adverse impacts under Alternative A, and would be substantially more adverse than under Alternative B. NSO and

closed-type stipulations are enforced to protect NHTs only within ¼ mile of either side. Outside the ¼-mile buffer, there are no limits on mineral development, and the historic setting of the trails would be subject to adverse impacts. These impacts are managed on a case-by-case basis, and protection measures focus on reducing impacts rather than preventing them. Alternative C management protects the immediate foreground of the NHTs, but is limited in protecting the historic settings of the NHTs outside this area; Alternative B extends the protections for 15 to 20 miles. Therefore, the impacts under Alternative C would be similar to impacts under Alternative A, and substantially more adverse than under Alternative B. The most likely impact to the NHTs would be from leasable phosphate minerals exploration, because potentially valuable phosphate outcrops, covering approximately 26,800 acres, cross the trails in the Upper Sweetwater River region above Sweetwater Station.

Alternative C management of wind-energy developments, mines, and large ROWs is the same as Alternative A and would result in impacts much less beneficial than Alternative B. Highly visible ROW projects, such as wind-energy developments, gas plants, power plants, and large transmission lines, can adversely impact NHTs in substantial ways. For example, a wind-energy development or gas plant near an NHT with good historical settings would seriously impact the trail's value as a historic resource. Alternative C includes no protections from these types of projects other than standard NHPA measures. Because there are lands with high potential for industrial wind-energy development open under alternatives A and C, lands that are exclusion areas under Alternative B, it would be likely that there would be adverse impacts from this type of development under Alternative C. The most highly visible projects anticipated along the NHTs are wind-energy developments and associated large transmission lines, due to high wind-energy potential in the area.

Under Alternative C, adverse impacts to NHTs from range development projects would be similar to impacts under Alternative A. Alternative C enforces avoidance-type stipulations within ¼ mile on either side of NHTs to protect trail resources. However, outside the ¼-mile on either side buffer, there are no protections for NHTs specific to range improvement projects, and the historic setting of the trails would be subject to adverse impacts similar to those under Alternative B. These impacts would be managed on a case-by-case basis, and protective measures would focus on reducing impacts rather than preventing them. Alternative C management protects the immediate foreground of the NHTs, but is limited in protecting the historic settings of the NHTs outside of that area. Therefore, impacts under Alternative C would be similar to impacts under Alternative A, and much more adverse than under Alternative B. The most likely impact to NHTs would from fencing projects that cross the NHTs.

Impacts from recreation management would be the same under Alternative C as Alternative A. See above under Alternative B for a comparison of alternatives A and B.

4.7.1.3.4.4. Special Designations

Alternative C does not include any ACECs or WSRs. Under Alternative C, Congressionally Designated Trails would be generally protected out to ¼ mile on each side, except from locatable minerals exploration. Alternative C retains the pre-FLPMA withdrawals but does not include new locatable mineral withdrawals. This alternative removes Plan of Operations requirements and opens the lands along the NHTs to unrestricted mining. Therefore, Alternative C would result in more adverse impacts than Alternative A.

4.7.1.3.5. Alternative D

4.7.1.3.5.1. Program Management

Alternative D establishes an NTMC that applies uniform oil and gas management throughout the corridor and does not distinguish between the NHTs and the CDNST. The different issues and management approaches between the NHTs and the CDNST, as determined by their nature and purposes, is captured by setting the boundaries of the NTMC. Where the CDNST travels through a more industrially developed area toward Rawlins, at some distance from the NHTs, the corridor width is ¼ mile on either side of the CDNST to protect user safety. However, when the CDNST joins the NHTs and is in primarily undeveloped areas with intact setting, the NTMC expands to meet the nature and purposes of the five Congressionally Designated Trails. In general, the management of the NTMC under Alternative D includes close to the same level of proactive management as Alternative B, which is more than alternatives A and C. Alternative D would better prevent impacts to the five Congressionally Designated Trails than current management (Alternative A) by more fully protecting the historical settings of the trails and their associated sites than Alternative A or C, and almost as well as Alternative B.

4.7.1.3.5.2. Resources

Air quality management under Alternative D is the same as Alternative A with the same generally neutral impact to the Congressionally Designated Trails. However, management of air emissions is important to address atmospheric conditions that could impact setting. Alternative D management of soil and water resources would be less beneficial than management under Alternative B, but more beneficial than management under alternatives A and C. Restrictions under Alternative D in terms of limiting surface disturbance are not as broad as under Alternative B, but would provide much more protection than Alternative A or Alternative C.

Alternative D protections for greater sage-grouse and other wildlife close fewer acres to surface disturbance than Alternative B, but substantially more acres than Alternative A or Alternative C. Consequently, Alternative D special status species management would be substantially more beneficial to NHTs than Alternative A or Alternative C, and almost as beneficial as Alternative B. Required Design Features to limit adverse impacts from surface disturbance would limit the adverse impacts that would otherwise occur, but not to the extent of Alternative B.

Alternative D classifies approximately 580,697 more acres of BLM-administered surface as VRM Classes I and II than Alternative A, but 502,514 fewer acres than Alternative B. Therefore, Alternative D would protect substantially more trail resources from the introduction of modern visual intrusions than alternatives A and C, but substantially less than Alternative B. Alternative D classifies utility corridor crossings as VRM Class III, the same as Alternative B and more protective than alternatives A and C.

In general, restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological, and visual resources) are the most under Alternative B, with Alternative D providing a moderate amount of protection and alternatives A and C affording substantially less protection for the Congressionally Designated Trails.

4.7.1.3.5.3. Resource Uses

Alternative D withdraws more acres (425,935) of mineral estate from locatable mineral entry than Alternative A, but much less than Alternative B, which proposes to withdraw 1,632,605 acres. Alternative D specifically withdraws the ruts and swales and 10 feet on either side of the NHTs. The alternatives A, C, and D withdrawals focus on specific trail-associated historic sites, while Alternative B proposes to withdraw the entire landscape out to 5 miles around the trails. Therefore, Alternative D would result in more beneficial impacts than alternatives A and C, but less than Alternative B. Although some of the lands that are proposed for withdrawal under Alternative B have very low or no identified potential for locatable minerals, that is not the case in all areas, particularly near South Pass. The impacts from locatable mineral management under Alternative D are similar to impacts under Alternative B where locatable mineral potential exists.

Applying NSO to the NTMC would limit the adverse impacts to NHT resources, but less than the closure to oil and gas leasing under Alternative B. However, the difference in impacts between the two alternatives is limited by the very low or no potential for oil and gas in the area. The Required Design Features applied under Alternative D reduce adverse impacts associated with development, but less than Alternative B, which prohibits those activities. The Beaver Rim MLP management of the lands north of the NHTs and west of Jeffrey City provide beneficial impacts to lands adjoining the NTMC, including some within the viewshed of places within the NTMC. Alternative B management extends CSU protections out to a distance of 5 miles from the NHTs, while Alternative D relies on VRM Class II and Class III objectives. It is likely that Alternative B would have a slightly less adverse impact to the NHTs than Alternative D, but this difference would be minor. The difference could be evaluated only on a site-specific basis in response to a specific proposal, which would identify object height, size, placement and other site-specific factors. Alternative D oil and gas management would be far less adverse to the NHTs than either Alternative A or C.

Alternative D prohibits geophysical exploration in areas managed as NSO to oil and gas, with the exception that the NTMC is closed to geophysical exploration within a mile of the CDNST and NHTs, which is less closure than the NSO area. This would allow more adverse impacts to the NHTs from geophysical exploration. Trail-related SRMAs are closed to exploration during the heavy visitor-use season. This management adversely impacts geophysical exploration, and the oil and gas program, but has much less adverse impacts than the trails protections under Alternative B.

Alternative D manages leasable solid minerals and mineral materials disposals, the same as Alternative B, and would be much more protective than alternatives A and C. The potential for leasable solid minerals is generally low along the NHTs, so restrictions are not expected to have substantial impacts on development of these minerals. Mineral materials are present in the area, although there will likely be little demand for those materials.

Realty actions, including ROWs and designated corridors, are less protective of the NHTs under Alternative D and would therefore allow more adverse impacts than Alternative B. The designated corridor along Bison Basin Road crosses the NHTs in a new corridor designation. Even if protective management is required for such things as reclamation, new disturbances would adversely impact the NHTs and their settings. The NTMC is managed as an avoidance zone for most of its length; this is less restrictive than the exclusion area under Alternative B. Avoidance criteria would limit this adverse impact to some extent, but would not be as beneficial as management under Alternative B. Alternative D provides substantially more protections than

alternatives A and C and therefore would have far fewer adverse impacts to the NHTs and their settings and related values.

Alternative D restricts high-profile/highly visible projects such as wind-energy development, power and gas plants, and large ROWs to a much greater extent than alternatives A and C, but less than Alternative B. Through VRM, Alternative D allows at most a weak visual contrast outside of the NTMC for these projects, while Alternative B prohibits these projects out to 20 miles from the trails unless they could not be seen. Alternatives A and C extend protection to ¼ mile on either side of trails. Therefore, Alternative D would result in much more beneficial impacts than alternatives A and C, but less than Alternative B (although the degree of adverse impacts would be identified through site-specific analysis). The most highly visible ROW projects anticipated along the NHTs are wind-energy developments and associated large transmission lines, due to high wind-energy potential in the area.

Alternatives A, C, and D manage range developments and minor realty actions essentially the same and less restrictively than Alternative B. Range improvement projects and minor realty actions are subject to visual resource conformance along the trails under Alternative D, while Alternative B prohibits range improvement projects within 3 miles and minor realty actions within 5 miles on either side of trails. Therefore, beneficial impacts under Alternative B would be much greater than under alternatives A, C, and D. However, expected adverse impacts from these types of projects are usually not major.

Alternative D allows fewer ROW crossings of the trails than alternatives A and C, but more than Alternative B. Crossings are in four designated corridors under Alternative D; Alternative B includes one designated crossing. Conversely, alternatives A and C allow proposed crossings to be analyzed on a case-by-case basis. All alternatives include restrictions on crossing widths, but Alternative B is most restrictive. Beneficial impacts to trails would be highest under Alternative B, almost as high as Alternative B under Alternative D, and lowest under alternatives A and C.

Alternative D, like Alternative C, designates a corridor crossing the NHTs at Bison Basin Road. The existing disturbance adversely impacts the NHTs setting. However, this impact is somewhat reduced because the road is low profile and somewhat “meandering” rather than very straight and thus presents less of a contrast. New ROWs are limited to underground uses that are within the road ROW. While this will limit the adverse impacts, the new disturbance will create a contrast that adversely impacts what is otherwise a pristine and remote setting. Bison Basin Road adjoins the recreation management area of the NHTs identified for solitary recreation and primitive back country experience; additional disturbance in this area would adversely impact that experience. The extent to which aggressive reclamation could result in quicker revegetation would help to limit the adverse impacts, but reclamation in this area is slow because of poor soils and low precipitation so even when the soil has been stabilized, buried pipelines are visible for many years if not decades. Therefore, pipelines would need to follow the existing line of the roads to limit the contrast as much as possible.

4.7.1.3.5.4. Special Designations

Special designations in the NTMC provide additional protections for the nature and purposes of the NHTs. There are five WSAs in or adjoining the NTMC. The protections afforded by the WSA management would further protect the setting and recreational use of the NTMC. Similarly, the management associated with the one eligible and suitable WSR through Sweetwater Canyon support and provide additional beneficial impacts to the NTMC values. The only ACEC to

overlap the NTMC is the South Pass Historical Landscape ACEC, but the Green Mountain ACEC and the Beaver Rim ACEC are nearby. The VRM of the ACECs would beneficially impact the NTMC values. WSAs, WSRs, and ACECs limit surface disturbances in various ways through limitations on mineral development, realty actions, and other land uses to benefit the identified resource values in the area. Under Alternative D, managing the Congressionally Designated Trails as the NTMC protects 481,557 acres of trail remains and their historic settings, trail-related recreation, and important wildlife habitat, including mule deer winter and crucial winter range, from disturbance. Alternative D would result in more beneficial impacts than Alternative A because it protects 391,539 more acres but less than Alternative B.

Managing the lands around the Congressionally Designated Trails in a cohesive and synergistic way would promote public interest by making the overall management more understandable and predictable and allowing the BLM to process land use applications more efficiently and consistently. In this regard, alternatives B and D would be more beneficial than alternatives A and C.

Other special designations, including WSAs and the South Pass Historical Landscape ACEC, beneficially impact Congressionally Designated Trails' values in approximately the same way as Alternative B.

4.7.2. Congressionally Designated Trails – Recreation and Visual Resources

4.7.2.1. Summary of Impacts

This section focuses specifically on analyzing impacts to recreation and visual resources in Congressionally Designated Trails landscapes. This includes the foreground/midground zone, which is 0 to 5 miles, and the background zone, which is 5 to 15 miles in any direction from an NHT or the CDNST.

Trends in recreation setting and activity opportunities and the impacts thereto along Congressionally Designated Trails under various BLM management actions mirror those identified in Table 4.32, "Impacts to Recreation Setting by Alternative" (p. 1088) in the *Recreation* section.

BLM management actions under other programs limit the BLM's ability to accommodate visitor demand for beneficial outcomes. For example, accommodating visitor demand for specific beneficial outcomes would be almost impossible in an area targeted for heavy energy development. Conversely, SRMA management objectives focus specifically on beneficial outcomes for visitors. Therefore, the beneficial recreation outcomes targeted under each alternative serve as anticipated beneficial impacts. Table 4.39, "Congressionally Designated Trail Recreation Areas Managed for Beneficial Outcomes" (p. 1117) lists the acres of recreation-specific beneficial outcomes and the sectors where benefits would be anticipated as a result of SRMA management for Congressionally Designated Trails.

Table 4.39. Congressionally Designated Trail Recreation Areas Managed for Beneficial Outcomes

Recreation Area (Priority Activities)	Beneficial Outcomes to:	Acres by Alternative Managed for Beneficial Outcomes			
		Alternative A	Alternative B	Alternative C	Alternative D
NHTs Group Use Area (Cultural site visitation, learning cultural heritage, teaching cultural heritage, photography, and historic reenactment)	Individuals, communities, and the environment	0	37,233	0	Same as Alternative B
NHTs Auto Tour Route (Cultural site visitation, learning cultural heritage, teaching cultural heritage, photography, driving for pleasure)	Individuals, communities, the environment, and economies	0	25,098	0	Same as Alternative B
Congressionally Designated Trails Undeveloped Recreation Area (Cultural site visitation, driving for pleasure, photography, horseback riding, hiking/backpacking, hunting)	Individuals, communities, and the environment	0	95,711	0	92,598
Alkali Basin of the CDNST (Horseback riding/packing, hiking/backpacking, mountain biking, hunting)	Individuals, Communities, the Environment, and Economies	0	37,384	0	Same as Alternative B
Sweetwater Historic Mining Area of the CDNST (Cultural site visitation, driving for pleasure, photography, horseback riding/packing, develop site camping, hiking/backpacking, mountain biking)	Individuals, the environment, and economies	0	45,394	0	Same as Alternative B
CDNST Continental Divide National Scenic Trail NHT National Historic Trail					

As discussed in the *Visual Resources* section of this chapter, VRM Classes establish a measurable standard for the amount of change allowed to the visual character of a specific area. See the *Visual Resources* section for VRM Class definitions. Table 4.40, “VRM Classes as Percent of Congressionally Designated Trails Landscape ” (p. 1117) compares acres of VRM Classes in Congressionally Designated Trails corridors under each alternative. The VRM Classes represent the allowable levels of impacts to visual resources.

Table 4.40. VRM Classes as Percent of Congressionally Designated Trails Landscape

Class	Alternative A	Alternative B	Alternative C	Alternative D
Class I	3	3	3	3
Class II	12	91 (+79)	2 (-10)	44 (+32)
Class III	10	3 (-7)	50 (+40)	49 (+39)
Class IV	75	3 (-72)	45 (-30)	4 (-71)
Source: BLM 2012a				
Note: The numbers in parenthesis represent the percent increase or decrease, compared to Alternative A.				

4.7.2.2. Methods and Assumptions

The recreation and visual resources analysis for Congressionally Designated Trails evaluates the level of impacts to the landscape (15 miles either side of the trail) and physical trail resource. This analysis used all methods listed in the *Recreation* and *Visual Resources* sections. The entire Congressionally Designated Trails landscape is considered an important recreation feature in the planning area. The Congressionally Designated Trails areas listed in Table 4.39, “Congressionally Designated Trail Recreation Areas Managed for Beneficial Outcomes” (p. 1117) represent portions of the trails with access and important visitor services that increase visitor focus in the area. This section refers to those visitor focused trail areas.

This analysis used the following assumptions:

- Absent decisions on allowable use along trails and associated landscapes, future actions and authorizations will continue to conflict with the enabling legislation and supporting documentation of the CDNST.
- The direction in the enabling legislation and supporting documentation will be better achieved through complementary allowable use decisions (e.g., NSO).
- Alternatives that protect a larger landscape around trails will better achieve the direction in the enabling legislation and supporting documentation associated with the CDNST.

4.7.2.3. Detailed Analysis of Alternatives

4.7.2.3.1. Impacts Common to All Alternatives

See *Impacts Common to All Alternatives* in the *Recreation* and *Visual Resources* sections.

4.7.2.3.2. Alternative A

4.7.2.3.2.1. Program Management

Program management under this alternative does not focus on identified customer demand for recreation settings, activities, and/or outcomes in the Congressionally Designated Trails landscapes. Under Alternative A, visitor services are a function of actions to protect resources, mitigate use and user conflicts, and protect human health and safety. That is, visitor services under this alternative focus on accommodating priorities of other BLM programs rather than of accommodating visitor demand for beneficial outcomes.

Alternative A program management protects several existing developed recreation sites, but does not include allowable use decisions to protect important recreation areas. Protections under this alternative would maintain existing investments and physical trail remains, but the alternative does not include future development of new recreation sites or maintenance/enhancement of important areas. Program management under this alternative would not sustain or enhance the recreation settings of visitor focused trail areas. Therefore, Alternative A recreation management in Congressionally Designated Trails corridors would not meet specific visitor demands for recreational opportunities (activities and outcomes).

Alternative A program management would result in long-term adverse impacts to visual resources along Congressionally Designated Trails because almost 85 percent of trails landscapes will be managed for the lowest level of scenic quality protection. This alternative allows

surface-disturbing activities on almost 85 percent of trails landscapes, activities that can create a moderate to strong visual contrast. In addition, the remaining 12 percent of trails landscapes in VRM Class II corresponds to a ¼-mile buffer either side of NHTs. There would be impacts to visual resources outside this ¼-mile buffer, which would create contrast at the Class III and IV levels. Therefore, the Class II designation would not be effective for maintaining the visual resources associated with Congressionally Designated Trails.

4.7.2.3.2.2. Resources

General impacts to the recreation environment and visual resources in Congressionally Designated Trails corridors from other BLM resource management actions would be similar to impacts discussed in the *Recreation* and *Visual Resources* sections. Specific impacts from resource management actions within ACECs are discussed below.

4.7.2.3.2.3. Resource Uses

Impacts from foreseeable resource use development in the trails landscapes under Alternative A include:

- There would be impacts from oil and gas exploration and development in the Crooks Gap/Bairoil portion of the CDNST landscape. Alternative A allows activities associated with this development on and along the CDNST and allows wildcat oil and gas exploration across the entire landscape.
- Wind-energy development would constantly be within view of the CDNST and NHTs. Development will occur within close proximity (within ¼ mile) of Congressionally Designated Trails.
- Alternative A limits ROW crossings of NHTs; however, the alternative allows ROW crossings of the CDNST. Alternative A allows ROWs within view of trails and would introduce strong levels of contrast.
- Alternative A allows phosphate development within and across the NHT landscape and within the Group Use and National Trails Undeveloped recreation areas.
- Alternative A allows mineral materials disposals throughout almost all the landscape.
- Alternative A allows actions under the 1872 General Mining Law within ¼ mile either side of Congressionally Designated Trails with Plans of Operation, and allows unrestricted actions everywhere else.
- The impacts of uranium mining under Alternative A would be evident from the CDNST and NHTs.

As a result of the activities listed above, the CDNST and NHT landscape would experience increased road densities (decreased remoteness), decreased naturalness, increases in facilities and structures, and increases in contacts with other users. These factors would cause the CDNST and NHT landscape to trend toward urban/industrial.

Visual disturbances as a result of these activities would result in strong contrast as viewed from both trails across the entire landscape. There would be impacts to visual resources in the sensitive foreground/middleground zone (0 to 5 miles) and the background zone (5 to 15 miles). All of the above actions would introduce man-made elements to a landscape that currently has very few visual intrusions. Mitigation actions would be minimally successful because Alternative A designates most of the trails landscapes as VRM Class IV, an allocation that does not provide for a justification for elaborate mitigation measures. In addition, several activities Alternative A allows

in NHT corridors would be very large (e.g., wind-energy development) and out of scale with NHT landscapes. Such activities would not lend themselves to standard VRM mitigation (e.g., color or relocating the project). As a result of resource use activities Alternative A allow NHT landscapes, the entire area would move away from current visual quality levels and demonstrate VRM Class IV characteristics. The NHT landscapes would be subject to management actions that introduce major modifications to the existing character of the landscape. The level of change to the characteristic landscape would be high under Alternative A. Developments and activities under Alternative A would dominate the view and be the major focus of viewer attention.

4.7.2.3.2.4. Special Designations

See *Program Management* above for a discussion of special designations regarding trails management. Special designations in the NHT landscapes include the South Pass ACEC, the Sweetwater Canyon WSA, and the Sweetwater Rocks WSA. These designations provide protections in the NHT landscapes and limit the activities described above. However, under Alternative A these areas are isolated, which would result in “island polygons” of protections in the NHT landscapes.

4.7.2.3.3. Alternative B

4.7.2.3.3.1. Program Management

Program management under Alternative B is responsive to customer demands in the Congressionally Designated Trails landscapes. Alternative B includes more (than Alternative A) visitor services in visitor focused trail areas and provides allowable use decisions that ensure the future recreational enjoyment of these areas. Alternative B manages five visitor focused trail areas (totaling 240,820 acres) as SRMAs. In SRMAs, the recreation setting is managed to meet visitor demands for specific activities, experiences, and benefits. Within these important areas, allowable uses (limits on other BLM programs) and management actions are specifically developed to sustain and/or enhance the entire recreation setting. Under Alternative B, the following visitor focused trail areas are in SRMAs to meet specific visitor demands: NHTs Auto Tour Route, NHTs Group Use Area, National Trails Undeveloped area (contains both NHTs and the CDNST), the Alkali Basin of the CDNST, and the Sweetwater Historic Mining Area of the CDNST. Alternative B also manages the remainder of NHT resources (not in a SRMA) in a manner that meets less specific/more diverse visitor demands in concert with other program (cultural resources) objectives. Alternative B manages the remaining portions of the physical trails and ¼ mile either side of the trails as distinct ERMAs. Distinct ERMAs represent areas where management focuses on providing a diversity of recreation opportunities, within the confines of both recreation and non-recreation program objectives. In distinct ERMAs, allowable uses and management actions address recreation/tourism issues, activities, conflicts, and/or single important attributes (such as remoteness) of the area. This focus on harmonizing visitor services, diversity of recreation opportunities, and other program priorities constitutes an increased level of visitor services over Alternative A. Alternative B manages the remainder of the important recreation area as distinct ERMAs, including: the CDNST in the Crooks Gap and Bairoil areas, the Willow Creek portion of the NHT, and the NHT through mixed private and public lands from Ice Slough east to the planning area boundary.

Program management under Alternative B protects more existing developed recreation sites than Alternative A. Additionally, the alternative protects future developed sites, investments, and

physical trail resources. The alternative applies allowable use decisions to protect more important recreation areas than Alternative A.

Alternative B VRM provides long-term protection for 94 percent of the NHT landscapes. This protection would be achieved through a VRM Class II designation. This is a 79 percent increase in the amount of VRM Class II designations over Alternative A. Alternative B allocates the remainder of the landscape as VRM Classes III and IV, which coincides with existing disturbances in the landscape; therefore, these designations would result in little to no change to the existing landscape. Alternative B VRM would maintain the existing visual quality of the entire NHT landscape.

4.7.2.3.3.2. Resources

General impacts to the recreation environment and visual resources of Congressionally Designated Trails landscapes from resources management actions under Alternative B would be similar to impacts described in the *Recreation* and *Visual Resources* sections of this chapter.

4.7.2.3.3.3. Resource Uses

Because Alternative B program management protects the entire Congressionally Designated Trails landscape, there would be no impacts to the recreation environment and visual resources of trail landscapes beyond those described above under *Impacts Common to All Alternatives*.

4.7.2.3.3.4. Special Designations

Compared to Alternative A, Alternative B includes more NHTs landscape in special designations. This alternative expands the South Pass, Green Mountain, and NHT ACECs. Additionally, this alternative designates the Granite Mountain and Government Draw/Upper Sweetwater Sage-Grouse ACECs. The recreation environmental and visual resources of the NHT landscapes would benefit from these additional ACECs because they would result in restrictions on development beyond those described above under *Program Management*. While Alternative B program management limits surface-disturbing activities within view of NHTs, the ACECs limit surface-disturbing activities subject to exceptions for other resource values (wildlife, visual resources, other non-trail historic resources). This means that areas of overlap between these designations and the NHT landscapes would be subject to multiple stipulations on surface-disturbing activities, further limiting the potential for change to the NHT landscapes. The synergy between program management and management of these ACECs would ensure maintenance of the entire trail landscape.

4.7.2.3.4. Alternative C

4.7.2.3.4.1. Program Management

Recreation program management under Alternative C would result in impacts the same as Alternative A, except that Alternative C provides for a ¼-mile corridor either side of the CDNST. This buffer would increase protection of the physical trail of the CDNST. Alternative C impacts to NHT landscapes would be the same as impacts under Alternative A.

4.7.2.3.4.2. Resources

Alternative C impacts to the recreation environment and visual resources of Congressionally Designated Trails as a result of resource actions would be the same as impacts under Alternative A.

4.7.2.3.4.3. Resource Uses

Alternative C impacts from resource uses would be similar to impacts under Alternative A. However, Alternative C would result in more adverse impacts to NHT landscapes because it does not include the existing South Pass and NHT ACECs. This alternative does not designate ACECs in the planning area, which would subject the trails themselves to more impacts than Alternative A. Specifically, Alternative C does not require Plans of Operation for exploration disturbing fewer than 5 acres or for casual use or notice-level operations. This could result in damage to the NHTs themselves. In addition, because Alternative C does not designate the South Pass ACEC, resource uses in this area of the trails landscape would result in more adverse impacts than Alternative A. Designation of the South Pass ACEC under alternatives A and B would protect the area from the impacts of oil and gas, ROW, and wind-energy development. Alternative C impacts in the South Pass portion of the NHT would be the same as resource use impacts under Alternative A.

4.7.2.3.4.4. Special Designations

The only special designations under Alternative C are the existing WSAs. Impacts from WSAs would not differ by alternative and are detailed under Alternative A. See *Resource Uses* above for a discussion regarding the impacts of no special designations.

4.7.2.3.5. Alternative D

4.7.2.3.5.1. Program Management

Alternative D recreation program management is the same as management under Alternative B.

Alternative D VRM would provide long-term protection for 47 percent of the NHT landscapes. This protection would be achieved through VRM Class I (3 percent) and II (44 percent) allocation. Alternative D designates the remainder of the landscape as VRM Class III and IV, which coincides with existing disturbances in the landscape, areas beyond 5 miles of the trail, and/or areas out of view of the trail. These designations would result in little to no change in the existing landscape. Alternative D VRM would maintain the existing visual quality of the entire trails landscape.

4.7.2.3.5.2. Resources

General impacts to the recreation environment and visual resources of Congressionally Designated Trails landscapes from resources management actions under Alternative D would be similar to impacts described in the *Recreation* and *Visual Resources* sections of this chapter.

4.7.2.3.5.3. Resource Uses

Because Alternative D program management protects the entire Congressionally Designated Trails landscape, there would be no impacts to the recreation environment and visual resources of trail landscapes beyond those described above under *Impacts Common to All Alternatives*.

4.7.2.3.5.4. Special Designations

Alternative D impacts, as a result of special designations, would be the same as impacts under Alternative B.

4.7.3. Wilderness Study Areas

4.7.3.1. Summary of Impacts

All alternatives meet the statutory requirement to ensure the protection of designated WSAs so as not to preclude the ability of Congress to designate these areas as Wilderness Areas. Compared to alternatives A, C, and D, Alternative B management provides for enhanced wilderness characteristics and experiences.

4.7.3.2. Methods and Assumptions

This analysis considers impacts to wilderness characteristics of naturalness, opportunities for solitude, primitive/unconfined recreation, and special features. Impacts are limited to potential changes in wilderness characteristics for the WSAs. Impacts to WSAs are considered adverse if management actions “impair the suitability of WSAs for preservation as wilderness.” See the *Recreation* and *Visual Resources* sections for impacts that would result from management actions adjacent to WSA boundaries.

Methods and assumptions used in this impact analysis include the following:

- Management of WSAs will follow BLM Manual 6330, *Management of Wilderness Study Areas*.
- Congress will not take action on planning area WSAs within the 20 year planning horizon.
- Impacts outside WSAs will not affect wilderness characteristics but are analyzed as impacts to recreation.
- Increased efforts to reduce motorized and mechanized travel will benefit wilderness visitors and the physical attributes of wilderness areas.
- Johnson et al. (Johnson et al. 1997) found the following livestock related factors to strongly detract from the wilderness experience: encounters in or near dispersed camps, encounters in riparian-wetland areas, encounters in meadows, manure on trails, tracks in riparian-wetland areas, and odors.

4.7.3.3. Detailed Analysis of Alternatives

4.7.3.3.1. Impacts Common to All Alternatives

There are several impacts that would not vary by alternative. Managing wildfire in WSAs by using conditional fire suppression would allow fire to play its natural role in the ecosystem, which would result in short-term adverse impacts to the naturalness and opportunity for primitive/unconfined recreation. However, in the long term such actions would result in protections to wilderness values. Continuing to manage the eight existing WSAs under BLM Manual 6330, *Management of Wilderness Study Areas* would protect the wilderness characteristics related to naturalness, and prevent impacts to the opportunity for solitude and primitive/unconfined recreation from most program activities. All alternatives require WSA management to follow BLM Manual 6330,

Management of Wilderness Study Areas; therefore, most programs would not impact wilderness characteristics in a way that would preclude the ability of Congress to designate the area as wilderness. Recreation and travel management actions for WSAs specifically related to livestock grazing do vary by alternative and would result in different impacts to wilderness characteristics.

Impacts to the WSAs from activities occurring outside the boundary of the WSAs are analyzed in the *Recreation* and *Visual Resources* sections as well as in *Special Designation* sections where appropriate.

4.7.3.3.2. Alternative A

4.7.3.3.2.1. Program Management

Closing the Dubois Badlands WSAs to OHV use would protect the wilderness characteristics in these areas by restricting activities that affect opportunities for solitude and primitive/unconfined recreation. Managing OHV use in the remaining seven WSAs as limited to designated roads and trails would provide some protection to the wilderness characteristics and mitigate impacts associated with OHV use. However, there could still be impacts in these areas from continuing proliferation of new user-created routes due to limited enforcement and implementation capabilities. The proliferation of unauthorized routes and general use of motorized vehicles in WSAs degrades the solitude, naturalness, and opportunities for primitive/unconfined recreation. Allowing over-snow vehicle use would result in short-term, temporary impacts to wilderness characteristics.

4.7.3.3.2.2. Resources

No impacts from resource management actions are anticipated from Alternative A.

4.7.3.3.2.3. Resource Uses

Alternative A recreation management does not include specific measures to manage livestock grazing in WSAs. Therefore, livestock management would follow the requirements in BLM Manual 6330, *Management of Wilderness Study Areas*. Most of the WSAs are undesirable (e.g., too far from water) and/or unavailable (e.g., too steep or rocky) for livestock. The Sweetwater Canyon WSA is the exception because the major visitor focus in the area, the river, also is the major focus for livestock grazing. Alternative A allows livestock grazing to continue at the current rate authorized for the area. This would result in livestock grazing related impact to wilderness experiences stemming from encounters in or near dispersed camps, encounters in riparian-wetland areas, encounters in meadows, manure on trails, tracks in riparian-wetland areas, and odors (Johnson et al. 1997).

4.7.3.3.2.4. Special Designations

See Impacts Common to All Alternatives.

4.7.3.3.3. Alternative B

4.7.3.3.3.1. Program Management

Closing all eight WSAs to motorized (including over-snow vehicles) and mechanized vehicle use would protect the wilderness characteristics in these areas by restricting activities that impact opportunities for solitude and primitive/unconfined recreation. Alternative B would result in less route proliferation than Alternative A because the ease of enforcement and implementation of closures versus route-by-route decision making. This management action would enhance solitude, naturalness, and opportunities for primitive/unconfined recreation in all WSAs.

4.7.3.3.3.2. Resources

No impacts from resource management actions are anticipated from Alternative B.

4.7.3.3.3.3. Resource Uses

Alternative B recreation management actions close the fenced portion of Sweetwater Canyon WSA to livestock grazing. In all other WSAs, Alternative B management of livestock grazing will follow the requirements in BLM Manual 6330, *Management of Wilderness Study Areas*. Livestock grazing may impact wilderness experiences in all WSAs not closed to livestock grazing. However, most of the WSAs are undesirable (e.g., too far from water) and/or unavailable (e.g., too steep or rocky) for livestock. The Sweetwater Canyon WSA is the exception because the major visitor focus in the area, the river, also is the major focus for livestock grazing. Alternative B closes the Sweetwater Canyon WSA to livestock grazing. Closing the area to livestock grazing would enhance all wilderness characteristics and would eliminate encounters with livestock that would adversely impact visitor experiences.

4.7.3.3.3.4. Special Designations

See Impacts Common to All Alternatives.

4.7.3.3.4. Alternative C

4.7.3.3.4.1. Program Management

Alternative C management for WSAs is the same as Alternative A. Therefore impacts to WSAs under Alternative C would be the same as Alternative A.

4.7.3.3.4.2. Resources

Same as Alternative A.

4.7.3.3.4.3. Resource Uses

Same as Alternative A.

4.7.3.3.4.4. Special Designations

No impacts from special designation actions are anticipated from Alternative C.

4.7.3.3.5. Alternative D

4.7.3.3.5.1. Program Management

Alternative D management for WSAs is the same as Alternative A, with the exception that Alternative D closes the Copper Mountain and Whiskey Mountain WSAs to motorized vehicles. These areas do not have existing roads; therefore, this management would not change the WSAs. Instead it would, however, increase enforcement capabilities in these areas.

The mapping of prescriptions associated with the WSAs and the limits on resource uses such as mineral management have been clarified. The mapping for alternatives A through C generally referenced BLM Manual 6330, *Management of Wilderness Study Areas* without specifying the management approach. The identification of how management is implemented (closed to oil and gas leasing) is not different management; but merely a clearer display of the management. As indicated, the limitations on motorized vehicle use in the Copper Mountain and Whiskey Mountain WSAs represents a clarification of management to improve enforcement.

4.7.3.3.5.2. Resources

See Impacts Common to All Alternatives.

4.7.3.3.5.3. Resource Uses

Impacts to WSAs as a result of livestock grazing would be the same under Alternative D as Alternative A.

4.7.3.3.5.4. Special Designations

See Impacts Common to All Alternatives.

4.7.4. Wild and Scenic Rivers

4.7.4.1. Summary of Impacts

Alternative B provides for the highest level of beneficial impact to identified waterways with very similar beneficial impacts resulting from the management detailed in Alternative D. The major difference between alternatives B and D is that Alternative B recommends all eligible waterways as suitable whereas Alternative D recommends only those three waterways found to meet suitability requirements. The management and allowable uses identified for these areas in alternatives B and D is nearly identical and therefore impacts from resources and resource uses is expected to be similar.

Alternative A provides limited direction for management of waterways, therefore it is anticipated that this alternative will have some beneficial impacts as detailed above, and some adverse impacts as detailed below.

Alternative C allows for the highest level of adverse impacts to waterways. The alternative does not recommend any eligible waterway as suitable, and also removes the majority of protections that currently overlap these waterways. Alternative C would eventually result in nearly all waterways no longer being eligible for inclusion in the NWSRS.

4.7.4.2. Methods and Assumptions

This section describes impacts to NWSRS-eligible waterway segments from management actions associated with the alternatives. Analysis of impacts to these segments is limited to a corridor $\frac{1}{4}$ mile on each side of the waterway. The indicators for this impact analysis are:

- The values or the free-flowing nature of the eligible waterways.
- Level of change to the tentative classification of eligible waterways.
- Level of change to waterway eligibility or suitability for inclusion in the NWSRS.

Table 4.41, “Waterways Eligible for Inclusion in the National Wild and Scenic River System” (p. 1127) lists the waterways found to be eligible for inclusion in the NWSRS, the ORVs along the waterways, the tentative classification of each eligible waterway, and the interim (subject to public input, EIS, and decision record for this RMP) evaluation of suitability for the waterway.

Table 4.41. Waterways Eligible for Inclusion in the National Wild and Scenic River System

Eligible Waterway	Outstanding Remarkable Values	Tentative Classification	Interim Evaluation of Suitability Factors
Baldwin Creek Unit	Scenic, Recreational, Wildlife Values	Wild	Suitable
Ice Slough	Historic Values	Recreational	Not Suitable
Little Popo Agie River	Scenic, Recreation, and Cultural Values	Wild	Not Suitable
North Popo Agie River	Scenic, Recreation, and Cultural Values	Wild	Not Suitable
Rock Creek	Historic Values	Scenic	Not Suitable
Sweetwater River Unit	Scenic, Recreational, Historical, and Ecological Values	Wild	Suitable
Warm Springs Creek	Geological and Historical Values	Recreational and Scenic (two segments)	Segment 1 Suitable, Segment 2 Not Suitable
Willow Creek	Recreational and Historical Values	Scenic	Not Suitable
Wind River	Scenic and Geological Values	Scenic	Not Suitable

Methods and assumptions used in this impact analysis include the following:

- Recommending an area as suitable for inclusion in the NWSRS will result in the greatest benefit to the eligible waterways, whereas not considering suitability and maintaining eligibility will moderately benefit the waterways.
- Recommending an area as not suitable for inclusion in the NWSRS and not developing management actions to maintain eligibility and suitability will result in varying levels of

impacts to the waterway. Impacts will vary based on the level of protections instituted by other programs that correspond with WSR values (e.g., cultural, recreation, visual, and wildlife resources management).

- VRM Class I or II will enhance waterways; Classes III and IV will degrade waterways.
- VRM Class I or II designations adjacent to waterways boundaries will enhance WSR values; Classes III and IV within view of the waterways (but outside of the boundary) will allow for changes to the visual environment that will impact WSR values.
- Actions that benefit primitive recreation also will benefit waterways tentatively classified as Wild.
- Limited (e.g., designated roads and trails, seasonally, and existing roads and trails) travel management decisions will not impact WSR values. Motorized vehicle closures will enhance waterways tentatively classified as Wild.
- Management actions and allowable use decisions that benefit or protect WSR values will benefit eligibility and suitability.
- Additional administrative designations such as WSAs and ACECs will benefit identified waterways, specifically in cases where the designation provides additional protections (to corresponding values) inside and outside the WSR corridor.

4.7.4.3. Detailed Analysis of Alternatives

4.7.4.3.1. Impacts Common to All Alternatives

The free-flowing character of eligible waterways will be protected to the extent that modifications such as stream impoundments, channelization, and/or rip-rapping will not be permitted along BLM shorelines. However, depending on the alternative, values could be at risk from potential minerals development, OHV activity, or other surface-disturbing activities. Also, the protection is limited because there are no federal reserved water rights established for in-stream flow purposes due to eligibility and suitability determinations. In addition, in cases where there is not a federal nexus, the BLM has no control over potential modifications of the shoreline or other development (including development related to the perfection of water rights). Because of these factors, protective management of eligible/suitable waterways will not affect existing water compacts. BLM management authority extends only to public lands in the river corridor, and there are no water rights associated with suitability determinations. A suitability determination also has no impact on existing water compacts.

Standard protective management of cultural/historic resources will maintain these values, but alone, will not provide sufficient management to maintain or enhance tentative classifications associated with NWSRS-eligible waterways. Actions that protect settings associated with cultural/historic resources vary by alternative and can result in maintenance/enhancement of values. Standard protective buffers for riparian-wetland areas will ensure protection of all eligible waterways from surface-disturbing activities. However, the corridors associated with WSRs are larger than the standard protective corridor. Therefore, portions of WSR management corridors would experience different impacts across alternatives. In addition, impacts outside the WSR corridor but within view would also vary by alternative.

The Ice Slough waterway has acreage leased for oil and gas under stipulations developed in the 1987 RMP. These oil and gas leases will remain valid until they expire in 2015. Currently, the Ice Slough area has a NSO stipulation to protect NHT resources and a CSU stipulation to protect watersheds. These existing stipulations would provide adequate protections from oil and

gas development for the eligible waterway and its ORVs, thus maintaining the area's tentative classification as a recreational WSR.

4.7.4.3.2. Alternative A

4.7.4.3.2.1. Program Management

Program management under this alternative does not make suitability determinations for any NWSRS-eligible waterway, including the Baldwin Creek, Warm Springs Segment 1, and the Sweetwater River Unit. BLM-administered public lands in these areas are managed to maintain the free-flowing nature, values, and tentative classifications of the waterways. Because the eligible river corridors will be subject to the existing land use plan as far as resource allocations are concerned, they could be adversely impacted on a case-by-case basis. These would be addressed through the site-specific NEPA process, with mitigation applied if appropriate. If any proposed action is found to affect the eligibility of the waterway, it is BLM policy to deny the action until suitability can be determined.

Alternative A does not make suitability determinations, designate a management corridor, or establish allowable use decisions for eligible waterways. This would result in several of the waterways and the ¼ mile corridor on either side being bisected by contrasting management stipulations (such as portions excluded, avoided, or open to ROWs). In these cases, portions of the waterway or corridor would be subjected to management inconsistencies that could change the areas' ORVs.

4.7.4.3.2.2. Resources

NWSRS-eligible waterways not in an ACEC include Rock Creek and Warm Springs Creek. To protect historic values associated with these sites, the cultural resource program prescribes several stipulations that would benefit the eligible waterway. These stipulations include limitations on surface-disturbing activities to protect important cultural resources. In addition, standard riparian-wetland stipulations also protect a large portion of these areas. As a result of these management prescriptions, little change to the Rock Creek and Warm Springs Creek waterways and associated corridors would be expected under this Alternative A. See below for additional resource protection measures associated with special designations that would benefit eligible waterways.

As a result of VRM Class I and II designations, the visual environment associated with Baldwin Creek Unit, Little Popo Agie, North Popo Agie, Sweetwater River Unit, and Wind River would remain unchanged. Conversely, VRM Classes III and IV allocations under Alternative A would result in adverse impacts to portions of the Willow Creek, Rock Creek, and Warm Springs NWSRS-eligible waterways.

4.7.4.3.2.3. Resource Uses

Table 4.42, “Impacts to Eligible WSRs under Alternative A from Resource Uses” (p. 1130) lists the impacts to NWSRS-eligible waterways anticipated as a result of resource uses allowed under Alternative A.

Table 4.42. Impacts to Eligible WSRs under Alternative A from Resource Uses

Eligible Wild and Scenic Rivers	Projected Impact From Resource Uses
Baldwin Creek Little Popo Agie North Fork Popo Agie	Impacts from phosphate development would be within and in view of corridors. Additionally, motorized vehicle use in the bottom of Baldwin Creek would continue to degrade the wild character of this area. These impacts would eliminate values associated with these units and eventually cause the area to no longer be an eligible waterway.
Rock Creek Wind River Willow Creek	Wind-energy development would be within view of this waterway and degrade scenic values. These impacts can be mitigated and would not result in an eligibility change to this waterway.
Warm Springs	Resource uses projected to occur within this eligible waterway include wildcat oil and gas exploration and phosphate development. In addition, wind-energy development would occur within view of the corridor. Impacts from these uses would degrade the waterway's geological and historical values. Due to the longevity of the impacts associated with these uses, it is anticipated that mitigation measures to offset degradation of values would be minimally successful. These uses and associated impacts would cause the area to no longer be an eligible waterway.
WSR Wild and Scenic River	

4.7.4.3.2.4. Special Designations

Table 4.43, “Impacts to Eligible WSRs from Other Special Designation Management” (p. 1131) lists the NWSRS-eligible waterways encompassed by other special designations and the associated management that would protect WSR values.

Table 4.43. Impacts to Eligible WSRs from Other Special Designation Management

Eligible Wild and Scenic River	Special Designation	Protective Management Associated with Special Designation that will benefit Wild and Scenic Rivers
Baldwin Creek Unit North Popo Agie	Lander Slope ACEC	Designated ACEC to protect scenic and wildlife values. Specific prescriptions that would protect values and tentative classifications include NSO to oil and gas; requirement for Plans of Operation for activities under the 1872 General Mining Law; VRM Class II; closure to mineral materials disposals; closure to phosphate mining as a result of management actions to protect water; excluded from wind-energy development and other ROWs; and closed to geothermal exploration.
Little Popo Agie	Red Canyon ACEC	Designated ACEC to protect scenic and wildlife values. Specific prescriptions that would limit surface-disturbing activities and protect values and tentative classifications include NSO to oil and gas; requirement for Plans of Operation for activities under the 1872 General Mining Law; VRM Class II; closure to mineral materials disposals; closure to phosphate and other leasable mineral materials mining; excluded from wind-energy development and other ROWs; major constraints and closed to geothermal exploration.
Ice Slough	National Historic Trail ACEC	Designated ACEC to protect historic values. Specific prescriptions that would limit surface-disturbing activities and protect outstanding remarkable values and tentative classifications include NSO to oil and gas; requirement for Plans of Operation for activities under the 1872 General Mining Law; VRM Class II; closure to mineral materials disposals; closure to phosphate and other leasable mineral materials mining; excluded from wind-energy development and other ROWs; major constraints and closed to geothermal exploration.
Willow Creek	South Pass ACEC	Designated ACEC to protect historic values. Specific prescriptions that would limit surface-disturbing activities and protect outstanding remarkable values and tentative classifications include NSO to oil and gas; requirement for Plans of Operation for activities under the 1872 General Mining Law; VRM Class II; closure to mineral materials disposals; closure to phosphate and other leasable mineral materials mining; excluded from wind-energy development and other ROWs; major constraints and closed to geothermal exploration.
Sweetwater River Unit	Sweetwater Canyon WSA	The entire unit is within the WSA boundaries. Managing the area under BLM Manual 6330, <i>Management of Wilderness Study Areas</i> would continue to maintain values and tentative wild classification.
ACEC Area of Critical Environmental Concern BLM Bureau of Land Management NSO no surface occupancy ROW right-of-way VRM Visual Resource Management WSA Wilderness Study Area WSR Wild and Scenic River		

4.7.4.3.3. Alternative B

4.7.4.3.3.1. Program Management

Alternative B manages all eligible waterways as suitable, and therefore manages ¼ mile corridor on either side of these waterways to maintain and enhance values and tentative classifications. If any proposed action affects the eligibility and suitability of the river segment, it is BLM policy to deny the action until suitability can be determined.

This alternative makes consistent decisions across WSR corridors and therefore would result in no waterway corridors being bisected by contrasting management stipulations (conflicting management occurs in nearly all NWSRS-eligible segments as a result of Alternative A). The seamless management proposed under Alternative B would provide consistent protection of the values associated with these corridors.

4.7.4.3.3.2. Resources

As a result of VRM Classes I and II designations, the visual environment in all eligible WSRs would remain unchanged. Alternative B VRM also provides protections to the visual environment both inside and outside all eligible WSR corridors. Alternative B VRM designations would benefit and protect WSRs at a higher level than Alternative A. See below for additional resource protection measures associated with special designations that would benefit WSRs.

4.7.4.3.3.3. Resource Uses

Alternative B closes or excludes most surface-disturbing activities in eligible WSR corridors, which would provide maximum protection of values and tentative classifications. In addition, the alternative closes the Baldwin Creek and Sweetwater River suitable units to motorized vehicles, which would enhance the wild classifications of these systems. This alternative would result in fewer impacts to eligible WSRs from resource uses than Alternative A.

4.7.4.3.3.4. Special Designations

Alternative B applies special designations management actions on a landscape scale. These designations and associated management complement and protect all eligible and suitable WSR values and tentative classifications. Therefore, Alternative B provides more protections and benefits to WSRs than Alternative A.

4.7.4.3.4. Alternative C

4.7.4.3.4.1. Program Management

This alternative does not recommend any eligible waterways as suitable for inclusion in the NWSRS and proposes standard management for these areas. Therefore, this alternative offers fewer protections to identified waterways than Alternative A. Impacts to the eligible waterways would be the higher under this alternative than those detailed in Alternative A.

4.7.4.3.4.2. Resources

Resource protections under this alternative will not exceed standard management. *Impacts Common to All Alternatives* (above) describes impacts from standard management.

Under this alternative, most eligible waterways (except for those in WSAs, which remain VRM Class I) are managed as VRM Classes III and IV. VRM Class III and IV designations under Alternative C would allow more adverse impacts to visual resources along more NWSRS-eligible waterways than Alternative A.

4.7.4.3.4.3. Resource Uses

Impacts from resource uses to the Ice Slough, Warm Springs, Sweetwater River Unit, and Wind River waterway segments would be the same under this alternative as under Alternative A. Removal of the Lander Slope ACEC and South Pass ACECs and associated management would reduce (compared to Alternative A) protections for five of the nine NWSRS-eligible waterways. Table 4.44, “Impacts to Eligible WSRs under Alternative C” (p. 1133) details impacts to these five eligible waterways under Alternative C.

Table 4.44. Impacts to Eligible WSRs under Alternative C

Eligible Wild and Scenic Rivers	Projected Impact From Resource Uses
Baldwin Creek Little Popo Agie North Fork Popo Agie	Impacts from phosphate mining, oil and gas development, and wind-energy development would be within and in view of management corridors at higher rate under Alternative C than under Alternative A. In addition, the open two-track road in the bottom of Baldwin Creek would continue to degrade the wild character of this area. These impacts would eliminate values associated with these units and eventually cause the area to no longer be eligible as a WSR. This would occur at a faster rate and more drastic scale under this Alternative C than under Alternative A.
Rock Creek Willow Creek	Wind-energy development would be within the WSR corridor and in view of these waterways at a higher rate than under Alternative A. Extensive wind-energy development in this area would adversely impact the scenic value of the entire WSR and introduce a level of development in the corridor that would eliminate values associated with the units, and eventually cause the area to no longer be eligible as a WSR. Alternative C would result in more impacts than Alternative A.
WSR Wild and Scenic River	

4.7.4.3.4.4. Special Designations

Alternative C does not have any administrative designations except for WSAs and a ¼-mile buffer on either side of Congressionally Designated Trails. Therefore, impacts from special designations in the Ice Slough, Sweetwater River Unit, and Wind River would be the same as under Alternative A

4.7.4.3.5. Alternative D

4.7.4.3.5.1. Program Management

Alternative D program management makes suitability determinations for the Baldwin Creek, Warm Springs Segment 1, and Sweetwater River Units; the remainder of NWSRS-eligible waterways will be dropped from further consideration for inclusion in the NWSRS. The alternative establishes protective management for all waterways found to meet the suitability requirements. This alternative ensures protection of values and maintenance of wild classifications. Eligible waterway and the surrounding ¼ mile corridors on either side are subject to other program management, and therefore could be subject to case-by-case actions. These would be addressed through the site-specific NEPA process, with mitigation applied if appropriate.

This alternative makes consistent decisions across waterway corridors, and therefore would result in no waterways or corridors being bisected by contrasting management stipulations (conflicting management occurs in nearly all waterway corridors under Alternative A). The

seamless management proposed under Alternative D would provide consistent protections for the values associated with WSR corridors reviewed during this planning process.

4.7.4.3.5.2. Resources

Alternative D impacts would be the same as Alternative B. Although Alternative D recommends fewer waterways as suitable than Alternative B, the protections identified for the areas that are not managed as eligible will maintain the values associated with all eligible waterways.

4.7.4.3.5.3. Resource Uses

Alternative D impacts to NWSRS-eligible waterway segments would be similar to Alternative B. One difference between Alternative D management and Alternative B management is that Alternative D allows motorized vehicle use in the Sweetwater River segment corridor through Sweetwater Canyon on designated roads and trails. However, this management would not be allowed to degrade the wild character of the river corridor; therefore, Alternative D impacts would be less than alternatives A and C and more than Alternative B. Travel management implementation will evaluate motorized use in Sweetwater Canyon.

4.7.4.3.5.4. Special Designations

Alternative D beneficial impacts from special designations would be the same as Alternative B, including protections from locatable mineral entry by withdrawal to protect other resources.

4.7.5. Areas of Critical Environmental Concern

This section describes impacts to the ACECs designated in the 1987 RMP and EIS ROD, proposed expansions of those ACECs, and proposed new ACECs in the planning area (see Table 2.5, “Comparative Summary of Areas of Critical Environmental Concern by Alternative” (p. 50)), as well as impacts if no ACECs are designated. ACECs are designated to provide special management for relevant and important values, resources, natural systems, and natural hazards (referred to herein as “values of concern”). The discussion of ACECs focuses on the values of concern and potential impacts to those values from other programs. Many of the values of concern in ACECs are also resources with management independent of ACEC designation; this non-ACEC management is addressed under the relevant sections of this chapter. For example, impacts to wildlife values of concern in the Whiskey Mountain ACEC are discussed below under the ACEC, but overall impacts to wildlife from management under the alternatives appear in the *Biological Resources* section. The analysis in this section focuses on relative comparisons among alternatives of potential adverse and beneficial impacts in ACECs.

4.7.5.1. Summary of Impacts

Alternative C would have the most adverse impacts to values of concern because standard management in the ACECs under this alternative would not prevent adverse impacts to those values through mineral, realty, and other surface-disturbing activities. Alternative A has the next most adverse impacts because while 119,622 acres are designated as ACECs, 1,373,368 acres identified as relevant and important are not specially managed. Alternative D would have the second fewest adverse impacts to values of concern, and Alternative B would result in the fewest adverse impacts because it designates the most acres as ACECs.

Alternative B would have the most beneficial impacts because all ACECs are proposed for withdrawal from locatable mineral entry and closed to other mineral and realty actions. Sage-grouse and other resource protections under Alternative B limit most surface disturbances so that not only are the most acres designated as ACECs, but the associated management both in and surrounding the ACEC has the most beneficial impacts to values of concern. Alternative D has the next most beneficial impacts including proposed new withdrawals in the Lander Slope, Twin Creek, and Red Canyon ACECs and other restrictions on mineral development and major ROWs. Alternative C with no special ACEC management would have the fewest beneficial impacts of all alternatives.

4.7.5.2. Methods and Assumptions

ACECs are areas requiring special management to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards (43 CFR 1610.0–5). Only one management prescription comes automatically with ACEC designation; in an ACEC, a Plan of Operations for locatable mineral exploration and development is required regardless of the amount of surface disturbance, whereas outside an ACEC, a Plan of Operations is required if the area disturbed would be larger than 5 acres (43 CFR 3809). The requirement for a Plan of Operations allows the BLM limited ability to avoid or mitigate potential adverse impacts associated with locatable mining operations such as uranium and gold mines, but does not preclude development. In an effort to limit adverse impacts to values of concern, specific management prescriptions must be adopted for each ACEC because there are no automatic management prescriptions other than a Plan of Operations for small disturbances (generally, exploration).

Analysis of impacts to the values of concern under Alternative C assumes that management would be subject only to standard stipulations, such as limits on construction on slopes in excess of 25 percent or standard wildlife seasonal limitations unless some other non-ACEC management imposes different prescriptions such as WSAs.

Impacts of ACEC management (or non-ACEC management) were determined based on GIS data and information in the Mineral Occurrence and Development Potential Report, the RFD Scenario for Oil and Gas, and wind-energy potential. GIS data and information were overlaid with boundaries identified under Alternative B. Mineral and wind-energy potential and the specific management constraints in the area were used as the basis of analysis when comparing impacts to mineral resources from management under the alternatives.

4.7.5.3. Detailed Analysis of Alternatives

4.7.5.3.1. Impacts Common to All Alternatives

Generally, management prescriptions for the protection of air quality, geology, soil, water, and lands with wilderness characteristics would benefit ACECs by preventing the degradation of those resources located within the ACEC. This beneficial impact to ACECs would be secondary to other benefits, such as improving wildlife habitat, which is an important component of wildlife ACECs such as the Whiskey Mountain ACEC. Non-ACEC management actions to protect air quality, soil, water, and vegetation through limiting surface-disturbing activities vary by alternative depending on the number of acres protected by slope steepness, riparian-wetland buffer sizes, and the protections applied in those buffers.

The Lander Field Office staff has determined that each proposed ACEC meets the FLPMA relevance and importance criteria (BLM 2010e). This section analyzes the impacts to relevant ACEC values from management actions for other programs. Impacts to other programs from ACEC designations are addressed in resource-specific sections of this chapter. In addition, this section only analyzes impacts to the values that meet the relevance and importance criteria. Impacts to other values in the ACEC are not analyzed unless they contribute to the need for special management. For example, although the South Pass Mining District contains important wildlife habitat, its relevant and important values are limited to historic resources. Therefore management impacts to wildlife in the South Pass area are not addressed in this section.

All mineral development and other surface-disturbing or disruptive activities, such as ROWs and road development, would adversely impact elk, due both to loss and fragmentation of habitat and human presence. While more surface disturbance would result in more adverse impacts, the relationship is not linear; the first disturbances result in the greatest impacts. See the *Fish and Wildlife Resources – Wildlife* section for more information. Elk are considered values of concern in the Lander Slope, Red Canyon, East Fork, and Green Mountain ACECs.

All of the proposed ACECs are designed to protect wildlife, historic, and/or visual resources. In general, surface-disturbing activities such as mineral development and realty actions reduce the quality of habitat by causing fragmentation and removing vegetation. Often these developments also create a moderate to strong contrast with the characteristic landscape for visual resources or historical setting of ACECs. Therefore, surface-disturbing activities, regardless of the cause, generally result in adverse impacts to ACEC values. In the analysis that follows, the adverse impacts of surface disturbance will not be discussed repetitively; additional information regarding adverse impacts to wildlife, historic, and visual resources are found in those respective sections.

The impact of the sale of forest products is not expected to vary by alternative over the planning period because there is no foreseeable market for substantial quantities of saw timber. Therefore, although current ACEC management addresses the amount of board-feet of timber available in some of the ACECs, impacts from such sales are speculative. Specific future proposed projects would require implementation-level analysis.

Impacts to ACEC values from management actions for cultural and paleontological resources would be generally similar under all alternatives because of NHPA requirements. Cultural and paleontological resource management could result in limited surface disturbance and loss of vegetation if excavation is necessary. These potential impacts are addressed only for ACECs in which such surface disturbance is anticipated to adversely impact visual and historic resources, as impacts to wildlife habitat would likely be minimal.

As indicated above, ACEC designation triggers the requirement of a Plan of Operations for locatable mineral activities even if less than five acres are to be disturbed. The environmental impact of requiring a Plan of Operations is a modest to moderate inconvenience to a mining applicant in the exploratory phase since having the BLM review a Plan of Operations is administratively more burdensome than the applicant's merely filing a Notice. (Full-development mining operations generally exceed five acres of disturbance and require a Plan of Operations.) In addition, in reviewing the Plan of Operations, the BLM could require some modification of the applicant's approach in order to minimize adverse impacts, but would not prevent successful recovery of the mineral resource. The requirement for a Plan of Operations could make the mining operation more costly or more time consuming, which would be adverse impacts to the

claimant. However, these are not considered adverse impacts to the locatable mineral resource, since recovery would not be precluded.

Since the management implications of Plans of Operations are the same for each alternative, the following analysis does not repeat those implications, but merely states whether or not a Plan of Operations would be required.

Restrictions on the exploration for, or development of mineral resources other than locatable minerals and realty actions would generally result in beneficial impacts to values of concern. The impacts of ACECs on those programs are analyzed in their respective sections.

All of the ACECs have management prescriptions for major ROWs such as large pipelines, transmission lines, and wind-energy developments. Impacts from smaller ROWs such as those required to access private property are not analyzed because they depend on site-specific factors. The BLM is mandated to accommodate access to private property and will always seek to co-locate minor ROWs and limit adverse impacts to resources and other uses. This type of realty action is handled on a case-by-case basis with project-level analysis in consideration of ACEC values.

Because none of the alternatives considers expansion of the road system, which would be an adverse impact because of additional surface disturbance and wildlife habitat fragmentation, there is no analysis of new roads.

Livestock grazing management varies by alternative but is authorized in all ACECs except Whiskey Mountain and most of East Fork. Similar to other surface disturbances, disturbance associated with range improvement projects would result in adverse impacts to ACEC values because of the loss of vegetation due to livestock grazing concentration and surface disturbance and the increases in habitat fragmentation, but also because of the increased potential for INNS. The more surface disturbance, the greater the adverse impacts to ACEC values. However, range improvement projects could also result in an increase in rapid improvements in riparian-wetland health with long-term beneficial impacts to wildlife, if wildlife can access the riparian-wetland areas. Impacts to ACEC values from livestock grazing are further addressed below under each alternative. In all cases, no change in grazing management would occur until monitoring and the Wyoming Standards for Healthy Rangelands assessments are done. The BLM expects to complete this process at the rate of 5 percent of the allotments per year; therefore, changes would be implemented slowly and grazing modifications made only where required to meet the Wyoming Standards for Healthy Rangelands. This gradual implementation is not further analyzed in the individual ACECs.

The difference in travel management between limiting motorized travel to designated roads and trails (Alternative B and in some cases alternatives A and D) rather than existing roads and trails (Alternative C) is the same for all ACECs. On a long-term basis, limiting travel to designated roads would reduce the density of roads, which would result in the beneficial impacts of increasing vegetation and decreasing habitat fragmentation, and often would reduce the contrast with ACEC visual resources. It is not possible to quantify these beneficial impacts to ACEC values, therefore, they are described under the alternatives as long-term benefits. Some alternatives include management that would limit mechanized travel, such as by bicycle, including on-road use and cross-country use. Mechanized travel would result in less adverse impacts to ACEC values than motorized travel, but more adverse impacts than pedestrian travel.

Management of over-snow motorized vehicle use varies by alternative and ACEC. Over-snow travel would adversely impact wildlife values and could adversely impact scenic and cultural values if it impacts below-snow vegetation and artifacts. Many of the ACECs are important to the big game winter populations that concentrate in the area for the unique habitat offered. Motorized winter travel would result in the most adverse impacts of any travel mode because it occurs at a time when game is most vulnerable and with the fewest options to evade human contact. Cross-country over-snow motorized travel, unlike other cross-country motorized travel, is allowed except where specifically prohibited.

The analysis of Alternative C addresses potential impacts to identified relevant and important values in the absence of ACEC management. Alternative C applies standard stipulations such as seasonal closures for the protection of wildlife. Although Alternative C does not designate ACECs, for simplicity, the area analyzed under Alternative C is called the ACEC to refer to the same geographic area analyzed under alternatives A, B, and D. Similarly, in analyzing proposed new ACECs and proposed expansion of ACECs not designated under Alternative A, the area analyzed is described as the ACEC or expanded area to describe the geographic area, not the management.

For all ACECs under each alternative, acreage is given for federal surface only. Management of federal mineral estate in split-estate ownership will also be governed by ACEC management actions. In no case does ACEC management apply to private or state lands, which are “clipped out” of the ACEC, even if federally owned minerals in those clipped out areas are subject to ACEC management.

Impacts common to all alternatives for each ACEC are described under *Impacts Common to All Alternatives*.

Under all alternatives, the use of heavy equipment in fire suppression would be restricted in areas containing sensitive resources. This includes all ACECs. Therefore, adverse impacts to ACEC values from the use of heavy equipment would not vary by alternative and are not further analyzed in this section. Whether or not full suppression of wildland fire is utilized varies by alternative. Full suppression could result in adverse impacts to wildlife and visual resources, at least in the short term, if resources were damaged by fire suppression efforts. Conversely, full suppression would result in short-term beneficial impacts by preventing fire damage to vegetation. However, on a long-term basis, full suppression could lead to fuels buildup and increase the risk of landscape-level fires, with substantial adverse impacts to ACEC values. Rather than repeat these potential outcomes from wildland fire, the following analysis identifies whether full suppression will be used.

All alternatives manage WSAs in accordance with the interim guidance (with minor differences in travel management not relevant here). Therefore, there would be no differences in impacts to ACEC values among the alternatives. Individual ACEC discussions include more information for ACECs that overlap WSAs.

Each of the following alternatives are analyzed separately, although this approach results in some duplication of material, such as repeating adverse impacts to wildlife in each of the ACECs in which wildlife is a value of concern. This approach is taken to accommodate readers who may be interested in only one ACEC, such as the Green Mountain ACEC, but not the Whiskey Mountain ACEC even though both have wildlife as values of concern.

4.7.5.3.2. Detailed Analysis of Alternatives – Lander Slope

4.7.5.3.2.1. Summary of Impacts

Alternatives A, B, and D designate 25,065 acres as an ACEC to protect big game winter range and scenic views. Alternative C does not designate the area as an ACEC and manages it with standard stipulations.

Alternative C would result in the most adverse impacts to ACEC values because it would manage the area with standard stipulations which would not preclude surface disturbance that would adversely impact wildlife and viewshed. Alternatives A and D have very similar management and similar impacts, except that Alternative A would be somewhat more adverse because prescriptions avoid but do not explicitly prohibit potentially adverse actions such as phosphate leasing, and Alternative A merely requires a Plan of Operations for locatable mineral actions smaller than 5 acres whereas Alternative D proposes the withdrawal of these areas from locatable mineral entry. Alternative B would result in the fewest adverse impacts to the resources of concern because it would preclude development of all leasable and salable minerals, whereas alternatives A and D would only preclude surface use for fluid mineral development and associated disturbance, such as utilities and roads required to support NSO development.

Alternative B would result in the most beneficial impacts because resources are emphasized over resource uses. Wildlife protections would be the most beneficial under Alternative B and VRM would limit the most visual intrusions. Alternative D has the next most beneficial impacts. Similar to Alternative B, VRM would restrict development. Mineral management is less beneficial in that the area is open to oil and gas development subject to NSO, rather than closed; because there is low potential, this difference in impact could be small. Alternatives B and D withdraw the ACEC from locatable mineral entry. Alternative A is similar in its impacts, although the ACEC is only avoided and not excluded from major ROWs, and open to phosphate leasing with surface restrictions rather than closed. Since the Lander Slope has phosphate potential, this difference between alternatives B and D may be moderate or more less beneficial. Alternative C would have the fewest beneficial impacts because VRM would allow far more adverse intrusions and oil and gas development is not limited. ROWs might adversely impact both viewshed and habitat since they are not prescribed except by slope and riparian-wetland areas.

4.7.5.3.2.2. Impacts Common to All Alternatives

The view of most of the Lander Slope ACEC is very prominent from the City of Lander and its surrounding areas. As a result, extensive surface disturbance would be highly visible and present a strong contrast with undisturbed areas. Protection of many cultural resources, including viewshed and limits on development, would also protect the relevant visual resources in the ACEC. The absence of such protection would result in adverse impacts to the ACEC.

All alternatives identify the Lander Slope as an area in which full-suppression fire management should be utilized; open the area to livestock grazing; and manage travel to meet wildlife and scenic values. Therefore, impacts from these actions would not vary by alternative. All alternatives emphasize acquisition of parcels on the Lander Slope to support relevant and important values, including Alternative C, even though the area is not managed as an ACEC.

4.7.5.3.2.3. Alternative A

4.7.5.3.2.3.1. Program Management

The 1987 RMP and EIS ROD designated the Lander Slope as an ACEC for wildlife, primarily for big game winter range, and for scenic values. Big game use the windswept portions of the ACEC for forage during winter when snow buries their summer range in the Shoshone National Forest. See the Lander ACEC Report (BLM 2010e) for a detailed discussion of these values. Management actions that protect physical and biological values result in direct beneficial impacts to Lander Slope ACEC wildlife by protecting forage and intact habitat, and avoiding adverse impacts to visual resources. Vegetation is managed to provide forage for the elk and mule deer populations in the ACEC. The area has restrictive minerals and realty management.

4.7.5.3.2.3.2. Resources

General management of resources under Alternative A would result in beneficial impacts to ACEC values by protecting soil and riparian-wetland areas from disturbance. Although forest management is addressed, it is unlikely to impact ACEC values; see above under *Impacts Common to All Alternatives*. Alternative A includes some vegetative treatment in the Lander Slope ACEC to benefit wildlife forage. These treatments would result in long-term beneficial impacts to wildlife habitat by contributing to vegetative diversity and forage, and preventing INNS encroachment. However, there would be a short-term adverse impact to visual resources unless the impacts were properly mitigated. Grasslands management would have a beneficial impact to elk and mule deer.

Wildlife management in the Lander Slope ACEC includes seasonal closures for the benefit of large concentrations of wintering big game. However, wildlife management under Alternative A does not prohibit fences, which could result in adverse impacts. However, if the fences were utilized for improvement of riparian-wetland areas, a minor beneficial impact could result. Greater sage-grouse management would result in marginal beneficial impacts to ACEC values by buffering leks against surface disturbance, but only by minimal amounts.

Alternative A VRM would result in beneficial impacts to the Lander Slope ACEC by retaining (VRM Class II) or partially retaining (VRM Class III) the existing character of the landscape. This management would avoid adverse impacts to both scenic and wildlife resources by restricting development that would adversely impact visual resources and potentially fragment habitat.

4.7.5.3.2.3.3. Resource Uses

Alternative A applies an NSO stipulation to oil and gas development, which limits surface-disturbing activities.

Alternative A does not close the ACEC to phosphate or other solid mineral leasing, but places restrictions on phosphate recovery to protect sensitive visual resources and crucial wildlife habitat. In the absence of an explicit prohibition on surface occupancy for phosphate mines or outright closure to leasing, any proposal for a lease would require analysis of potential impacts, including stripping of all vegetation and soil, and surface removal of the mineral (strip mining) with severe declines in big game populations. It is likely, but not mandated, that a leasing application, a BLM discretionary activity, would be denied under Alternative A because the surface disturbance on

the Lander Slope would be highly visible from Lander and the surrounding communities, and because of the loss of crucial winter habitat for big game that summer throughout the Shoshone National Forest.

Alternative A does not withdraw the ACEC from locatable mineral entry. (As discussed above, the RMP recommendation is to segregate the area and pursue locatable mineral withdrawal.) Historically, there has been little demand for locatable minerals in the ACEC, but the geologic formations (Upper Cretaceous aged Frontier Formation and the Lower Cretaceous aged Mowry and Thermopolis Shales) contain bentonite, a locatable mineral. While the impacts of exploration on the ACEC values would be adverse to ACEC values, they could be mitigated and reclaimed through the requirement of a Plan of Operations that comes with ACEC designation. Full mining, however, would adversely impact both viewshed and wildlife habitat. Both above-and belowground mining would fragment habitat and block migration patterns, and result in a visual scar that would remain long after mining was completed and reclamation implemented. Mining activities would require roads and utilities, which would cause further damage to the ACEC values.

Alternative A does not close the Lander Slope ACEC to mineral materials disposals which, if allowed, would likely result in a strong to moderate contrast with the landscape. Because Alternative A does not close the ACEC to such sales, they would remain a possible adverse impact and any application would need to be analyzed in accordance with NEPA.

Alternative A avoids the Lander Slope ACEC for major ROWs and corridors, which would protect habitat values by retaining vegetation, avoiding fragmentation of habitat, and preserving the viewshed. However, because Alternative A does not manage the ACEC as an ROW exclusion area, if there were no alternative location for the ROW, it would be permitted. The most likely demand for a ROW would be to support wind-energy development on public or private lands. The ACEC is not closed to wind-energy development and would consider it on a case-by-case basis.

Livestock grazing management under Alternative A allows continued construction of rangeland infrastructure, including fences and water projects. This construction, coupled with the trend of subdividing private lands, is expected to continue. As the private lands near the Lander Slope ACEC are subdivided, demand for fencing in the ACEC is expected to increase to limit conflicts among livestock, wildlife, and human uses. Moderate use of forage by livestock, as allowed by Alternative A, would leave less forage for use by wildlife.

The Bus @ Baldwin Creek, Red Canyon/Lander Slope, and Sinks Canyon climbing areas are part of the planning area-wide ERMA, with no specific management actions or identified recreational settings or experiences. Alternative A allows motorized recreation on designated roads, which would increase conflicts with animals and create pressure on wildlife. Cross-country mechanized travel is allowed, which would likely increase soil loss and fragmentation of habitat. Cross-country travel by bicycle would increase conflicts with wildlife by expanding the area for human access. Bicycles would increase adverse impacts from human contact more than pedestrian travel. Alternative A opens the Baldwin Creek climbing trail to forest product removal.

Alternative A limits motorized travel to designated roads and trails, which would likely lead to reduced road density or number of roads, although Alternative A only identifies roads for closure on a case-by-case basis. Decreased road density would be a long-term beneficial impact to wildlife by increasing vegetative cover and reducing contrast with the landscape, which, by reason of the linear nature of roads, are a strong to moderate contrast with line, color, and texture. Road designation under Alternative A has not been fully implemented, in part because designations

have been difficult to enforce with the presence of intermingled private land. Therefore, there has been some degree of road proliferation, which adversely impacts wildlife and scenic values.

Alternative A opens the ACEC to over-snow vehicle travel regardless of snow depth, which would result in an adverse impact by stressing wildlife at a time of the year when they are most vulnerable. Over-snow vehicle travel can remove vegetation and compact soil if there is not enough snow cover. Over-snow vehicles used to collect antlers bring vehicles close to elk populations, and could also result in use that disturbs or harasses the animals. Because the ACEC value is for wintering big game, adverse impacts from over-snow vehicles would be substantial.

4.7.5.3.2.3.4. Special Designations

Under Alternative A, the Baldwin Creek Unit is managed as eligible for inclusion in the NWSRS to maintain its free flowing character, which complements management of ACEC values by limiting surface disturbance around it and restricting development that would change its wild and scenic character.

4.7.5.3.2.4. Alternative B

4.7.5.3.2.4.1. Program Management

Alternative B designates the same amount of acres on the Lander Slope as an ACEC as Alternative A. Alternative B resource protections and limits on surface disturbances for a wide variety of resource uses would result in substantial beneficial impacts to ACEC values. Alternative B closes the ACEC to all mineral development and major ROWs, which would result in more beneficial impacts than the less restrictive management under Alternative A.

4.7.5.3.2.4.2. Resources

Management of air quality, soil, and water under Alternative B would benefit ACEC wildlife and visual resources by limiting erosion and fugitive dust. Alternative B would close more acres to surface disturbance than Alternative A. Alternative B would implement a more proactive approach to reduce emissions and improve air quality, which could improve the view of the ACEC from surrounding communities. Compared to Alternative A, Alternative B includes more restrictive management of activities that could degrade water quality as well as limit surface disturbance.

Following a fire or a timber sale, Alternative B would result in more beneficial impacts to forest resources than Alternative A because Alternative B mandates forest replanting. Alternative B management to protect forest health from insect and disease outbreak would likely result in more short-term adverse impacts than Alternative A because under Alternative B, treatment would be attempted solely to protect human health and safety. The short-term loss of forest health would result in a short-term adverse impact to wildlife habitat and could result in reduced visual resource values. Under Alternative B management, a landscape-level fire could result in long-term adverse impacts to visual resources and wildlife.

Alternative B grassland and shrubland management would have the same beneficial impacts to wildlife as Alternative A. Closing the Baldwin Creek climbing area and access trail to forest product removal would result in more beneficial impacts than under Alternative A.

Although all alternatives would utilize an integrated approach to the management of INNS, an identified problem in the Lander Slope ACEC, INNS management would require more fire and mechanical treatment under Alternative B because of limitations on the use of chemicals in known aquifer recharge areas, which includes much of the ACEC. While this management would be more protective of water quality, it could reduce the acres treated and could result in loss of native vegetation that cannot compete against INNS. Alternative B has the potential to result in more beneficial impacts to vegetation by allowing the Authorized Officer to require livestock flushing before they are turned out on the public lands if it appears they have ingested INNS feed. Alternative B is also more proactive in addressing the link between BLM-permitted activities and the spread of INNS, which should result in a long-term beneficial impact to vegetation, and therefore wildlife.

Wildlife management under Alternative B would result in more beneficial impacts to the Lander Slope ACEC values than Alternative A. Under Alternative B, livestock forage is adjusted as needed to meet big-game herd objectives, and vegetation management emphasizes wildlife needs. Alternative B would remove some existing fences and would not authorize new fences on public lands. Alternative B road closures to benefit wildlife would result in a long-term beneficial impact to ACEC wildlife values. However, the closures are not anticipated to result in any short-term benefits. Sage-grouse management buffers leks with a larger buffer than in Alternative A, which increases the areas closed to surface disturbance in the greater sage-grouse Core Area.

Alternative B would protect visual resources more than Alternative A because Alternative B manages all of the ACEC as VRM Class II, which restricts more surface disturbances than in the portions of the ACEC managed as VRM Class III under Alternative A. Alternative B manages visual resources on the NWSRS-eligible segment as VRM Class I, which would be a beneficial impact. Visual and wildlife resources would benefit from the BLM pursuit of conservation easements on lands adjoining the ACEC to limit surface disturbance around the ACEC and within its viewshed.

4.7.5.3.2.4.3. Resource Uses

Mineral management under Alternative B is more protective of ACEC values than under Alternative A. Alternative B would have the fewest adverse impacts to the resources of concern because it precludes development of all leasable and salable minerals, whereas alternatives A and D only preclude surface use for fluid mineral development and associated disturbance such as utilities and roads required to support NSO development. The beneficial impact of this management would clarify to the public that these types of surface disturbances are precluded rather than the less clear direction of Alternative A, which leaves open the possibility of mineral development. Alternative B withdraws the ACEC from locatable mineral entry such as bentonite which beneficially impacts ACEC values. Mining of locatable minerals would adversely impact both viewshed and wildlife habitat whether mining were surface mining or underground operations supported on the surface by roads and utility lines and adverse impacts associated with transportation of the material. Locatable mineral management under this alternative could have beneficial impacts in relation to Alternative A, depending on the market for bentonite. Placer gold operations would also be precluded under Alternative B, but because the likelihood of this occurring is much lower than for bentonite mining, the beneficial impacts of this management are much lower.

Alternative B management of wind-energy development and major ROWs and corridors would be markedly more beneficial to ACEC values than Alternative A management because Alternative B

manages the ACEC as an exclusion area for these realty actions. Excluding major ROWs would beneficially impact both habitat and visual resources in the ACEC.

Livestock grazing management under Alternative B would result in fewer adverse impacts to ACEC values than under Alternative A because Alternative B manages grazing for rangeland health by reducing livestock use of vegetation to light utilization. In addition, rangeland infrastructure would not be authorized, although this would also preclude using fences to improve riparian-wetland areas. Alternative B could use the funds Alternative A would spend on range improvement projects for vegetation treatments to improve rangeland health with both short- and long-term beneficial impacts. However, while fencing of BLM-administered lands would not increase beyond current amounts and could be reduced, it is likely that fencing on private lands would increase to meet light utilization rates. It is not possible to estimate the extent to which such private fencing would increase (much of the private land in the ACEC is already fenced), but fencing would generally adversely impact both wildlife and visual resources.

Alternative B would close the Bus @ Baldwin Creek and Sinks Canyon climbing areas to motorized vehicle use, even on designated roads, therefore avoiding conflicts between motorized vehicle use and wildlife on less than 10 miles of roads. However, the increased use of these two areas by those seeking a nonmotorized type of recreational experience could offset decreased use by motorized vehicles. It is not possible to analyze these different impacts because recreational use would most likely occur outside of the winter season when wildlife is most likely to be present.

Outside of the two RMZs, travel management under Alternative B would result in more beneficial impacts to wildlife and scenic values than Alternative A. Although Alternative A limits travel to designated roads and trails with seasonal restrictions, this management has not been implemented in a way that can be enforced. Designation of roads and trails under Alternative B would be followed with implementation-level planning, which would deter user-created routes and unauthorized road expansions that have been allowed to proliferate under current management (Alternative A).

Over-snow motorized use is prohibited under Alternative B, which would be substantially more beneficial to wildlife than the open use under Alternative A, particularly because of the importance of the ACEC as a big-game winter concentration area. This management would also avoid adverse impacts to visual and cultural resources caused by travel that degrades vegetation and artifacts under the snow.

4.7.5.3.2.4.4. Special Designations

Alternative B manages more segments for inclusion in the NWSRS with more protective measures to maintain their ORVs, which would result in more beneficial impacts to the ACEC because of additional limits on surface disturbance.

4.7.5.3.2.5. Alternative C

4.7.5.3.2.5.1. Program Management

Alternative C designates no portion of the Lander Slope area as an ACEC. Instead, the area would be managed with standard prescriptions such as limits on disturbance based on slope and distance from riparian-wetland areas. Alternative C favors resource use and in general offers fewer protections to wildlife and scenic resources. Therefore, it would result in more adverse impacts to

ACEC values than Alternative A or B. The following analyzes the impacts from management actions for the area designated as an ACEC under alternatives A, B, and D.

4.7.5.3.2.5.2. Resources

Alternative C would not proactively manage air quality like Alternative B, and similar to Alternative A manages soil and water resources with standard stipulations of closing only slopes greater than 25 percent. Alternative C waives these setbacks if a shorter distance is adequate. This somewhat less stringent management would result in adverse impacts to ACEC values.

Clear-cuts are allowed under Alternative C and can be within 100 feet of riparian-wetland areas and on slopes up to 45 percent. This difference from Alternative B might not be meaningful if there is no change in the local demand for timber/biomass. Fuels treatment and fire management impacts would be similar to Alternative B, except that Alternative C could result in more beneficial impacts because it does not limit chemical treatment. Similar to Alternative B, Alternative C would close the Baldwin Creek climbing area and access trail to forest product removal to prevent adverse impacts to visual resources.

Shrubland and grassland management under Alternative C would be less beneficial to ACEC wildlife because it emphasizes forage production for all grazing animals and not for wildlife as under Alternative B. Vegetative treatments would also emphasize forage production under Alternative C, not ecological diversity or wildlife needs. Riparian-wetland protections are the same as Alternative A with the same moderate beneficial impacts to intact wildlife habitat and visual resources, but less than under Alternative B's greater buffer.

Alternative C would increase areas open to surface disturbance in comparison to Alternative B with the potential for more adverse impacts. Although no additional roads are contemplated under any alternative, the additional acres open to major ROWs and realty actions and the larger area available for surface disturbance under Alternative C would increase the likelihood of INNS infestation. Under Alternative C, all available funds would be utilized for range improvement projects. This would result in fewer beneficial impacts to ACEC values than Alternative B, because Alternative B would have more vegetative treatments.

Alternative C wildlife management would result in more adverse impacts to wildlife than under Alternative B. This would also adversely impact big game concentrated in the ACEC. Alternative C has the same buffer as Alternative A, which closes substantially less acres to surface disturbance than Alternative B. Alternative C does not limit habitat fragmentation or increase vegetation by closing roads or limiting the footprint of projects, which would adversely impact wildlife. Alternative C does not apply seasonal restrictions to oil and gas O&M actions, therefore, there would be adverse impacts to wildlife during important seasons in their life-cycles due to disruptions from O&M actions. Because the Lander Slope ACEC is open to oil and gas development, O&M activities can occur year-round, despite adverse impacts to wildlife. The *Biological Resources* section describes these impacts to wildlife in more detail.

VRM under Alternative C allows more surface disturbance because the ACEC is managed as Class III and Class IV. This would result in greater adverse impacts to ACEC values than Alternative B, because substantially more development would meet this VRM Class and result in more adverse impacts to ACEC visual resources. ACEC key observation points, which include all of the City of Lander and its surrounding areas, are from a subordinate position, which would increase the contrast of any development.

4.7.5.3.2.5.3. Resource Uses

Alternative C opens the ACEC to mineral leasing and disposal with standard slope and riparian-wetland stipulations. Adverse impacts from surface oil and gas operations would likely be minimal because the potential for the presence of oil and gas is low. However, early oil exploration has resulted in adverse impacts to visual resources in the ACEC that are still visible. Alternative C allows geophysical exploration, which would result in adverse short-term impacts to wildlife and visual resources due to vegetation and soil compaction. Long-term adverse impacts are not anticipated.

Alternative C would result in substantially more adverse impacts to visual and wildlife resources because it opens the ACEC to surface mining of phosphate. There are phosphate resources on 8,175 acres of the ACEC. The location of mineralization is on the portion of the ACEC easily visible from the surrounding communities and, particularly, the residences in the foothills. Surface mining of phosphate would remove all vegetation and overburden and create a pit to a depth necessary to obtain all of the minerals (approximately 300 to 400 feet). As with the iron mine on Route 28 through the South Pass area, phosphate mines would be visible from most observation points in the surrounding communities. Underground mining would have fewer adverse impacts to vegetation than strip mining, but would still result in adverse impacts to ACEC values through surface disturbance for facilities and access roads, and increased use of the area by motorized vehicles. The ACEC would be lost as winter habitat for the big game that concentrate in the area, with a resulting loss of herd numbers that would likely be irreversible. This would be both a short- and long-term adverse impact to wildlife.

Like Alternative A, Alternative C does not preclude locatable mineral entry. Because the Lander Slope area is not designated an ACEC, there would be no requirement for a Plan of Operations for activities smaller than 5 acres. This management could result in more adverse impacts to ACEC values, because the BLM would not have authority to limit exploration activities or require mitigation as it could do under Alternative A. The extent of the adverse impacts would depend on the demand for bentonite or other locatable minerals.

Management of major ROWs and corridors, including wind-energy development and transmission lines and minor ROWs, under Alternative C, would result in substantially more adverse impacts to visual resources than Alternative B, which excludes these developments. Portions of the ACEC have high potential for wind-energy development. Industrial wind-energy development assumes approximately 5 turbines of at least 450 feet in height per section, plus roads, pads, structures, and transmission lines. Adverse impacts to ACEC visual resources from wind-energy development would result in a much more industrial backdrop to Lander and its foothills. It is likely that the loss of big game winter concentration habitat would be permanent.

Alternative C would include major ROWs in the ACEC. The demand for ROWs in the ACEC cannot be determined because, for the last quarter century, the Lander Slope has been an avoidance area for major ROWs. However, the ACEC and adjoining lands have high potential for wind energy, development which is allowed under Alternative C, but prohibited under Alternative B. By allowing major ROWs, Alternative C would facilitate wind-energy development, not just on BLM-administered lands, but on the adjoining Shoshone National Forest, which is not protected by wilderness designation. Development of wind energy has been limited because locating transmission lines on adjoining lands has not been allowed under ACEC management since 1987, which avoided the ACEC. Transmission lines allowed under Alternative C would

have the potential to adversely impact visual resources and wildlife values in the same way as industrial wind-energy development.

Livestock grazing management under Alternative C would result in adverse impacts to ACEC values similar to Alternative A. Alternative C would allow higher utilization rates, which would reduce the vegetation available to wildlife, and make progress toward rangeland health through additional infrastructure, including water developments and fencing (see the discussion in the *Biological Resources* section). It is not possible to determine how much additional fencing is needed or would be constructed because some of the private land in the ACEC is already fenced.

Alternative C would result in impacts to vegetation and wildlife in the Bus @ Baldwin Creek and Sinks Canyon climbing areas similar to Alternative A. These impacts would be more adverse than impacts under Alternative B because Alternative C allows mechanized cross-country travel, resulting in impacts to vegetation. The impacts are difficult to assess because increased recreation management focusing on the Bus @ Baldwin Creek under Alternative B could increase use, thus increasing adverse impacts to wildlife from human activity. Other recreation management in the ACEC under Alternative C focuses on maintaining the safety of recreationists and reducing conflicts which would not beneficially impact values of concern.

Alternative C limits travel to existing roads and trails, which would result in more adverse impacts to ACEC values than the Alternative B limits to designated roads and trails. Alternative C management of impacts from over-snow vehicles would be the same as Alternative A, and more adverse to wildlife than Alternative B.

4.7.5.3.2.5.4. Special Designations

In addition to not managing the area as an ACEC, management of the Baldwin Creek and North Fork waterway segments under Alternative C would not preclude adverse impacts to the area's wildlife and visual resources. In contrast to the other alternatives, Alternative C does not specially manage the NWSRS-eligible segments in the ACEC as VRM Class I. Alternative C allows water diversion projects, even if there would be adverse impacts to the segments.

4.7.5.3.2.6. Alternative D

4.7.5.3.2.6.1. Program Management

Alternative D designates the same area on the Lander Slope as an ACEC as alternatives A and B. Its management is similar to Alternative B in that both alternatives segregate the area to pursue locatable mineral withdrawal, with somewhat more beneficial impacts than Alternative A, and fewer adverse impacts than Alternative C.

4.7.5.3.2.6.2. Resources

Alternative D management of air quality, soil, and water would beneficially impact wildlife and visual resources in the Lander Slope ACEC by limiting erosion and fugitive dust. Alternative D closes the same number of acres to surface disturbance for a riparian-wetland buffer as alternatives A and C, and approximately 50 percent less than Alternative B. Alternative D implements the same approach to emissions and air quality as alternatives A and C, which would result in more adverse impacts to the view of the ACEC from the surrounding communities than under Alternative B.

Alternative D would include more restrictive management of activities that could degrade water quality than Alternative A or Alternative C, which would reduce surface disturbance and thus benefit ACEC values of concern. Following a fire or a timber sale, Alternative D, like Alternative A, would be less beneficial to forest resources than Alternative B or C because Alternative D mandates forest replanting only after it is determined that natural processes would not result in regeneration. It is not possible to determine how much less beneficial this impact would be, because forest product sales would not be likely under any alternative, and all alternatives allow full fire suppression.

Alternative D management to protect forest health from insect and disease outbreak would be similar to Alternative A and less likely to result in short-term adverse impacts than Alternative B, which provides that treatment be attempted only to protect human health and safety. The short- and long-term impacts of case-by-case management under alternatives A and D cannot be quantified, but this management would likely result in fewer adverse impacts than Alternative B or Alternative C because it offers more management flexibility in vegetative treatments that meet the VRM objectives of the ACEC. In the long term, it is expected that this treatment would help to maintain visual resources and avoid landscape-level fires that would result in long-term adverse impacts to wildlife habitat and reduce the value of visual resources. In the long term, Alternative D would result in similar beneficial impacts to forest life-cycle by allowing natural processes to be reestablished, but this benefit would not be evident during the planning period. Landscape-level fire could result in long-term adverse impacts to visual resources and wildlife in the ACEC.

Alternative D would manage grassland and shrubland communities to support a diversity of wildlife, and close the Baldwin Creek climbing area and access trail to forest product removal. These actions would result in beneficial impacts to wildlife in the Lander Slope ACEC. This management is similar to alternatives A and B, and would result in similar beneficial impacts to ACEC values. Alternative C would result in more adverse impacts by managing for livestock production.

Although all alternatives use an integrated approach to the management of INNS, INNS management would require more fire and mechanical treatment under Alternative D because of limitations on the use of chemicals in known aquifer recharge areas, which includes much of the ACEC, although chemicals may be used if no other treatment is effective. While this management is more protective of water quality, it could reduce the acres of treatment and could result in the loss of native vegetation that cannot compete with INNS. This management is similar to, but less restrictive than Alternative B. Alternative D could result in beneficial impacts to vegetation by allowing the Authorized Officer to require livestock flushing before they are turned out on the public lands if it appears that they have ingested INNS feed. Alternative D is also more proactive in addressing the link between BLM-permitted activities and the spread of invasive plant species, which should result in a long-term beneficial impact to vegetation and, therefore, wildlife.

The presence of invasive plant species would adversely impact visual resources, not only because of the different appearance of invasive plant species than native vegetation, but because of the more intense fire regimes associated with heavy invasive plant species infestations and the resulting adverse impacts to visual resources.

Wildlife management under Alternative D would result in more beneficial impacts to ACEC wildlife values than alternatives A and C, but fewer than Alternative B. The acres closed to surface disturbance around sage-grouse leks is the same as Alternative B in the Core Area but less outside of the Core Area. Alternative D is the same as Alternative A with regard to

authorizing roads, which would result in more adverse impacts than Alternative B, which closes the ACEC to new roads for wildlife protections and also includes more proactive road closures of redundant roads to reduce adverse impacts to habitat. It is not clear how different the impacts would be because no alternative assumes new roads in the area. However, with the trend toward subdividing private lands near or adjoining the ACEC (see the *Cumulative Impacts* section) the difference could increase in importance over time.

ACEC values would further benefit from management of the area to the east of the ACEC in the Lander Front-Hudson-Atlantic City area, which has strong limits on minerals activities and ROWs for the protection of wildlife, heritage, and viewshed values. This management would result in beneficial impacts similar to those under Alternative B and much more beneficial than alternatives A and C. Seasonal protections under Alternative D for mule deer winter range and crucial winter range will have similar beneficial impacts to mule deer, which are one of the resources of importance in the ACEC.

As under Alternative A, Alternative D manages forage and adjusts livestock utilization rates as needed to meet big game herd objectives, and manages vegetation to emphasize wildlife needs. This would result in impacts similar to but possibly less beneficial to Lander Slope ACEC wildlife than Alternative B. Alternatives A and D would result in more beneficial impacts than Alternative C, which emphasizes livestock use over wildlife values and does not limit roads or fences. Alternative D would remove some existing fences and would not approve new fences so as to avoid habitat fragmentation and migration (see *Resource Uses* for livestock grazing below), an important beneficial impact to ACEC wildlife and visual resources. Alternative D road closures to benefit wildlife would result in a long-term beneficial impact to ACEC wildlife and resource values. However, road closures are not anticipated to result in any short-term beneficial impacts.

Alternatives B and D would protect visual resources more than Alternative A, because they manage all of the ACEC as VRM Class II (except for the WSR segments that are Class I). This would restrict more development, particularly ones that would be highly visible. Visual and wildlife resources under Alternative D would benefit from the BLM pursuit of conservation easements on lands adjoining the Lander Slope ACEC to limit surface disturbance.

4.7.5.3.2.6.3. Resource Uses

Leasable and mineral material management would result in more beneficial impacts to Lander Slope ACEC values under Alternative D than under Alternative A, with almost as many beneficial impacts as Alternative B. Similar to Alternative B, Alternative D would close the ACEC to phosphate leasing, mineral materials disposals, locatable mineral entry, and geophysical exploration. Similar to Alternative A, Alternative D applies NSO restrictions for oil and gas development in the ACEC, which would result in fewer beneficial impacts compared to the leasing closure under Alternative B. The most notable difference between alternatives B and D and Alternative A is in the locatable mineral program; Alternative A does not withdraw any areas in the ACEC, whereas alternatives B and D propose to withdraw the entire ACEC. The actual adverse impacts of this difference is unclear, because the mineral resources present are primarily phosphate rather than any locatable minerals. As discussed for Alternative B, closure to phosphate leasing is a stronger protection than the limits under Alternative A. Therefore, Alternative D would result in more beneficial impacts to ACEC values than Alternative A.

In all mineral actions, Alternative C would result in the most adverse impacts to Lander Slope ACEC values of all the alternatives because it manages mineral actions with standard stipulations

that allow surface disturbance for oil and gas and phosphate extraction. See the discussion under Alternative A regarding the adverse impacts that would likely result to both the ACEC wildlife and visual resources from phosphate mining.

Management of wind-energy development and major ROWs and corridors under Alternative D would result in more beneficial impacts to ACEC values than Alternative A, because Alternative D closes the Lander Slope ACEC to these actions, whereas Alternative A merely avoids them. This management would result in the same beneficial impacts as Alternative B, and would avoid the adverse impacts discussed under Alternative C. Even if no other route is available, the realty action would be denied and surface disturbance prevented under Alternative D.

Livestock grazing management under Alternative D would result in fewer adverse impacts to Lander Slope ACEC values than under Alternative A because Alternative D allows range improvement projects only if their purpose is to enhance ACEC values. This would likely result in more beneficial impacts to wildlife than Alternative B, which prohibits range improvements of any kind. Alternative D would result in more beneficial impacts than Alternative A, which allows range improvement projects that are not for the benefit of wildlife. Alternative C would result in many more adverse impacts as this alternative would not limit range improvement projects, because it does not emphasize protecting wildlife and visual resources.

Livestock utilization levels under Alternative D are the same as under alternatives A and C. However, like Alternative B, Alternative D protects wildlife forage resources. This would avoid the adverse impacts under Alternative C, which has higher utilization levels and does not have wildlife forage protection as an objective.

Similar to Alternative B, Alternative D closes the Bus @ Baldwin Creek and Sinks Canyon climbing areas to motorized vehicle use, even on designated roads, thus avoiding conflicts between motorized vehicle use and wildlife in these areas. However, the increased use of these two areas by those seeking a nonmotorized type of recreational experience could offset decreased use by motorized vehicles. It is not possible to analyze the differences in impacts because the elk and mule deer that use these areas for winter habitat would likely be concentrated at the higher elevations in the Shoshone National Forest during the seasons when recreational use is highest. Compared to alternatives A and C, Alternative D is more protective of vegetation and soils and better avoids fragmentation by limiting mechanized use such as bicycles to designated roads, and closing 1,298 acres from cross-country nonmotorized use.

Outside the two RMZs, travel management under Alternative D would be more beneficial to wildlife and scenic values than Alternative A. Although Alternative A limits travel to designated roads and trails with seasonal restrictions, this management has not been implemented in a way that can be enforced.

Alternative D allows over-snow motorized travel (as opposed to Alternative B, which prohibits over-snow travel), but Alternative D would avoid potentially adverse impacts to soils and vegetation that could occur under alternatives A and C because Alternative D requires that motorized over-snow vehicles comply with standard travel management (designated roads and trails) unless there are at least 12 inches of snow. While this would not result in the same beneficial impacts as Alternative B's avoidance of conflicts between wildlife and motorized vehicles, Alternative D would avoid adverse impacts to visual and cultural resources caused by travel that degrades vegetation and artifacts under the snow.

4.7.5.3.2.6.4. Special Designations

Alternative D would manage NWSRS-eligible segments along Baldwin Creek as suitable for inclusion in the NWSRS, but not the North Fork of the Popo Agie, as under Alternative B. Alternative D limits surface disturbance and thus would result in more beneficial impacts to ACEC values than Alternative C, which would not specially manage any part of the ACEC as suitable for WSR designation.

4.7.5.3.3. Detailed Analysis of Alternatives – Red Canyon

4.7.5.3.3.1. Summary of Impacts

Alternatives A, B, and D would designate 15,109 acres as an ACEC to protect big game winter range and scenic views. Alternative C does not designate the area as an ACEC and manages it with standard stipulations.

Alternative C would result in the most adverse impacts to ACEC values because it manages the area with standard stipulations which would not preclude surface disturbance that would adversely impact wildlife and viewshed. Alternatives A and D have very similar management and similar impacts, except that Alternative A may be somewhat more adverse because prescriptions avoid, but do not explicitly prohibit potentially adverse actions such as phosphate leasing. Alternative B would result in the fewest adverse impacts because the area is closed to oil and gas leasing and not just NSO as with alternatives A and D.

Alternative B would have the most beneficial impacts because resources are emphasized over resource uses. Wildlife protections would be the most beneficial under Alternative B because VRM limits the most visual intrusions. Alternative D would have the next most beneficial impacts. Like Alternative B, VRM restricts development. Mineral management would be less beneficial in that the area would be open to oil and gas development subject to NSO, rather than closed; because there is low potential, this difference in impact could be small. Alternatives B and D would withdraw the ACEC from locatable mineral entry. Alternative A would have impacts similar to alternatives B and D, although the ACEC would only be avoided and not excluded to major ROWs, and open to phosphate leasing with surface restrictions rather than closed. Since the Lander Slope has phosphate potential, this difference from alternatives B and D may be moderate or less beneficial. Alternative C would have the fewest beneficial impacts because VRM would allow more adverse intrusions and oil and gas development is not limited. ROWs might adversely impact both viewshed and habitat since they are not prescribed except by slope and riparian-wetland areas.

4.7.5.3.3.2. Impacts Common to All Alternatives

The view of Red Canyon from Highway 28 and surrounding areas is considered one of the most iconic views in Wyoming. Its prominence means that surface disturbance would be highly visible and present a strong contrast with undisturbed areas. Red Canyon is also crucial winter big game habitat where elk, that roam the Shoshone National Forest in the summer, concentrate to take advantage of the broad, windswept slopes in the ACEC.

Under all alternatives limitations on surface disturbance would result in beneficial impacts to Red Canyon ACEC values, including viewshed and elk habitat. Conversely, surface disturbance would

adversely impact ACEC values. Since the ACEC is an important elk habitat, the degree of impact, including the frequency and amount of human presence, is also a factor beyond the mere loss of vegetation as elk are wary of human activity. All alternatives would maintain forage for 500 elk.

All alternatives identify the Red Canyon ACEC as an area in which to use full suppression fire. In all cases, fuels treatment is responsive to the concerns of the many private landowners in the WUI who desire the beneficial impacts to visual resources of junipers against the red rocks. Fuels treatment objectives are the same under all alternatives although the alternatives vary in the amount of the planning area that would be treated each year.

All alternatives manage the NNL portion of the ACEC as VRM Class I, which preserves the existing character of the landscape from development. VRM of the rest of the ACEC (approximately 13,004 acres) varies by alternative.

The alternatives vary in their management of forest resources and the use of clear-cuts as silviculture techniques. However, there would likely be little difference in impacts from the different management because of the very low demand for saw timber.

Although the alternatives vary in the locatable minerals management, there would be no difference in impacts because no locatable mineral potential has been identified, so no impacts can be analyzed.

All alternatives would allow livestock grazing in the Red Canyon ACEC.

None of the alternatives manage waterway segments in the ACEC as eligible or suitable for inclusion in the NWSRS.

4.7.5.3.3.3. Alternative A

4.7.5.3.3.3.1. Program Management

The 1987 RMP and EIS ROD designated Red Canyon as an ACEC for wildlife (elk) and scenic values (see the Lander ACEC Report [BLM 2010e] for detailed discussion of these values). Management actions for the benefit of wildlife benefit elk that winter in the ACEC but migrate to the surrounding mountainous areas. Limitations on surface disturbance would benefit ACEC wildlife and visual resources. Vegetation would be managed to provide forage for a population of 500 elk.

4.7.5.3.3.3.2. Resources

Air quality, soil, and water management under Alternative A, with standard stipulations, would result in beneficial impacts to ACEC values by limiting surface disturbance. Forest management could result in adverse impacts to ACEC values but these impacts are unlikely to occur. Alternative A includes vegetative treatments in the Red Canyon ACEC for the benefit of wildlife forage. These treatments would result in short- and long-term beneficial impacts to wildlife habitat by contributing to vegetative diversity and preventing INNS encroachment. However, mechanical vegetative treatments would result in a short-term adverse impact to visual resources, which could be mitigated by careful feathering of the edges.

Wildlife management under Alternative A would generally benefit ACEC values, including seasonal travel closures to protect large concentrations of wintering big game and the maintenance

of elk forage. Alternative A would result in limited protections for greater sage-grouse although 8,392 acres are in the Wyoming Governor's Core Area. Wildlife management under Alternative A does not prohibit fences, which would cause an adverse impact by removing vegetation, creating livestock concentration areas, fragmenting habitat, and impeding migration. Much of the Red Canyon ACEC wildlife migrates between winters in the ACEC and summer habitat in the Shoshone National Forest, so fences result in an important adverse impact. However fences can also improve riparian-wetland areas resulting in a long-term benefit to the elk if the fences are ultimately removed and livestock grazing in the riparian-wetland area is appropriately managed. Buffers around sage-grouse leks benefit ACEC values by limiting surface disturbance.

VRM under Alternative A would benefit visual resources in the ACEC by retaining the existing character of the landscape within and adjacent to the ACEC with Class II management, which allows activities that can be seen but do not attract the attention of the casual observer. This management limits surface-disturbing activities, which would beneficially impact both wildlife and visual resources.

4.7.5.3.3.3. Resource Uses

Alternative A oil and gas management in the Red Canyon ACEC is subject to NSO restrictions, which would limit loss of vegetation and avoids habitat fragmentation and degradation of visual resources. Alternative A would not withdraw the ACEC from locatable mineral entry, but there is no identified potential for locatable minerals in the ACEC. A Plan of Operations would be required for small mining disturbances.

Alternative A would not close the ACEC to phosphate leasing, but restricts phosphate recovery to protect sensitive visual resources and crucial wildlife habitat. In the absence of an explicit prohibition on surface occupancy for phosphate mines, any proposal for a lease would require analysis of potential impacts, which would include stripping of all vegetation and overburden and surface removal of the phosphate (strip mining). It is likely, but not mandated, that leases would be denied because damages to the area would be visible from the surrounding areas and would have the potential to threaten elk herds. Under Alternative A, there are no limits on phosphate recovery in adjoining areas visible from the ACEC or utilized by elk for migration. Both the ACEC and adjoining lands have phosphate potential.

Alternative A does not close the ACEC to mineral materials disposal, which would prevent adverse impacts to wildlife and visual resources. However, any proposals for material disposals would be assessed on a case-by-case basis to avoid adverse impacts to values of concern.

Alternative A avoidance of the ACEC for major ROWs and corridors would result in adverse impacts to ACEC values should disturbances occur. ROWs are not excluded under Alternative A, if there was no alternative location for an ROW, it would be authorized. No such ROW potential or demand has been forecast under current management because of avoidance of both Red Canyon and the Lander Slope since 1987. However, if private lands or Shoshone National Forest lands were developed for wind energy, it is unlikely that transmission lines could avoid the ACEC.

Under Alternative A, recreation management in the ACEC would support ACEC values. There are no RMZs in the ACEC. Alternative A closes the ACEC to over-snow vehicle travel and winter sport activities to protect elk in the ACEC. Motorized travel is limited to designated roads and trails but has been managed as limited to existing roads and trails, a more adverse management that allows the use of more existing roads and trails.

4.7.5.3.3.4. Special Designations

Under Alternative A, the Little Popo Agie River is managed to maintain its free flowing and outstanding characteristics which would beneficially impact ACEC values by limiting surface disturbance.

4.7.5.3.3.4. Alternative B

4.7.5.3.3.4.1. Program Management

Alternative B is more protective of wildlife and visual resources than Alternative A. Management would limit or prohibit substantially more mineral resource development and limit livestock grazing to light rather than moderate as under Alternative A. Alternative B designates the same area as an ACEC as Alternative A, but with more restrictive management of activities allowed in the ACEC.

4.7.5.3.3.4.2. Resources

Management of air quality, soil, and water resources under Alternative B would benefit wildlife and visual resources by limiting erosion and fugitive dust to a greater extent than Alternative A. Alternative B implements a more proactive approach to reduce emissions and improve air quality, which could improve the view of the ACEC from Highway 28.

Following a fire or a timber sale, Alternative B would result in more beneficial impacts to forest resources in the ACEC than Alternative A, because Alternative B mandates forest replanting. The impact of this management cannot be analyzed because forest sales would not be likely under any alternative, and full fire suppression would be allowed under all alternatives. Alternative B management of insect and disease outbreaks likely would result in more short-term adverse impacts than Alternative A, because treatment would be implemented only to protect human health and safety. This short-term loss of forest health would result in a short-term adverse impact to wildlife habitat and could result in reduced visual resource values. Alternative B fuels management would result in impacts similar to Alternative A, but perhaps more beneficial because more areas would be treated (see below under livestock grazing management).

Alternative B manages grassland and shrubland communities to support a diversity of wildlife and game, which would result in a more beneficial impact to wildlife than Alternative A. Alternative B maintains forage for 500 elk, similar to Alternative A.

Alternative B has the potential to result in more beneficial impacts to vegetation than Alternative A because Alternative B is also more proactive in addressing the link between BLM-permitted activities and the spread of INNS. The presence of invasive plant species also adversely impacts visual resources, not only because of the different appearance of invasive plant species than native vegetation, but also because of the more intense fire regimes associated with heavy invasive plant species infestation and the resulting adverse impacts to visual resources.

Wildlife management under Alternative B is more protective of ACEC wildlife values than Alternative A. Livestock forage would be adjusted as needed to support elk forage and vegetation management would emphasize wildlife needs. Alternative B does not allow new fences and could remove some existing fences to improve animal movement. Visual resources management under Alternative B is the same as Alternative A, and impacts would be similar. Sage-grouse

management buffers leks with a larger buffer than in Alternative A, which increases the acres closed to surface disturbance.

4.7.5.3.3.4.3. Resource Uses

Leasable and mineral materials management under Alternative B would be more protective of ACEC values than Alternative A. Alternative B would close the ACEC to phosphate and all mineral leasing and all mineral materials disposals.

Management of wind-energy development and major ROWs and corridors would be substantially more beneficial to ACEC values under Alternative B, because the alternative excludes these realty actions. Even if no other route was available, the realty action would be denied under Alternative B thus avoiding the potentially serious adverse impacts to ACEC values under Alternative A.

Livestock grazing management under Alternative B would result in fewer adverse impacts to ACEC values than Alternative A, because Alternative B manages grazing for rangeland health by over time reducing utilization to light use and does not allow rangeland infrastructure. This management would slowly reduce adverse impacts to vegetation from the heavier Alternative A utilization, and would avoid livestock concentrations near water developments and fence lines. It is possible that these beneficial impacts to ACEC values would be offset, in some part, by the likelihood that light utilization could be achieved only by some additional fencing of private lands. Because livestock grazing objectives would be achieved by stocking rates and not infrastructure under Alternative B, triple the amount of acres planning area wide would receive vegetation treatments in comparison to Alternative A (1,500 acres per year versus 500 acres). It is likely that some of this additional vegetation treatment would occur in the ACEC.

Recreation management under Alternative B would be more protective of wildlife values because the alternative closes the ACEC to human presence in winter, rather than just closing it to sport activities and over-snow vehicles, which potentially could result in human activities that stress wintering elk. Alternative B limits travel management to designated roads and trails, with implementation-level planning to meet the management requirements. This would result in beneficial impacts to ACEC values, but the difference from Alternative A would be evident only over the long term.

4.7.5.3.3.4.4. Special Designations

Under Alternative B, the NWSRS-eligible segment on the Little Popo Agie River is recommended as suitable for inclusion in the NWSRS. Management prescriptions for the WSR are the same as for the remainder of the ACEC and would not result in additional beneficial or adverse impacts to the ACEC.

4.7.5.3.3.5. Alternative C

4.7.5.3.3.5.1. Program Management

Alternative C does not designate any portion of the Red Canyon as an ACEC. The area would be managed with standard stipulations and open to mineral development and ROWs. This management conforms to the overall emphasis on resource utilization under Alternative C. The Red Canyon NNL is managed as VRM Class I under all alternatives. Because this VRM

classification would preclude almost all surface disturbance in the NNL, impacts to visual resources under Alternative C would be limited to the portion of the ACEC outside the NNL.

4.7.5.3.3.5.2. Resources

The Alternative C emphasis on resource uses over physical and biological resources would result in more adverse impacts to values of concern. Unlike Alternative B, but similar to Alternative A, Alternative C does not proactively manage air quality and manages soil and water resources with standard stipulations which can be waived if restrictions would be adequate to protect the resources. The less restrictive forest management than Alternative B might mean little if a local demand for timber/biomass products does not materialize. Fuels treatment and fire management impacts under Alternative C would be the same as under Alternative B, except for vegetation treatments discussed below under grazing. Grassland and shrubland management under Alternative C would be less beneficial to wildlife because it emphasizes forage production for all grazing animals and not, as under Alternative B, for elk and other wildlife.

More areas open to surface disturbance under Alternative C would also result in more adverse impacts to vegetation than Alternative B because the likelihood of INNS infestation increases with surface disturbance. The additional acres open to major ROWs and realty actions and the larger area available for surface disturbance under Alternative C would increase the likelihood of INNS infestation.

Alternative C wildlife management is similar to Alternative A and would be somewhat more adverse to ACEC values than Alternative B because forage allocations under Alternative C emphasize livestock grazing use rather than wildlife and Alternative C has the same sage-grouse buffer as Alternative A. Alternative C does not limit habitat fragmentation or increase vegetation by closing roads or limiting the footprint of projects. Although Alternative C does not apply seasonal protections from oil and gas O&M activities as does Alternative B, this would result in a minimal impact because there is very low potential for oil and gas in the ACEC. These impacts are described in more detail in the *Biological Resources* section.

Under Alternative C, VRM in the areas around the NNL would result in more adverse impacts to ACEC values than Alternative B, which manages the area outside the NNL with limited surface disturbance.

4.7.5.3.3.5.3. Resource Uses

Leasable mineral management under Alternative C allows activities that would result in more adverse impacts to ACEC values than Alternative A or B. Alternative C opens all of the ACEC to mineral leasing with surface occupancy. While the ACEC has a low potential for oil and gas, it does have extensive phosphate resources. Marked adverse impacts from phosphate development would be likely under Alternative C, including stripping of vegetation and overburden to reach the mineral resource (strip mining). If underground mining occurred, there would be less adverse impacts to vegetation, but the habitat fragmentation associated with access roads, facilities, and increased motor vehicles would still occur. The loss of habitat for elk that winter in the ACEC would be a serious adverse impact because elk are wary of human activities and would avoid the area. Because there is no readily available winter habitat for the large number of elk that summer in the Shoshone National Forest, phosphate mining in the Red Canyon ACEC would threaten the life of the herd. Major adverse impacts to visual resources would also be likely under Alternative C. The location of mineralization is on the portion of the ACEC easily visible

from the surrounding communities, the scenic lookout along Highway 28, and particularly, the residences in the foothills. Surface mining of phosphate would remove all vegetation and create a pit to a depth necessary to obtain all of the minerals. As with the iron mine farther up Route 28, phosphate mines would be visible from most observation points in the surrounding communities.

Under Alternative C, geophysical exploration with resulting adverse impacts to wildlife and visual resources, due to vegetation and soil compaction, would be authorized. However, it is unlikely there will be much demand for geophysical exploration in light of the low potential for oil and gas. Impacts from geophysical exploration would likely be short-term.

Alternative C management of major ROWs and corridors, including wind-energy development and transmission lines, would result in substantially more adverse impacts to visual resources than Alternative B, which excludes these developments. Portions of the ACEC and adjoining lands, including private lands, have high potential for wind-energy development and Alternative C opens the ACEC to wind-energy development. This industrialization of the area would result in a substantial adverse impact to ACEC visual and wildlife resources in the short term and long term, with potential loss of the elk herd.

Livestock grazing management under Alternative C would result in impacts to ACEC values similar to Alternative A with slightly less beneficial impacts than Alternative B. See the *Biological Resources* section for more information on the impacts of livestock grazing on wildlife. Alternative C would result in increased infrastructure to concentrate livestock (which would adversely impact vegetation). Additionally, fences could fragment habitat and migration corridors. Impeding wildlife movement would adversely impact elk that winter in the ACEC and move to habitat in the Shoshone National Forest in summer. However, part of the adverse impact of additional infrastructure could be offset by the Alternative B potential increase in the numbers of fences on private lands to reduce livestock utilization. Vegetation treatment under Alternative C would be similar to Alternative A, with fewer beneficial impacts to vegetation and viewshed.

Alternative C recreation management would result in many more adverse impacts to wildlife than Alternative A or B, because Alternative C places no winter limitations on over-snow vehicles or sporting activities. This would stress the wintering elk population. There are no areas managed as RMZs under Alternative C. Impacts to the ACEC from travel management would be slightly more adverse under Alternative C and similar to impacts under Alternative A. These impacts are anticipated to be long-term.

4.7.5.3.3.5.4. Special Designations

Alternative C has no special designations other than the NNL that is common to all of the alternatives. There is no limit on development in the Little Popo Agie River.

4.7.5.3.3.6. Alternative D

4.7.5.3.3.6.1. Program Management

Alternative D designates the same ACEC area as alternatives A and B. Alternative D management of Red Canyon is similar to management under Alternative B including pursuing withdrawals from locatable minerals and excluding ROWs, and would result in somewhat more beneficial impacts than Alternative A. Alternative D would be substantially more beneficial to ACEC values than Alternative C. Resource values are emphasized and resource uses are limited if adverse

impacts to ACEC values would result. Required Design Features would reduce the adverse impacts associated with surface-disturbing activities.

4.7.5.3.3.6.2. Resources

Alternative D management of air quality, soil, and water would benefit wildlife and visual resources by limiting erosion and fugitive dust in a way that is similar to Alternative A. Alternative D includes more restrictive management of activities that could degrade water quality than Alternative A or C that would likely reduce surface disturbance. Following a fire or a timber sale, Alternative D, similar to Alternative A, would result in fewer beneficial impacts to forest resources in the Red Canyon ACEC than Alternative B or Alternative C, because Alternative D mandates forest replanting only after natural processes do not result in regeneration. Alternative D management to protect forest health from insect and disease outbreaks is the same as Alternative A, and would be less likely to result in short-term adverse impacts than Alternative B.

All alternatives use an IPM approach to INNS in the Red Canyon ACEC, although, under Alternative D chemical treatment is allowed only if other methods are not successful. While this could result in beneficial impacts to water quality similar to Alternative B, Alternative D would result in more adverse impacts by being less effective in treating INNS than alternatives A and C, which do not limit the use of chemical treatments. The presence of invasive plant species would adversely impact visual resources because of the different appearance of invasive plant species than native vegetation and the more intense fire regimes associated with heavy invasive plant species infestation.

Alternative D wildlife management would result in more beneficial impacts to Red Canyon ACEC wildlife values than Alternative A, substantially more than Alternative C, and similar impacts to Alternative B. Alternative D would limit surface disturbance in the 8,392 acres of the Core Area. Similar to Alternative B, Alternative D is more protective of visual resources in the Red Canyon ACEC than alternatives A and C because Alternative D would manage all of the ACEC as VRM Class II (other than the NNL, which would be managed under all alternatives as VRM Class I), which restricts more surface disturbance that would adversely impact wildlife and visual resources.

ACEC values would further benefit from management of the area to the east of the ACEC in the Lander Front-Hudson-Atlantic City area, which has strong constraints on minerals and ROWs for the protection of wildlife, heritage, and viewshed values. This management would result in beneficial impacts similar to those in Alternative B and much more beneficial than under alternatives A and C.

4.7.5.3.3.6.3. Resource Uses

Leasable and mineral materials management under Alternative D would result in more beneficial impacts to Red Canyon ACEC values than Alternative C, but somewhat fewer than Alternative B. Similar to Alternative B, Alternative D would close the ACEC to phosphate leasing, mineral materials disposals, and geophysical exploration. As under Alternative A, the Alternative D ACEC would manage oil and gas development with an NSO stipulation.

As discussed for Alternative B, the Alternative D closure to phosphate leasing would result in more beneficial impacts than the management prescriptions under Alternative A, which does not

expressly close the ACEC to phosphate leasing. In this regard, Alternative D would result in the same beneficial impacts to the ACEC as Alternative B.

Alternative D management of wind-energy development and major ROWs and corridors, would result in more beneficial impacts to ACEC values than Alternative A, because Alternative D, like Alternative B, makes the ACEC an ROW exclusion area. Livestock grazing management under Alternative D would result in fewer adverse impacts to ACEC values than Alternative A, because Alternative D allows range improvement projects only if they would enhance ACEC values. This would result in more beneficial impacts to wildlife than Alternative B, which prohibits range improvements of any kind. Grazing utilization levels under Alternative D are the same as under alternatives A and C. Through out the planning area, range infrastructure would be built which would result in the same acres of vegetation treatment as alternatives A and C, and approximately one-third of Alternative B. If this results in fewer acres treated in the ACEC, it would adversely impact both habitat and visual resources.

Similar to Alternative B, Alternative D travel management would be more beneficial to wildlife and scenic values than Alternative A. Although Alternative A limits travel to designated roads and trails with seasonal restrictions, this management has not been implemented in a way that can be enforced. Alternative B and D travel designations are followed with implementation-level planning, which would deter user-created routes and unauthorized road expansions that have been allowed to proliferate under current management (Alternative A) or would continue under Alternative C.

Like alternatives A and B, Alternative D does not allow over-snow motorized vehicle use, which would result in a beneficial impact to elk and avoid adverse impacts that would occur under Alternative C. Although Alternative D includes a shorter closure period to human presence (allowing nonmotorized use such as hiking after April 30), this would not result in more adverse impacts than Alternative A or Alternative B, because motorized vehicle use in May and June is the primary activity that would adversely impact saturated soils and damage vegetation.

4.7.5.3.3.6.4. Special Designations

There are no special designations in the Red Canyon area under Alternative D, other than the ACEC designation. The Little Popo Agie is not specially managed.

4.7.5.3.4. Detailed Analysis of Alternatives – Dubois Badlands

4.7.5.3.4.1. Summary of Impacts

Alternatives A and B would designate 4,903 acres as an ACEC to protect fragile soils and scenic views. Alternative C does not designate the area as an ACEC and would manage it with standard stipulations. Alternative D adds 342 acres outside of the WSA to the East Fork ACEC and would not designate the remaining 4561 acres as an ACEC. Alternative D would manage the WSA in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*.

There is very little difference in impacts among the alternatives because of the WSA. The only area of difference is in the management of the 342 acres that are within an ACEC under alternatives A, B, and D (where the ACEC is East Fork), but managed in accordance with standard stipulations under Alternative C. Management of the WSA under all alternatives (including travel management) would be the same and impacts would be similar.

Alternative C would result in somewhat more adverse impacts because it has limited protections for the non-WSA portion of the ACEC. However, there are limited potential adverse impacts to these lands. Adverse impacts are not anticipated under alternatives A, B, or D.

Beneficial impacts from management would be similar among all four alternatives because of the WSA.

4.7.5.3.4.2. Impacts Common to All Alternatives

The Dubois Badlands provide prominent views along Highway 287 (the main route to Yellowstone and Grand Teton National Parks) and the town of Dubois. Extensive surface disturbance would be highly visible and present a strong contrast with undisturbed areas. The extremely erodible sandstone along the southern edge of the ACEC can tolerate almost no human disturbance. Consequently, any surface-disturbing activity would adversely impact sensitive soils and visual resources in the ACEC.

The majority of the Dubois Badlands ACEC, 93 percent, is managed under BLM Manual 6330, *Management of Wilderness Study Areas* because it is located within a WSA. The more restrictive management (whether under BLM Manual 6330 or ACEC management) would be applied. Under all alternatives, the WSA portion would be managed as VRM Class I and closed to motorized vehicle travel, with other protections against adverse impacts from surface disturbance, including mineral developments (see the *Wilderness Study Areas* section for more information). The practical effect of the WSA is that there is very little difference among the alternatives with regard to specific management actions.

All alternatives identify only the parts of the ACEC outside the WSA as areas in which full suppression fire management should be utilized, in accordance with the provisions of BLM Manual 6330, *Management of Wilderness Study Areas*. The different management prescriptions under each alternative for forestry and silvicultural practices would not result in different impacts to ACEC values, because the area lacks forests and woodlands. There would not be any difference in INNS management impacts among the alternatives.

Notwithstanding the travel closure, unauthorized OHV use of the Dubois Badlands ACEC has resulted in substantial adverse impacts to the area by disturbing and compacting soils, and damaging or destroying vegetation. None of the alternatives include management that would reverse this damage during the planning period.

No locatable minerals have been identified as occurring in the Dubois Badlands ACEC. Therefore, although the alternatives vary in their locatable mineral management, there is not likely to be any difference in impacts among the alternatives as a result of this difference in management. Accordingly, locatable minerals are not further analyzed.

Although the alternatives vary in their ROW and realty management, the impacts of these differences would not vary by alternative, because it is not reasonable to assume there would be demand for ROWs outside of the WSA. Accordingly, ROWs, including wind-energy development, are not further discussed.

All alternatives manage the ACEC as open to livestock grazing, but vary in the use of funds for range improvement projects or increased vegetation treatment. However, since so much of the ACEC is under the provisions of BLM Manual 6330, *Management of Wilderness Study Areas*, there is no meaningful difference among the alternatives in impacts from these differences.

Similarly, the different motorized travel management outside the WSA, would result in no difference in impacts among alternatives.

4.7.5.3.4.3. Alternative A

4.7.5.3.4.3.1. Program Management

The 1987 RMP and EIS ROD designated the Dubois Badlands as an ACEC for sensitive soils and scenic values (see ACEC Report for detailed discussion of these values). Management actions from other programs that protect physical and biological values would avoid adverse impacts to ACEC visual resources and sensitive soils by limiting surface disturbance. Management that results in beneficial impacts to wildlife supports ACEC values.

4.7.5.3.4.3.2. Resources

Alternative A manages soil, water, and riparian-wetland values with standard stipulations, which would beneficially impact ACEC values. VRM management would beneficially impact visual resources and sensitive soils in the ACEC by limiting surface disturbance outside the WSA, and on lands adjacent to the ACEC with VRM Class II management.

4.7.5.3.4.3.3. Resource Uses

Oil and gas management in the ACEC outside the WSA is subject to an NSO restriction under Alternative A, which would limit vegetation loss, and avoid habitat fragmentation and adverse impacts to visual resources. Alternative A manages the ACEC as closed to mineral materials disposals, although no closure has been identified because of sensitive soils and the requirements under BLM Manual 6330, *Management of Wilderness Study Areas*, which would avoid adverse impacts to sensitive soils and visual resources. Alternative A would manage recreation as part of the planning area-wide ERMA, with no focus on visitor services to provide a recreational experience in the ACEC.

4.7.5.3.4.3.4. Special Designations

Alternative A does not include any other special designations in the area with the exception of the WSA, which is common to all alternatives.

4.7.5.3.4.4. Alternative B

4.7.5.3.4.4.1. Program Management

Alternative B designates the same number of acres as ACEC as Alternative A, but would increase management prescriptions for the benefit of the same values of concern.

4.7.5.3.4.4.2. Resources

Management of air quality, soil, and water resources under Alternative B, would reduce adverse impacts to sensitive soils and visual resources by reducing the amount of surface disturbance. Similar to Alternative A, Alternative B management would avoid adverse impacts to sensitive

soils and visual resources. Visual resources management under Alternative B is the same as Alternative A, so impacts would be similar.

4.7.5.3.4.4.3. Resource Uses

Alternative B management of leasable and mineral materials is more protective of ACEC values outside the WSA than Alternative A, but the beneficial impacts are unlikely to differ from those impacts under Alternative A.

There is no special recreation management for the ACEC under Alternative B. However, recreation management would be more focused on protecting existing values from change, therefore, resulting in more beneficial impacts to ACEC values than Alternative A.

4.7.5.3.4.4.4. Special Designations

The WSA is a special designation within the Dubois Badlands ACEC.

4.7.5.3.4.5. Alternative C

4.7.5.3.4.5.1. Program Management

Alternative C does not designate any portion of the Dubois Badlands as an ACEC. Instead, the area outside the WSA would be managed with standard stipulations. Alternative C would result in the fewest beneficial impacts and the most adverse impacts to ACEC values of any alternative.

4.7.5.3.4.5.2. Resources

The Alternative C emphasis on resource uses over physical and biological resources would result in minimal impact to visual resources in the Dubois Badlands ACEC because development is limited by management requirements under BLM Manual 6330, *Management of Wilderness Study Areas*. For areas outside of the WSA, Alternative C management would be similar to Alternative A, with very minor differences in adverse impacts as identified under Alternative B.

Fuels treatment and fire management impacts under Alternative C would be similar to Alternative B, except to the limited extent that fewer vegetation treatments might be done in the area outside of the WSA, because available funds would be utilized for range infrastructure projects. This difference would not be expected to result in any noticeable difference in impacts to the ACEC.

VRM under Alternative C would be more adverse to Dubois Badlands ACEC values than under Alternative B for areas outside the WSA, because this alternative (VRM Class III) would allow more activities that would contrast with visual resources in the area, even if they would attract the attention of viewers.

4.7.5.3.4.5.3. Resource Uses

Alternative C management of leasable minerals would result in slightly more adverse impacts to Dubois Badlands ACEC values than Alternative A or B. Alternative C would open the non-WSA portions of the ACEC to leasing with surface occupancy for all mineral activities and allows geophysical exploration. However, it is not likely that the limited restrictions on minerals management under Alternative C would result in development, because the non-WSA portions of

the ACEC have very low potential for minerals. Therefore, adverse impacts are anticipated to be similar to Alternative A or B during the planning period.

Alternative C limits travel to existing roads and trails outside the WSA, which would result in the potential for substantial adverse impacts to ACEC values. OHV usage in the area has caused resource damage in the past and introduced new “illegal” routes. Not designating travel to specific roads would reduce BLM's ability to enforce its travel management and would make it more difficult to prevent new user-created roads and trails. This difference in management could have increasingly greater long-term adverse impacts over time.

4.7.5.3.4.5.4. Special Designations

Alternative C does not include any special designations in the Dubois Badlands other than the WSA, which is common to all alternatives.

4.7.5.3.4.6. Alternative D

4.7.5.3.4.6.1. Program Management

Similar to Alternative C, Alternative D does not designate the Dubois Badlands as an ACEC. However, Alternative D designates the 342 acres outside the WSA, but within alternatives A and B ACEC boundaries, as part of the East Fork ACEC.

4.7.5.3.4.6.2. Resources

See the description of impacts to ACEC values from management of resources under Alternative D for the East Fork ACEC.

4.7.5.3.4.6.3. Resource Uses

See the description of impacts to ACEC values from management of resource uses under Alternative D for the East Fork ACEC.

4.7.5.3.4.6.4. Special Designations

There is no special designation management under Alternative D other than the WSA.

See the description of impacts to ACEC values from management of the non-WSA portions of the Dubois Badlands under Alternative D for the East Fork ACEC.

4.7.5.3.5. Detailed Analysis of Alternatives – Whiskey Mountain

4.7.5.3.5.1. Summary of Impacts

Alternatives A, B, and D, designate 8,776 acres as an ACEC to protect bighorn sheep habitat. Alternative C does not designate the area as an ACEC and would manage it with standard stipulations.

Alternative C has the most adverse impacts to ACEC values because it manages the area with standard stipulations which would not preclude surface disturbance that would adversely impact bighorn sheep. Alternative A has fewer adverse impacts because ROWs must avoid the area if possible and the area is withdrawn from locatable minerals. Alternative A manages oil and gas with NSO stipulations but this difference is only minor because the area has little to no potential. Alternatives B and D have very similar management and similar minor adverse impacts except that Alternative B closes the entire area to livestock grazing. However, Alternative D allows grazing in 2,164 acres which could adversely impact bighorn sheep by reducing forage availability.

4.7.5.3.5.2. Impacts Common to All Alternatives

Whiskey Mountain was designated as an ACEC in the 1987 RMP and EIS ROD for management as bighorn sheep habitat, with a small portion (519 acres) managed as a WSA in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*. The resident bighorn sheep herd in the ACEC is nationally known and an important contributor to the tourism economy of Dubois. Because the ACEC is prominent in the view along Highway 287 (a main route to Yellowstone and Grand Teton National Parks) and the local community, surface disturbance in the ACEC would be highly visible and present a strong contrast with undisturbed areas.

While not designated for visual resource values, the presence of the bighorn sheep makes the area a focus of visitor visual attention. Local tourism is based, in part, on a desire to view the bighorn sheep in the wild, and the barren sweeps of the ACEC make this possible. Management that protects the visual setting of the sheep and protects sheep habitat is important from a tourism standpoint as well as a pure VRM standpoint. However, although Alternative B is more proactive in its management of air quality than alternatives A, C, and D, the air quality in the Whiskey Mountain ACEC would be aggressively managed under all alternatives because the ACEC is near Air Quality Class 1 areas, including wilderness areas and national parks. Therefore, there would be no difference in impacts to visual resources in the ACEC among the alternatives from management of air quality.

In general, management actions from other programs designed to protect physical and biological resources would result in direct beneficial impacts to bighorn sheep by protecting forage and intact habitat. In general, management actions for other programs that would result in adverse impacts to physical and biological resources would adversely impact bighorn sheep and their setting in the ACEC.

Bighorn sheep are extremely sensitive to human presence and disturbances. Management that avoids surface disturbance and human use would beneficially impact bighorn sheep.

The difference in riparian-wetland setbacks among the alternatives (the setback is larger under Alternative B than under the other alternatives) would not result in different impacts to the ACEC because there are no riparian-wetland areas in the ACEC.

Under all alternatives a small part of the ACEC is a WSA managed in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*. Visual resources in the WSA are managed as VRM Class I under all alternatives. This management protects bighorn sheep and visual resource values by limiting surface disturbance and resource uses in the WSA. By special agreement among federal and state agencies, vegetative treatments in the WSA to benefit bighorn sheep are allowed under all alternatives, so management under BLM Manual 6330 would not adversely impact the ACEC.

Land near the Whiskey Mountain ACEC was identified as containing wilderness characteristics due to its remote and scenic qualities. Managing to protect the wilderness values would beneficially impact ACEC values. The alternatives vary in how the identified lands with wilderness characteristics are managed.

Other than the WSA common to all alternatives, there is no other special designation management except the ACEC itself.

Although the alternatives vary in their management actions for air quality, there would not be any differences in air quality impacts among alternatives because for all alternatives, BLM actions must meet the higher standards associated with the wilderness areas to the north and south of the ACEC.

4.7.5.3.5.3. Alternative A

4.7.5.3.5.3.1. Program Management

Alternative A designates the Whiskey Mountain area as an ACEC to protect bighorn sheep habitat. Existing mineral withdrawals would be extended. Alternative A generally manages to balance resource protections with resource use. There is no special management for the nearby lands with wilderness characteristics.

4.7.5.3.5.3.2. Resources

Management that benefits soil and water and other biologic resources would beneficially impact Whiskey Mountain ACEC bighorn sheep and their visual setting. Lands in the Little Red Creek Complex near to but not adjoining the ACEC are identified as lands with wilderness characteristics. These lands are not specially managed, so there would be no beneficial impacts to the ACEC. However, given the special designation because of bighorn sheep, it is not likely that substantial disturbance would be allowed in the Little Red Creek Complex, although Alternative A would not manage it for wilderness characteristics. VRM would beneficially impact visual resources in the ACEC by limiting surface disturbance and visually intrusive actions.

4.7.5.3.5.3.3. Resource Uses

Alternative A would close the Whiskey Mountain ACEC to oil and gas development and proposes to withdraw it from mineral entry. Mineral withdrawals would be extended before they expire if they were withdrawn for a finite period. This management would limit the loss of vegetation, avoid habitat fragmentation, avoid degradation of visual resources, and avoid human intrusion that would result from such development projects. This would result in a highly beneficial impact to ACEC values.

Alternative A closes most of the ACEC to livestock grazing, but authorizes grazing on 2,203 acres having 57 AUMs. The existing BLM permit is available in spring and fall. This grazing would adversely impact bighorn sheep, particularly in the fall, when uses by the permitted horses would reduce forage bighorn sheep need going into winter. In recent years an agreement has been in place to move the fall grazing portion of the permit to WGFD lands to ensure adequate forage is available to bighorn sheep.

Alternative A manages the ACEC as an avoidance areas for major ROWs and corridors, which would protect ACEC habitat values by retaining vegetation, avoiding habitat fragmentation, and preserving the viewshed. Because Alternative A does not manage the area as an ROW exclusion area, if there were no alternative location for a proposed ROW, it would be permitted. No such ROW potential or demand has been forecast under current management, however, the ACEC and the areas around it have high wind-energy potential. In light of resource values and investments made to acquire lands, it is not likely the BLM would grant ROWs and such a permit would only occur after the preparation of an EIS. Alternative A management reauthorizes the communications site on BLM Ridge that expires in 2013. Use of the ROW to access the tower for maintenance would adversely impact bighorn sheep, particularly in fall, winter, and early spring months, when the sheep are present in the ACEC and dependent on ACEC forage for survival.

4.7.5.3.5.3.4. Special Designations

Other than the Whiskey Mountain ACEC, there are no special designations that would impact the ACEC values, with the exception of the small portion that is also a WSA. Travel in the WSA, as in the rest of the ACEC, would be limited to designated roads and trails.

4.7.5.3.5.4. Alternative B

4.7.5.3.5.4.1. Program Management

Alternative B emphasizes wildlife and other resources even if the protective management would adversely impact or limit development. Alternative B extends withdrawals that would expire with time and closes the ACEC to livestock grazing. The Alternative B approach would result in more beneficial impacts to ACEC values than Alternative A.

4.7.5.3.5.4.2. Resources

Management of soil and water resources under Alternative B would beneficially impact Whiskey Mountain ACEC bighorn sheep and their visual setting by limiting erosion, fugitive dust, and by preventing habitat degradation and fragmentation. Alternative B would manage the Little Red Creek Complex as non-WSA land with wilderness characteristics and manage it to protect the naturalness and outstanding opportunities for solitude which would beneficially impact ACEC values because it would preclude uses that would contrast with the ACEC visual setting.

Alternative B manages grassland and shrubland communities to support the bighorn sheep population, which would beneficially impact ACEC values. Vegetative treatments would also benefit bighorn sheep. Any forestry actions under Alternative B would benefit bighorn sheep, including in the WSA. In general, Alternative B wildlife management would be more protective of ACEC wildlife values than Alternative A.

4.7.5.3.5.4.3. Resource Uses

Locatable minerals management under Alternative B would result in the same beneficial impact to ACEC values as Alternative A by renewing the existing withdrawals. Alternative B closes the ACEC to mineral materials disposals, but this would have the same beneficial impact as the informal closure under Alternative A.

Alternative B would close the ACEC to oil and gas leasing, while Alternative A applies NSO stipulations. The difference in impacts between alternatives A and B is minor, because the area has no potential for CBNG and very low potential for conventional oil and gas. Alternative B closes the ACEC to phosphate leasing; the area is open under Alternative A. Alternative B management would result in more beneficial impacts to ACEC wildlife and scenic values because the area has phosphate resources. While it is not likely that phosphate leasing, a BLM discretionary activity, would be allowed under Alternative A, Alternative B closes the ACEC, thereby removing any possibility of leasing. Phosphate mining would have an adverse impact to bighorn sheep due to human presence and the removal of vegetation.

Alternative B management of wind-energy development and major ROWs and corridors would be somewhat more beneficial to ACEC values than Alternative A, because Alternative B manages the ACEC as an exclusion area for these realty actions. Even if no other routes are available including ROWs and corridors, the realty action would be denied under Alternative B. Under Alternative A, it is possible that a ROW would be allowed. However, there is little difference between the impacts of the two alternatives because the demand for a ROW is low. Alternative B does not renew the lease for the communications site on BLM Ridge. The site represents a visual intrusion into the bighorn sheep setting, and regular maintenance increases the human presence during fall, winter, and early spring seasons, when the sheep depend most on the ACEC habitat.

Alternative B livestock grazing management would be more beneficial to bighorn sheep because it closes the allotment in the ACEC to livestock grazing, allowing it to be used by the bighorn sheep in the fall, an important time for the bighorn sheep to feed before winter. The primary difference between alternatives B and A is that while fall grazing is allowed on the allotment under Alternative A, recently, the operator has grazed on WGFD lands in the fall. However, this practice may not continue.

Alternative B recreation management would be more protective of wildlife values because the Dubois Mill Site near the ACEC is not open to motorized recreation and guarantees a primitive recreation experience. Under Alternative B, the Dubois Mill Site is managed as a community SRMA for nonmotorized recreation. Although there is a potential adverse impact by bringing more recreationists closer to bighorn sheep, which are wary of human presence and can experience adverse impacts from recreation activities, the more likely result would be to have the nonmotorized recreation occur at lower elevations by town residents and not have recreational activities advance into the bighorn sheep habitat. Alternative B would be more protective of ACEC values by closing the Dubois Mill Site to cross-country mechanized travel than Alternative A, which manages the area as open to such travel.

The impacts of travel management under Alternative B would be similar to Alternative A.

4.7.5.3.5.4.4. Special Designations

Under Alternative B, the only special designation other than the Whiskey Mountain ACEC is the WSA common to all alternatives. Under Alternative B, the WSA would be closed to motorized and mechanized travel which beneficially impacts bighorn sheep by reducing human presence and travel disruption.

4.7.5.3.5.5. Alternative C

4.7.5.3.5.5.1. Program Management

Alternative C does not designate the Whiskey Mountain area as an ACEC. Standard stipulations are applied to authorized activities. Alternative C emphasizes resource use, and protects wildlife, such as bighorn sheep, at minimal levels. Bighorn sheep are not considered a BLM sensitive species, so there are no standard stipulations for their protection. The area is open to oil and gas leasing with surface occupancy, and mineral withdrawals are allowed to expire.

4.7.5.3.5.5.2. Resources

The Alternative C emphasis on resource uses over physical and biological resources would result in more adverse impacts to bighorn sheep in the Whiskey Mountain ACEC. Alternative C manages soil and water with standard stipulations.

Alternative C grassland and shrubland management would be less beneficial to wildlife because it emphasizes forage production for all grazing animals and not, as under Alternative B, for bighorn sheep. Alternative C vegetative treatment also emphasizes forage, and not ecological diversity or wildlife needs.

Alternative C does not manage lands with wilderness characteristics in the Little Red Creek Complex specifically to preserve their wilderness characteristics. Therefore, there would be no beneficial impact to bighorn sheep. It is possible that this approach to the Little Red Creek Complex could adversely impact bighorn sheep if the Little Red Creek Complex is utilized to access the Shoshone National Forest Wilderness.

Alternative C VRM would result in more adverse impacts to ACEC values than Alternative B because outside of the WSA, Alternative C allows development that would contrast with the existing landscape. This management would result in a substantial potential for surface disturbance and disruptive activity that would adversely impact bighorn sheep and their visual setting if there were a demand for it.

4.7.5.3.5.5.3. Resource Uses

Locatable and leasable minerals management under Alternative C would result in more adverse impacts to ACEC values than Alternative A or Alternative B. Alternative C opens the non-WSA portions of the ACEC to leasing with surface occupancy. No Plan of Operations is required under Alternative C for locatable mineral exploration on less than 5 acres. As a result the BLM would have little ability to limit adverse impacts to soil, vegetation, water quality, and visual resources from mineral exploration. Initially, these adverse impacts would not occur in most of the ACEC, but as mineral withdrawals expire, there could be additional adverse impacts to bighorn sheep. Although potential is low, Limestone Kiln Gulch could have some potential for phosphate and limestone. Alternative C allows geophysical exploration, which would adversely impact wildlife and visual resources due to vegetation and soil compaction.

Alternative C management of major ROWs and corridors, including wind-energy development and transmission lines, could result in substantially more adverse impacts to visual resources than under Alternative B, which excludes these developments. It is not likely that there would be a strong demand for major ROWs in light of the protections afforded by the adjoining Wilderness

designation. However, demand for access to the area across BLM-administered land could arise in the future, particularly as the population of Dubois grows. Like Alternative A, Alternative C management would reauthorize the communications site on BLM Ridge that will expire in 2013. Use of the ROW to access the tower for maintenance would adversely impact bighorn sheep, particularly in fall, winter, and early spring months, when the sheep are present in the ACEC and depend on ACEC forage for survival.

Travel management for the nearby Dubois Mill Site is the same under Alternative C as under Alternative A, which would allow motorized travel on existing roads and trails. This would result in far fewer beneficial impacts to ACEC values than Alternative B, which closes the area. There is demand for motorized vehicle access to BLM-administered land from the Dubois Mill site, so it is likely that motorized use would result in substantial adverse impacts to ACEC values.

Alternative C would allow livestock grazing on the allotment during both the spring and fall seasons resulting in adverse impacts to ACEC values very similar to Alternative A, with more adverse impacts than under Alternative B. Additional range infrastructure would not be precluded but the demand for such development is likely low.

Recreation management under Alternative C, like Alternative A, would have adverse impacts to bighorn sheep because motorized use is emphasized, rather than the more beneficial impacts of nonmotorized recreation under Alternative B. Management for the nearby Dubois Mill Site also allows motorized use and cross-country mechanized (bicycle) travel and would, therefore, result in more adverse impacts than Alternative B from this type of use.

4.7.5.3.5.5.4. Special Designations

Alternative C does not designate Whiskey Mountain as an ACEC. The WSA travel management would be the same as Alternative A, with the same minor adverse impacts to bighorn sheep.

4.7.5.3.5.6. Alternative D

4.7.5.3.5.6.1. Program Management

Alternative D designates the same area as Alternative A as an ACEC. In general, Alternative D management protects resources of priority concern, such as bighorn sheep. Alternative D closes the entire Dubois area to oil and gas leasing, and the ACEC would be closed to all mineral leasing and excluded from major ROW development. This management would result in substantial beneficial impacts to ACEC values.

4.7.5.3.5.6.2. Resources

Alternative D management of soil and water resources would benefit bighorn sheep by limiting erosion and fugitive dust. Alternative D would manage 4,954 acres as non-WSA land with wilderness characteristics to protect their wilderness character. This management would beneficially impact bighorn sheep because it restricts motorized vehicle use and prohibits surface-disturbing activities. This management, which is the same as Alternative B except over a slightly smaller area, would be more beneficial to ACEC values than alternatives A and C, particularly with regard to motorized use.

Management of grassland and shrubland communities under Alternative D is the same as under Alternative A, which is to meet NRCS Ecological Site Guide objectives that would beneficially impact bighorn sheep by supporting habitat. All alternatives use an IPM approach to INNS in the ACEC, although Alternative D allows chemical treatments only if other methods are unsuccessful. Alternatives B and D are also more proactive in addressing the link between BLM-permitted activities and the spread of INNS, which would avoid some of the adverse impacts that could result under alternatives A and C.

Alternative D wildlife management for the Dubois area would have more beneficial impacts to bighorn sheep because the entire area would be closed to oil and gas leasing for the protection of special status species. This management would result in less human contact and surface disturbance throughout the area which would benefit the ACEC bighorn sheep that travel in and out of the ACEC. Similarly, although Alternative D general wildlife management is the same as Alternative A (regarding allowing roads in crucial winter range), it is very unlikely that there would be a demand for any kind of ROW, or that the BLM would grant one under Alternative A, B, or D, in contrast with Alternative C.

Alternatives A, B, and D, all limit roads and fences for the benefit of bighorn sheep, although Alternative A would result in slightly more adverse impacts because it retains the existing pasture fence. Alternative C does not limit roads or fences in bighorn sheep habitat, so the adverse impacts associated with this type of habitat fragmentation and surface disturbance would occur under Alternative C.

Alternative D VRM would result in similar beneficial impacts to Alternative B. This would avoid the adverse impacts that would result from more less restrictive VRM, which would allow more visual intrusions into the ACEC and more human presence.

4.7.5.3.5.6.3. Resource Uses

Similar to Alternative B, Alternative D leasable and mineral materials management would result in more beneficial impacts to ACEC values than Alternative A. Alternatives B and D close the ACEC to phosphate leasing, mineral materials disposals, and geophysical exploration. Like Alternative B, Alternative D closes the ACEC to oil and gas development. In the locatable mineral program, Alternative D would result in the same beneficial impacts to ACEC values as alternatives A and B, as these alternatives withdraw the entire ACEC.

Alternative D management of wind-energy development and major ROWs and corridors would result in more beneficial impacts to ACEC values than Alternative A, since Alternative D manages the ACEC as an exclusion area. Unlike Alternative B, Alternative D closes only one pasture of the allotment in the ACEC to livestock grazing and allows higher utilization levels — closing a total of 28 AUMs. This would be more beneficial than Alternative A, which authorizes 57 AUMs, but less beneficial than Alternative B which closes 57 AUMs. It is not likely that any range improvement projects would be authorized under Alternative D.

Recreation management under Alternative D would beneficially impact ACEC values because it focuses on nonmotorized recreation and manages the Dubois Mill Site for pedestrian activities which keeps motorized vehicles away from the bighorn sheep. Under Alternative A, this area is not closed to motorized activities.

The limits on surface-disturbing activities under Alternative D, including closing the area to leasing and excluding ROWs, would result in benefits to ACEC values similar to the benefits under Alternative B.

4.7.5.3.5.6.4. Special Designations

Other than ACEC designation and the small portion of the area managed as a WSA, there are no special designations in the Whiskey Mountain area. The WSA is closed to motorized travel in Alternative D which is more beneficial than Alternative C.

4.7.5.3.6. Detailed Analysis of Alternatives – East Fork

4.7.5.3.6.1. Summary of Impacts

Alternative A designates 4,431 acres as an ACEC. Alternative B designates 7,744 acres, and Alternative D designates 7,745 acres as an ACEC to protect elk habitat. Alternative C does not designate the area as an ACEC and manages it with standard stipulations. The difference between alternatives B and D is the transfer of 342 acres from the Dubois Badlands ACEC in Alternative B to the East Fork ACEC in Alternative D.

Alternative C would result in the most adverse impacts to ACEC values because it manages the area with standard stipulations which would not preclude surface disturbance that would adversely impact elk and bighorn sheep including mineral activities and ROWs. Alternative A has fewer adverse impacts because the mineral withdrawals are extended, oil and gas leasing has a NSO stipulation, and the ACEC is avoided for major ROWs. Alternatives B and D have similar management with limited adverse impacts to ACEC values. Alternative D would result in fewer adverse impacts because the entire Dubois area is closed to oil and gas leasing, while Alternative B only closes East Fork (and the other two Dubois-area ACECs) (Table 2.5, “Comparative Summary of Areas of Critical Environmental Concern by Alternative” (p. 50)).

Alternatives B and D are very similar in their beneficial impacts. Both alternatives would emphasize resource protections over resource uses and both would limit mineral actions. Both have similar VRM and wildlife protections and would limit livestock grazing to 691 acres within the East Fork ACEC. Additionally, there is no difference in size of ACEC management because while Alternative D has more acres in the East Fork ACEC, those lands are managed by the Dubois Badlands ACEC under Alternative B. Alternative A is the next most beneficial because the ACEC emphasizes protection of elk and bighorn sheep over resource uses such as oil and gas, and pursues a withdrawal on part of the area, though fewer acres than Alternative B. Alternative C would result in the fewest beneficial impacts because VRM management would allow more surface disturbance and oil and gas development is not limited. Although the potential is low, there is some oil and gas development in the area. Alternative C would beneficially impact elk only to the extent that slope and riparian-wetland setbacks preclude surface disturbance.

4.7.5.3.6.2. Impacts Common to All Alternatives

The East Fork area was designated as an ACEC in the 1987 RMP and EIS ROD to protect the crucial winter range for elk and, to a lesser degree, bighorn sheep habitat. To support the winter elk habitat, the WGFD has acquired lands in the East Fork area and undertaken protective management on these lands.

While the alternatives vary in their management of air quality, it is not likely that there would any differences in impacts to ACEC values. The East Fork area is close to the Washakie and Fitzpatrick Wilderness Areas and degradation of air quality under any alternative that could potentially impact elk adversely, would be limited.

Since visual resources are not relevant or important values of concern for this area, this analysis does not consider impacts to visual resources in determining adverse or beneficial impacts to ACEC values. However, to the extent that VRM precludes surface disturbance, it would beneficially impact elk habitat. Human intrusion would result in particularly adverse impacts to elk compared to other big game, so the more other management strategies such as visual resource prescriptions limit development, the more beneficial the impacts to ACEC values.

Fuels and vegetative treatments are the same under all alternatives. There would be some vegetative treatment that would benefit elk forage under all alternatives. These treatments would result in long-term beneficial impacts to wildlife habitat by contributing to vegetative diversity and fostering elk forage. While the alternatives vary in the approach taken to silvicultural techniques, impacts are not likely to vary among the alternatives because it is assumed that due to the availability of timber in the Dubois area outside of the ACEC, forest resources in the East Fork area would not be managed for commercial use, even under Alternative C. Accordingly, forest products and silvicultural techniques are not further analyzed.

Under all alternatives, hunters and anglers would use primitive camping sites in the ACEC for recreational purposes. There is no difference among the alternatives regarding recreation management of these camping areas.

There is a pre-FLPMA locatable mineral withdrawal of 3,470 acres in East Fork area. This withdrawal does not expire and does not vary by alternative, therefore it is not further addressed in this section.

Under all alternatives, the existing ACEC would be closed to livestock grazing. The alternatives vary regarding livestock grazing in the proposed expanded ACEC and non-WSA lands from the Dubois Badlands.

Although the alternatives differ in their management of ROWs, including wind-energy development, there would be little to no difference in the potential impacts. Although some of the ACEC has potential for wind, there is no transmission line support for exporting the produced electricity. The nearby lands managed as Wilderness in the Shoshone National Forest make it unlikely that East Fork would be considered a suitable location for wind-energy development. Accordingly, ROWs are not further analyzed in this section.

To support ACEC values, alternatives B and D expand the ACEC originally designated in 1987 to include lands acquired after the 1987 RMP and EIS ROD. These lands were not added to the East Fork ACEC at the time of acquisition. This section refers to the area identified under Alternative B as the “expanded area,” and separately identifies management for the “expanded area” only if it is different from management of the original ACEC. In addition to the expanded area under Alternative B, Alternative D assigns certain lands managed as part of the Dubois Badlands ACEC under Alternative A to become part of the East Fork ACEC. These lands are identified here and for the Dubois Badlands ACEC as the “non-WSA lands in the Dubois Badlands.”

4.7.5.3.6.3. Alternative A

4.7.5.3.6.3.1. Program Management

The existing plan designated 4,431 acres in the East Fork area as an ACEC for elk crucial winter habitat. In addition, a small resident herd of bighorn sheep also occupy the ACEC (see the ACEC Report for a detailed discussion of these values). In general, Alternative A balances resource protection with resource use. On a site-specific basis this balance might not protect a resource as fully as would be the case if resource protection were the emphasis. However, Alternative A prescriptions would result in beneficial impacts to wildlife in the area, primarily elk.

Alternative A manages the lands in the expanded area similarly to the ACEC lands and surrounding WGFD lands.

4.7.5.3.6.3.2. Resources

Management actions from other programs that protect physical and biological values would result in direct beneficial impacts to East Fork ACEC elk by protecting forage and maintaining intact habitat. Soil and water management under Alternative A is according to standard stipulations, which would beneficially impact the elk by limiting or relocating some surface disturbance. Vegetation is managed to provide forage for wintering elk, which would benefit ACEC values.

Because visual resources are not considered a value of concern, Alternative A VRM of the East Fork ACEC is identified in the visual resource program. VRM management would result in beneficial impacts to ACEC values by limiting or prohibiting visually intrusive projects, although some surface-disturbing activities may be allowed.

4.7.5.3.6.3.3. Resource Uses

Under Alternative A, the East Fork ACEC would be managed with a NSO restriction for oil and gas development, and other solid mineral leasing and the expanded area would be managed under standard stipulations. The ACEC is also withdrawn from locatable mineral entry, but the expanded area would not be withdrawn. Although the potential for oil and gas in the ACEC is low, oil and gas development is occurring not far from the ACEC on BLM-administered lands and is proposed in the Shoshone National Forest. No potential for locatable minerals has been identified for the expanded area, however, exploration could occur without a Plan of Operations which could result in adverse impacts to elk habitat.

Alternative A closes the East Fork ACEC to mineral materials disposal, but does not close the expanded area. It is unlikely that disposals would be approved because of the adverse impacts to elk. No demand for mineral materials in the expanded area is anticipated. However, surface disturbance as a result of mineral development of any kind would result in short- and long-term adverse impacts to elk.

Alternative A does not authorize livestock grazing in the ACEC or in the expanded area except on 641 acres. However, lands in the expanded area were never officially closed to livestock grazing. Rangeland infrastructure, including fences and water projects, are not precluded on the 641 acres where grazing is authorized, but it is unlikely that a project action that would adversely impact elk would be authorized.

Alternative A limits motorized vehicle travel to existing roads and trails. Alternative A does not include seasonal closures for motorized over-snow travel and does not restrict cross-country mechanized travel. Travel by motorized vehicles during winter would result in adverse impacts to elk. However, because the majority of BLM-administered lands in the ACEC and expanded area are surrounded by WGFD controlled lands, most of the BLM-administered lands are seasonally closed due to the WGFD closures.

4.7.5.3.6.3.4. Special Designations

Under Alternative A, there are no special designations in the East Fork area except the ACEC.

4.7.5.3.6.4. Alternative B

4.7.5.3.6.4.1. Program Management

Alternative B expands ACEC protections to 3,313 more acres than Alternative A, for a total of 7,744 acres. Therefore, BLM-administered lands in the expanded area are designated as part of the ACEC with the same management prescriptions that would complement management of the surrounding WGFD lands.

4.7.5.3.6.4.2. Resources

Alternative B management of soil and water resources would benefit wildlife by limiting erosion and fugitive dust.

Following a fire, Alternative B would result in more beneficial impacts to forest resources than Alternative A because Alternative B mandates forest replanting. Alternative B management to protect forest health from insect and disease outbreak would likely result in more short-term adverse impacts than Alternative A, because treatment under Alternative B would be attempted solely to protect human health and safety. The impact of this management could result in short- and long-term adverse impacts to elk habitat, because it would increase the likelihood of landscape-level fires that would result in detrimental impacts to elk habitat.

Alternative B management of grassland and shrubland communities is similar to Alternative A, and would result in the same beneficial impacts to elk.

Wildlife management under Alternative B is more protective of wildlife values than Alternative A. Where grazing is allowed on the expanded ACEC, utilization is adjusted as needed to meet elk herd objectives, and vegetation management emphasizes wildlife needs. Management, including the management of visual resources, of the existing ACEC lands is the same under Alternative B as Alternative A, so the level of impacts would be the same.

4.7.5.3.6.4.3. Resource Uses

Alternative B management of locatable, leasable, and mineral materials is more protective of ACEC values than Alternative A because Alternative B extends the protections to the expanded area. Alternative B withdraws the expanded area from locatable mineral entry and closes it to leasable minerals and mineral materials disposal. The difference in beneficial impacts between Alternative B and Alternative A would directly depend on the risk of surface disturbance through mineral exploration and development.

Impacts from livestock grazing under Alternative B are the same as under Alternative A, except Alternative B officially closes the majority of lands in the expanded area. Under both alternatives, forage is managed to benefit elk. Alternative B, by not approving rangeland projects in other parts of the planning area, would have more funds available for non-infrastructure range improvements such as vegetative treatments. Infrastructure would be approved in the expanded area if needed to benefit elk. It is not likely that this management would result in a substantial difference in impacts between the two alternatives.

Recreational management under Alternative B is generally the same as Alternative A, so impacts to ACEC values would be similar. Travel management under Alternative B would be more beneficial to ACEC values because, not only does Alternative B protect more acres, it limits travel to designated roads and trails and includes seasonal limitations on all motorized vehicles, including over-snow vehicles. Therefore, travel management under Alternative B would result in more beneficial impacts to elk. In addition, Alternative B prohibits cross-country mechanized travel, which would result in more beneficial impacts to elk by protecting habitat from vegetation loss.

4.7.5.3.6.4.4. Special Designations

Alternative B does not include special designations other than the East Fork ACEC itself.

4.7.5.3.6.5. Alternative C

4.7.5.3.6.5.1. Program Management

Alternative C does not designate any acres in the East Fork area as an ACEC. Alternative C management would use standard stipulations to protect the ACEC values and mitigate impacts to wintering elk.

4.7.5.3.6.5.2. Resources

Alternative C emphasizes resource uses over physical and biological resources, which would result in somewhat more adverse impacts to wildlife in the ACEC. Full fire suppression under Alternative C would likely result in more beneficial impacts to elk than Alternative B, which uses suppression only to protect human health and safety.

Alternative C grassland and shrubland management would be slightly less beneficial to elk because it would emphasize forage production for all grazing animals and not, as under Alternative B, for wildlife. Alternative C vegetative treatment also emphasizes forage and not ecological diversity or wildlife needs.

Alternative C wildlife management would result in more adverse impacts to wildlife, specifically elk, than Alternative B. Forage allocations under Alternative C emphasize livestock grazing use rather than wildlife in portions of the expanded area where grazing is allowed. Alternative C does not limit habitat fragmentation or increase vegetation by closing roads or limiting the footprint of projects. Alternative C does not apply seasonal restrictions to oil and gas O&M activities, therefore, O&M activities could disrupt elk during the winter. These impacts are described in more detail in the *Biological Resources* section. Since this alternative would allow the subdivision and development occurring on private lands, this impact could increase in importance over time.

Alternative C manages the ACEC and expanded area as VRM Class III, which would be more likely to adversely impact ACEC values than the VRM Class II in Alternative B. This management would allow more surface disturbance by larger projects, and would result in more adverse impacts to elk than Alternative B to the extent that there is a demand for surface-disturbing activities.

4.7.5.3.6.5.3. Resource Uses

Locatable and leasable minerals management under Alternative C could result in more adverse impacts to ACEC values than Alternative A or B. Alternative C would open all of the ACEC to mineral leasing with surface occupancy. Current withdrawals are allowed to expire, so these areas would then be available for locatable mineral entry, as is the expanded area. Absent locatable mineral withdrawal or ACEC designation, Alternative C does not require a Plan of Operations for exploration that would disturb fewer than 5 acres. This management would result in more adverse impacts to the East Fork ACEC than Alternative B and Alternative A. Adverse impacts to ACEC values would be directly related to the likelihood of mineral development. Both the ACEC and the expanded area have low potential for oil and gas, although any exploration or geophysical activities would result in adverse impacts to elk.

Alternative C also opens the area to solid mineral leasing with surface occupancy. Although low, there is some potential for phosphate. Any solid mineral development would remove all vegetation from the area mined and create a pit to a depth necessary to recover the phosphate. Strip mines are not easy to revegetate and there would be long-term loss of forage, with potentially irreversible adverse impacts to elk. The most likely impacts from solid mineral leasing would be from exploratory activities, which would adversely impact elk by increasing human presence and removing vegetation.

Livestock grazing management under Alternative C would result in adverse impacts to ACEC values similar to Alternative A, and somewhat more adverse than Alternative B. Alternative C authorizes higher forage utilization levels, which would reduce the vegetation available to wildlife in the expanded area, and makes progress toward rangeland health through additional infrastructure, including water developments and fencing. Increased infrastructure would concentrate livestock, adversely impacting vegetation, and fences can fragment habitat and migration corridors. Impeding movement would adversely impact elk that winter in the ACEC and move to habitat in the Shoshone National Forest in summer. However, range developments could result in faster progress toward reaching rangeland health, which would beneficially impact wildlife. The private lands in the area are generally already fenced.

Alternative C recreation management in the ACEC focuses on maintaining the safety of recreationists and reducing conflicts, not on guaranteeing current recreation experiences. This would be less beneficial to ACEC values than Alternative B.

Alternative C would result in more impacts to elk from travel management than under Alternative A and fewer beneficial impacts than Alternative B, because Alternative C does not include limitations on winter travel. Winter is when elk depend most heavily on the ACEC for habitat, so this adverse impact could be severe.

4.7.5.3.6.5.4. Special Designations

Alternative C does not designate any of the East Fork area as an ACEC, and does not include other special designation management that would impact ACEC values.

4.7.5.3.6.6. Alternative D

4.7.5.3.6.6.1. Program Management

Alternative D designates the original 1987 ACEC, the expanded area (from Alternative B), and 392 acres of non-WSA land in the Dubois Badlands as an ACEC for a total of 7,745 acres. Alternative D wildlife management would beneficially impact elk in the ACEC in a manner similar to but not quite as protective of values as Alternative B. The Required Design Features would, in conjunction with other ACEC management, protect the elk habitat.

4.7.5.3.6.6.2. Resources

Alternative D management of air quality, soil, and water would beneficially impact wildlife and visual resources by limiting erosion and fugitive dust with generally the same beneficial impacts as Alternative B.

Following a fire, Alternative D, like Alternative A, would result in fewer beneficial impacts to forest resources than Alternative B because Alternative D mandates forest replanting only after natural processes do not result in regeneration. Replanting after a landscape-level fire would ultimately beneficially impact elk, but not within the planning period.

Alternative D management of grassland and shrubland communities would be the same as Alternative A which is to meet NRCS Ecological Site Guide objectives, resulting in a natural diversity of wildlife and game. Alternatives A, B, and D, would result in more beneficial impacts to ACEC values than Alternative C, which emphasizes the production of forage that would be shared with livestock on part of the ACEC.

In general, Alternative D wildlife management would result in more beneficial impacts to ACEC values than Alternative A because Alternative D closes the entire Dubois area to oil and gas leasing. This action would avoid the demand for ROWs through or near the ACEC and otherwise limit the kinds of surface disturbance and disruption that would adversely impact elk.

Similar to Alternative A, Alternative D manages forage and adjusts livestock utilization as needed to meet big game herd objectives and vegetation management emphasizes wildlife needs. This would result in beneficial impacts similar, but possibly less beneficial, to ACEC wildlife than Alternative B. However, because so little of East Fork ACEC is grazed under Alternative D, there would be very little difference in impacts between alternatives B and D. Alternative D road closures to benefit wildlife would result in some long-term beneficial impacts to ACEC wildlife and resource values. However, this action would not be likely to result in many beneficial impacts because there are very few redundant roads in the ACEC.

Alternatives B and D protect visual resources more than alternatives A and C, because alternatives B and D manage all of the ACEC as VRM Class II which would reduce surface-disturbing activities and thus benefit the elk.

4.7.5.3.6.6.3. Resource Uses

Alternative D leasable mineral and mineral materials management would result in more beneficial impacts to ACEC values than alternatives A and C, but fewer beneficial impacts than Alternative B. Like Alternative B, Alternative D closes the ACEC to phosphate leasing, mineral materials

disposal, and geophysical exploration. Similar to Alternative A, Alternative D manages the ACEC through a NSO stipulation for oil and gas. In the locatable mineral program, Alternative D would result in the same beneficial impacts to ACEC values as Alternative B, because alternatives B and D withdraw the entire ACEC. Alternative A does not withdraw any new areas, although it does maintain existing withdrawals. However, mineral resources in the ACEC are primarily phosphate rather than locatable minerals; therefore, the difference in impacts of this management is limited. Minerals management under Alternative D is protective of wildlife resources in Dubois outside of the ACEC in ways that would support ACEC values by limiting the area of surface disturbance. The Required Design Features would limit adverse impacts from the minimal disturbance that would occur. Travel management implementation would prioritize the Dubois area, which would beneficially impact ACEC values.

Alternative D livestock grazing management would result in fewer adverse impacts to ACEC values than Alternative A because Alternative D closes 1,494 more acres in the ACEC to livestock grazing, equal to a total of 832 AUMs, thereby reducing forage competition. Therefore, under Alternative D there would be no range improvement projects in most of the ACEC, and in the remainder of the ACEC, projects would be allowed only if their purpose was to enhance ACEC values. Alternatives B and D would result in more beneficial impacts than Alternative A, which allows range improvement projects even if they would not be for the benefit of wildlife. Range improvement projects do not need to be for the benefit of improving livestock grazing, so vegetation treatments and infrastructure could be developed in the absence of livestock grazing.

Similar to Alternative B, Alternative D travel management would be more beneficial to wildlife than Alternative A. Although Alternative A limits travel to designated roads and trails with seasonal restrictions, this management has not been implemented in a way that can be enforced. Alternatives B and D designation of roads and trails would be followed with implementation-level planning, which would deter user-created routes and unauthorized road expansions that would be likely under Alternative C travel management. Alternative D extends this protective management to a larger area.

Motorized travel would be seasonally closed under Alternative D for a slightly shorter period than under Alternative B. The Alternative D closure period would not adversely impact elk because they generally leave the ACEC by May 15 and this date is consistent with adjoining WGFD lands. Alternatives B and D seasonal closures are more protective of ACEC values than alternatives A and C, which do not close the area seasonally to motorized vehicle use.

4.7.5.3.6.6.4. Special Designations

There are no special designations in the East Fork area other than the ACEC itself.

4.7.5.3.7. Detailed Analysis of Alternatives – Beaver Rim

4.7.5.3.7.1. Summary of Impacts

Alternative A designates 6,421 acres as an ACEC for geologic and scenic values, Native American values, as well as unique vegetation and habitat. Alternative B expands the ACEC to 20,532 acres with additional management prescriptions. Alternative C does not designate the area as an ACEC but manages it with standard stipulations. Alternative D designates the same area as Alternative A, 6,421 acres, but has more management prescriptions to protect ACEC values. Alternative D also

applies Required Design Features that would limit adverse impacts to ACEC values from surface disturbance. Alternative D applies non-ACEC management that will support ACEC values.

Alternative C would result in the most adverse impacts to values of concern because it does not limit surface occupancy for oil and gas or limit ROWs which would present a strong contrast with the viewshed. Alternative A would have fewer adverse impacts but because of reduced VRM, could allow development that would adversely impact ACEC values. Alternative D would result in fewer adverse impacts than Alternative A because it manages the same area with more protections. Alternative B is similar to Alternative D but would apply the protective prescriptions to a larger portion of Beaver Rim.

The most beneficial impacts to ACEC values are under Alternative B, which prohibits the most surface disturbance and would provide the greatest protections for raptors and greater sage-grouse. Alternative D would result in similar beneficial impacts to wildlife and limits on surface disturbance. However, those beneficial impacts are applied to a much smaller area and thus less beneficial than Alternative B. Alternative A would limit some ROWs and oil and gas development, but would result in reduced wildlife benefits. Alternative C's minimal management strategies provide beneficial impacts only where slope restrictions would preclude development on the slope of Beaver Rim, and none at all for visual resources.

4.7.5.3.7.2. Impacts Common to All Alternatives

The view of Beaver Rim from Highway 287 and surrounding areas is important as a viewshed for Native American values and for its geologic sequencing that is easy to see, an extremely rare feature. To highlight the interesting and important views from Beaver Rim, the State of Wyoming installed a visitor observation point with an information sign about the visible geology. Beaver Rim's prominence means that surface disturbance would be highly visible and present a strong contrast with undisturbed areas. It has also been identified as an important area for unique plant communities and raptor nesting areas, and is considered an area important to Native Americans.

Under all alternatives, limitations on surface disturbance would beneficially impact ACEC values, including viewshed and habitat. Similarly, surface disturbance would adversely impact ACEC values.

Fuels and vegetation treatment objectives are the same under all alternatives, although the alternatives would vary in the amount of treatment expected each year. Livestock grazing would be allowed under all alternatives. Forest and grassland/shrubland management would not result in impacts under any alternative and are not analyzed here.

Alternative B designates a larger ACEC (20,532 acres as opposed to the 6,421 acres under Alternative A). All alternatives discuss 6,421 acres as "the ACEC" and the 14,111 additional acres proposed under Alternative B as the "expanded area."

The alternatives would vary in the management of locatable mineral entry. The alternatives that designate the area as an ACEC (alternatives A, B, and D) have the effect of requiring a Plan of Operations for exploration of 5 acres or less. Alternative B withdraws the ACEC. However, there is no identified locatable mineral potential so these differences in management actions are not likely to have different environmental impacts. Locatable mineral management in the ACEC is not further analyzed.

4.7.5.3.7.3. Alternative A

4.7.5.3.7.3.1. Program Management

The 1987 RMP and EIS ROD designated 6,421 acres of Beaver Rim as an ACEC for visual and geologic resources as well as for plant and raptor communities. Native American concerns have been identified. Management under Alternative A is generally supportive of ACEC values, although it limits some of its resource protections in areas where oil and gas potential is high.

4.7.5.3.7.3.2. Resources

See the ACEC Report for detailed discussion of resource values. Management actions from other programs that protect physical and biological values would directly benefit ACEC values. Alternative A vegetative management would result in short- and long-term beneficial impacts to wildlife habitat by contributing to vegetative diversity and preventing INNS encroachment which would directly benefit ACEC values. However, vegetative treatments would result in short-term adverse impacts to visual resources, which could be mitigated by careful feathering of the edges. Under Alternative A, fuels treatment would continue at the historic rate. Alternative A would result in more adverse impacts from INNS by not requiring weed-free feed or livestock flushing.

Alternative A wildlife management would benefit Beaver Rim ACEC values by seasonally limiting disturbance near active raptor nests. Wildlife management does not prohibit fences, which would result in a minor adverse impact to the viewshed which could be mitigated by proper fence placement. Wildlife sage-grouse management would beneficially impact ACEC values both in the ACEC and the expanded area because the areas within ¼ mile of greater sage-grouse leks are closed to surface disturbance. This would visually limit some intrusive development in the ACEC viewshed but would not be fully protective of greater sage-grouse.

Alternative A VRM would beneficially impact the visual and geologic resources in the ACEC by limiting disturbances within and adjacent to the ACEC to those areas that retain the existing character of the landscape. Lands farther away from the ACEC are managed to authorize activities that may contrast with the landscape more than within the ACEC. VRM in the expanded area has relatively few limits on surface disturbance under Alternative A, so there could be considerably more adverse impacts to ACEC values, particularly given the flat top of Beaver Rim and its prominence from a distance.

4.7.5.3.7.3.3. Resource Uses

Alternative A oil and gas management in the Beaver Rim ACEC and the expanded area are subject to NSO restrictions in areas with moderate, low, or no potential for oil and gas, which would limit adverse impacts to visual and geologic resources. Alternative A does not close the ACEC or the expanded area to phosphate leasing, and there is phosphate just outside of the ACEC and well within its viewshed and the viewshed of the ACEC. Phosphate mining would involve stripping the vegetation and overburden to access the mineral (strip mining) and would be highly visible from the ACEC as a long-term adverse impact. Alternative A manages the ACEC and the expanded area to allow mineral materials disposals on a case-by-case basis, which would have the potential to adversely impact ACEC values.

The resources of interest in the ACEC would be adversely impacted by surface disturbance in the area to the east because development there is unlimited, and standard oil and gas stipulations would be applied.

Alternative A opens the ACEC and the expanded area to major ROWs and corridors, which would adversely impact ACEC values. While it is possible that some projects could be sited in a way that would minimize or mitigate adverse impacts, it is more likely that a ROW, particularly a high-profile development such as an industrial wind-energy development, would adversely impact ACEC values, particularly Native American values, if the development was near the ACEC. The ACEC and the lands surrounding it, including the expanded area, have high potential for wind-energy development, which would adversely impact the viewshed, raptors, and would degrade the context of geologic resources.

Alternative A livestock grazing management would allow rangeland improvement projects. However, such development would result in only slightly adverse impacts because it would not be readily visible other than at a close distance, and would be small in scale to Beaver Rim's open vistas. Alternative A's development of range infrastructure would result in fewer vegetation treatments for invasive plant species and juniper encroachment, which would increase the risk of hotter fires that could adversely impact visual resources, unique plant communities, and raptors over the short term and long term, and would adversely impact viewsheds.

Alternative A recreation management in the ACEC and the expanded area supports ACEC values, but the recreation setting is not guaranteed, so there would be no beneficial impacts to ACEC values. Motorized travel is limited to existing roads and trails, which would not protect ACEC values, but the adverse impact would be minimal.

4.7.5.3.7.3.4. Special Designations

Under Alternative A, there is no special designation management in the area except the Beaver Rim ACEC. Paleontological resources have been identified on Beaver Rim, with a NPS recommendation for managing that area as an NNL. However, this designation was not pursued and protections for the area are only those under the heritage program. It is not expected that NNL listing would be pursued in the future. The ACEC is not expanded which would adversely impact both the important resources in the area to the east and the visual resources and setting of the ACEC values.

4.7.5.3.7.4. Alternative B

4.7.5.3.7.4.1. Program Management

Alternative B emphasizes protections of resources and focuses less on resource uses. This management would result in the most beneficial impacts to ACEC values. Alternative B designates a larger area, 20,532 acres rather than 6,421 acres, (the expanded area) than Alternative A, and beneficial impacts of ACEC management would occur over a larger area. Conflicting resource uses are limited. Alternative B would close all of greater sage-grouse Core Area, protecting the values of interest to a far greater extent than Alternative A.

4.7.5.3.7.4.2. Resources

Alternative B management of air quality, soil, and water closes more acres to surface disturbance and would benefit wildlife and visual resources in the Beaver Rim ACEC by limiting erosion and fugitive dust. This management would be more beneficial to ACEC values than Alternative A, which restricts surface disturbance in a smaller area. Alternative B implements a more proactive approach to reduce emissions and improve air quality, which could slightly improve the view of the ACEC as observed from Highway 287. Alternative B fuels management would result in impacts similar to Alternative A.

Alternative B is more proactive in addressing the link between BLM-permitted activities and the spread of invasive plant species. The presence of invasive plant species also adversely impacts visual resources, not only because of the different appearance of invasive plant species than native vegetation, but also because of the more intense fire regimes associated with heavy invasive plant species infestation and the resulting adverse impacts to visual resources. However, it is likely that this difference would be visible only at Beaver Rim itself, and would be less visible from a distance because of the geology of the area.

Wildlife management under Alternative B would be more protective of ACEC wildlife values than Alternative A. Alternative B does not allow new fences and would allow removal of some existing fences to improve animal movement. While this ACEC is not designated for wildlife values other than raptors, fence removal would also beneficially impact visual resources to a modest degree by eliminating disturbances and visual intrusions. Alternative B management of greater sage-grouse habitat would beneficially impact ACEC values by reducing considerably more acres around leks to surface disturbance as well as imposing disturbance caps. Disturbance caps and limits on the number of energy developments under Alternative B would provide additional beneficial impacts to ACEC values.

Alternative B VRM would be far more beneficial than Alternative A because Alternative B would allow substantially less visual intrusion that would change the characteristic landscape. This management would limit obtrusive developments that would adversely impact ACEC setting. Expanding this protection to a larger area would result in more beneficial impacts to ACEC values than Alternative A, which allows much more surface disturbance in this area.

4.7.5.3.7.4.3. Resource Uses

Alternative B leasable and mineral materials management would result in somewhat more beneficial impacts to ACEC values than Alternative A, both in the ACEC and in the expanded area. Unlike Alternative A, Alternative B closes the ACEC and the surrounding Core Area to all mineral leasing and mineral materials disposals. Alternative B closure of the area to phosphate leasing would avoid the adverse impacts of an open pit mine in the viewshed of the ACEC from key observation points. Minerals management would be most likely to result in more beneficial impacts under Alternative B than under Alternative A, because of the closure of the area to solid mineral leasing in the ACEC and VRM of the surrounding areas.

Alternative B management of wind-energy development, major ROWs and corridors would be substantially more beneficial to ACEC values than Alternative A. Alternative B would manage the ACEC as an exclusion area for these realty actions, whereas Alternative A allows them unless prohibited by VRM. Extending VRM Class II prescriptions to the expanded area includes lands on which Alternative A would allow wind-energy development and ROWs to transmit the

electricity. There is substantial wind energy potential in the ACEC and proposed expansion, as well as surrounding areas within key observation points of the Beaver Rim, so these visual resource prescriptions provide an important benefit.

Alternative B livestock grazing management would result in impacts to ACEC values somewhat different from Alternative A. Grazing management would utilize non-infrastructure range improvement projects, particularly vegetation treatment. This would beneficially impact habitat and viewshed to a moderate degree. Alternative B would manage to limit juniper encroachment, which would decrease the risk of hotter fires, that adversely impact visual resources and raptors, and would improve visual resources. Alternative B management would allow beneficial impacts for INNS grazing management by the Authorized Officer requiring flushing, and establishing forage reserves to support vegetation treatments and reclamation.

Alternative B recreation management is similar to Alternative A and would result in similar impacts. Alternative B would limit travel to designated roads and trails, with implementation-level planning to meet management requirements. This would beneficially impact ACEC values, but only in the long term.

4.7.5.3.7.4.4. Special Designations

Alternative B designates the expanded area as an ACEC. In addition, other special designation management under Alternative B would result in substantial additional beneficial impacts to the Beaver Rim ACEC because so much of the viewshed would be protected from surface-disturbing resource uses in the area not designated under Alternative A. The Government Draw/Upper Sweetwater Sage-Grouse ACEC and the Congressionally Designated Trails ACEC limit mineral, ROW, and some range improvement projects that would result in adverse impacts to the view of and from Beaver Rim. The difference in impacts between alternatives A and B is substantial and would likely increase over time as more development was authorized under Alternative A, particularly bentonite development to the west and wind-energy development to the south and east.

4.7.5.3.7.5. Alternative C

4.7.5.3.7.5.1. Program Management

Alternative C does not designate any portion of the Beaver Rim area as an ACEC. Instead, the area would be managed with standard stipulations. Alternative C emphasizes resource use, with fewer protections for resources. Alternative C would result in more adverse impacts to the values of concern than Alternative A, and substantially more than Alternative B.

4.7.5.3.7.5.2. Resources

The Alternative C emphasis on resource uses over the protection of physical and biological resources would result in more adverse impacts to raptors as well as the visual and geologic resources of the ACEC. Alternative C is like Alternative A in its impacts to air, soil, and water resources and would have similar, slightly more adverse impacts in comparison to Alternative B.

Alternative C impacts from fuels and fire management would be the same as Alternative A.

The larger area open to surface disturbance under Alternative C would also result in slightly more adverse impacts to the viewshed than Alternative B because the likelihood of INNS increases with

surface disturbance. The additional acres open to major ROWs and realty actions, and the larger area available for surface disturbance under Alternative C, would increase the likelihood of INNS infestation. Unless the spread of INNS resulted in a landscape-level fire, Alternative C INNS management, while less beneficial than Alternative B, would result in limited adverse impacts to Beaver Rim ACEC visual resources because they are generally viewed from a distance.

Alternative C wildlife management would result in more adverse impacts to ACEC values than Alternative B because Alternative C does not close roads or limit the footprint of projects. Alternative C includes the same management of greater sage-grouse habitat as Alternative A, and therefore, would result in fewer beneficial impacts to ACEC values than Alternative B. Alternative C VRM in the ACEC and expanded area would result in more adverse impacts to ACEC values than the Alternative B VRM Class II management. Under Alternative C, moderate or major changes to the landscape are allowed, which would authorize more disturbance including visually intrusive development.

4.7.5.3.7.5.3. Resource Uses

Alternative C leasable minerals management allows activities that would result in more adverse impacts to ACEC values than Alternative A or B. Alternative C opens all of the ACEC and the expanded area to mineral leasing with surface occupancy. While the ACEC and the expanded area have low to very low potential for oil and gas, there is potential for phosphate resources within the viewshed of the ACEC. Phosphate mining could result in highly adverse impacts to the viewshed from the ACEC by stripping of vegetation and overburden to reach the mineral resource (strip mining). This adverse impact to the viewshed would be irreversible and would likely result in the loss of the raptors because of year-round disturbance.

The Beaver Rim ACEC and the adjoining portions of the Beaver Rim to the east would be leased for oil and gas subject to standard stipulations. This would result in more adverse impacts to the values of concern than under Alternative A and far more than Alternative B.

Management of major ROWs and corridors, including wind-energy development and transmission lines, under Alternative C, would result in substantially more adverse impacts to visual resources than Alternative B, which excludes these developments. The ACEC and the expanded area have high potential for wind energy, and Alternative C opens the area to wind-energy development. This industrialization of the area would result in severe adverse impacts to ACEC visual resources in the short and long term. The demand for ROWs, such as roads and transmission lines to support industrial wind-energy development in the ACEC and the expanded area would likely be high. Moreover, Alternative C management of special designations would increase the likelihood that wind energy and related ROWs would be developed.

Livestock grazing management under Alternative C would result in impacts to ACEC values similar to Alternative A and only slightly less beneficial than Alternative B, although the emphasis on range infrastructure would make vegetation treatment far less likely with adverse impacts to visual resources.

Alternative C does not guarantee recreational setting or experience and would not result in beneficial impacts to ACEC values. Recreation *per se* would not be expected to result in adverse impacts to ACEC values. Similar to Alternative A, impacts to ACEC values from travel management under Alternative C would be slightly more adverse than Alternative B. This impact would only be apparent over the long term.

4.7.5.3.7.5.4. Special Designations

Alternative C does not have any special designations neither in the original ACEC or in the expanded area so special designation management (other than the ACEC itself) would not impact values of concern.

4.7.5.3.7.6. Alternative D

4.7.5.3.7.6.1. Program Management

Alternative D manages some areas with more resource protections and some areas for resource uses such as mineral development. In areas with low potential for mineral resources and areas of high resource values, Alternative D emphasizes resource protection. Alternative D designates the same number of acres as an ACEC as Alternative A, but fewer than Alternative B. Alternative D manages 6,421 acres as the Core Area with limits on surface disturbance and the number of energy developments. Alternative D applies an MLP to the area to the east of the ACEC, which would provide additional resource protections in this area. Alternative D would apply mineral prescriptions not associated with ACEC management that would strongly support ACEC values.

4.7.5.3.7.6.2. Resources

Alternative D implements the same approach to emissions and air quality, and soil and water resources as alternatives A and C and would have the same limited beneficial impacts to ACEC values of concern by limiting surface disturbance. Alternative D management of INNS is the same as Alternative A, and would be less likely to result in short-term adverse impacts than Alternative B, which provides that treatment be attempted only to protect human health and safety, although the difference is limited.

Alternative D wildlife management would result in more beneficial impacts to ACEC wildlife values than Alternative A, substantially more than Alternative C, and the same as Alternative B because of the more extensive greater sage-grouse buffers that are applied to surface disturbance in both the ACEC and the expanded area (which are both in the Core Area). In addition, Alternative D manages the Lander Front-Hudson-Atlantic City area under an NSO restriction for oil and gas, withdraws the area from locatable mineral entry, and, avoids the area for ROWs, which would beneficially impact the Beaver Rim ACEC. Raptor seasonal limitations are applied to a larger buffer than under Alternative C and the same under Alternative A, which beneficially impacts raptors, a value of concern.

Alternative D management of paleontological resources is the same as alternatives A and C regarding the Beaver Rim proposed NNL, and would result in the same slightly adverse impacts in comparison to Alternative B. Alternatives B and D are more protective of visual resources in the ACEC than alternatives A and C because alternatives B and D manage all of the ACEC and almost all of the expanded area as VRM Class II, which would limit visually intrusive activities that would adversely impact ACEC values.

4.7.5.3.7.6.3. Resource Uses

Alternative D leasable and mineral materials management would result in more beneficial impacts to Beaver Rim ACEC values than Alternative A, but fewer beneficial impacts than Alternative

B. Like Alternative B, Alternative D closes the ACEC to phosphate leasing, mineral materials disposals, and geophysical exploration. Like Alternative A, Alternative D manages the ACEC and most of the expanded area with the mineral protections described above. This management would have moderately less beneficial impacts than Alternative B, but much fewer adverse impacts than Alternative A and far fewer adverse impacts than Alternative C. Because the area has a low potential for oil and gas, there would be little difference in beneficial impacts between alternatives B and D. The application of the MLP to the area to the east of the ACEC would beneficially impact the ACEC values by protecting their setting from disturbance. This would directly benefit the viewing of the geologic and Native American resources in comparison to Alternative A.

Wind-energy developments and major ROWs and corridors can result in adverse impacts to ACEC values because of the very prominent position of Beaver Rim. Alternative D, like Alternative B, would result in substantially more beneficial impacts to ACEC values than Alternative A because Alternative D manages the ACEC as an exclusion area for ROWs. Alternative A manages the ACEC as an avoidance area to protect ACEC values, so on a case-by-case basis, Alternative A could result in very severe adverse impacts if the ROW were granted. While the face of Beaver Rim is protected from adverse impacts under Alternative C because of slope limitations, the top of Beaver Rim is flat and Alternative C would allow any kind of ROW, despite the resulting adverse impacts to Beaver Rim visual resources. As for the other ACECs, clear and unambiguous closure of the ACEC to ROWs would benefit the public, although this would not be an environmental benefit. Alternative D livestock grazing management would result in fewer adverse impacts to ACEC values than Alternative A because Alternative D allows range improvement projects only to enhance ACEC values, and when the projects are part of a Comprehensive Grazing Strategy. Alternative A includes no such requirement. However, there would likely be only limited beneficial impacts to ACEC values from this management under Alternative D, because range improvement projects would result in limited adverse impacts to visual resources at the distance from which Beaver Rim is viewed.

Alternative D utilizes range infrastructure to meet rangeland health standards but only if pursuant to a Comprehensive Grazing Strategy. This should be beneficial to vegetation and riparian-wetland values that support raptors, although the reduced vegetation treatment would adversely impact visual resources.

Similar to Alternative B, Alternative D travel management would result in slightly more beneficial impacts to ACEC wildlife and scenic values than alternatives A and C, which do include travel limitations. Travel restrictions help to limit the number of user-created trails and resulting adverse impacts to ACEC values. Alternatives B and D designation of roads and trails would be followed with implementation-level planning, which would deter user-created routes and unauthorized road expansions that have been allowed to proliferate under current management (Alternative A) or would continue under Alternative C.

Alternatives B and D limit over-snow motorized travel to snow depth of at least 12 inches; however, alternatives A and C do not include such a limitation. Alternatives B and D would result in more beneficial impacts to vegetation in the area, which would beneficially impact ACEC values to a moderate degree.

4.7.5.3.7.6.4. Special Designations

Alternative D management of the Congressionally Designated Trails would limit surface disturbance which beneficially impacts the viewshed of the Beaver Rim, particularly as viewed from the east.

4.7.5.3.8. Detailed Analysis of Alternatives – Green Mountain

4.7.5.3.8.1. Summary of Impacts

Alternative A designates 14,612 acres of crucial winter range on Green and Crooks Mountain as an ACEC to protect a resident elk herd. In addition, the greater sage-grouse Core Area has been designated within the ACEC boundary. Although greater sage-grouse is not the primary reason for ACEC designation, protection of greater sage-grouse habitat also protects overlapping elk habitat. Alternative B designates 24,860 acres which includes all of the area designated in Alternative A and additional elk parturition habitat. Alternative C does not designate the area as an ACEC and manages it with standard stipulations. Alternative D expands the original ACEC to 21,389 acres but limits the expansion to the parturition areas that are most threatened by mineral development.

Alternative C has the most adverse impacts to values of concern because it would allow the most surface-disturbing and disruptive activities, including wind-energy development, ROWs, and oil and gas development that would adversely impact elk and elk habitat. Alternative A would result in the next most adverse impacts because although the area is managed as an ACEC, and oil and gas is subject to a NSO stipulation, it does not include parturition habitat and does not cap total disturbance in the greater sage-grouse Core Area, which contains elk habitat. Alternative D would have similar but somewhat fewer adverse impacts compared to Alternative A because more restrictions are placed upon resource uses under Alternative D. Alternative B would result in the fewest adverse impacts because it includes all identified parturition habitat and closes the greater sage-grouse Core Area to oil and gas leasing, which would beneficially impact elk habitat, and proposes to withdraw the ACEC from locatable mineral entry subject to valid existing rights.

Alternative B would have the most beneficial impacts because it designates the largest area as an ACEC, closes the most buffer around sage-grouse leks and has surface disturbance caps in greater sage-grouse Core Area, and proposes to withdraw the entire area from locatable mineral entry. Alternative D would have the next most beneficial management as it expands the ACEC, although less than Alternative B, and has the same buffer around greater sage-grouse leks in the Core Area and the same surface disturbance caps. It does not withdraw the area from locatable mineral entry. Alternative A would result in the next most beneficial impacts to values of concern because it designates the area as an ACEC and has a NSO stipulation for oil and gas development. Alternative C would result in the fewest beneficial impacts because it does not designate the area as an ACEC and manages it with standard stipulations. Alternative C has the same buffers around sage-grouse leks as Alternative A.

4.7.5.3.8.2. Impacts Common to All Alternatives

The 1987 RMP and EIS ROD designated the Green Mountain ACEC as an important habitat to a resident, non-migratory elk herd. Impacts from uranium and oil and gas activities in the 1970s and 1980s adversely impacted elk habitat and threatened the remaining habitat. Protections from ACEC designation were determined necessary due to activities from uranium exploration on

fewer than 5 acres, which is uncontrolled without an ACEC designation, and surface management for oil and gas development. Since the Green Mountain ACEC designation, elk populations first stabilized and then exceeded identified herd objectives. Most importantly, following the designation, uranium mining activities stopped with the worldwide drop in uranium prices and the termination of federal subsidies on uranium. In addition, the commodity price of oil and gas dropped, which further reduced development activities. As stated in Chapter 3, after the bottoming out of prices in the 1990s and the oil spike of 2007, the price trend for oil and gas and for uranium is now upward with fluctuations regularly occurring. The upward trend of uranium and oil and gas prices are increasing the interest in mineral exploration and development in the Green Mountain area.

Visual resources are not part of Green Mountain ACEC relevant and important features, and management under all alternatives is consistent with general VRM for the area.

In 1987, the Sparhawk cabin was considered relevant and important. At present, it is not considered to be relevant and important as required by 43 CFR 1610.7-2, but under all alternatives it is a contributing feature of the ACEC.

Approximately 9,934 acres of the 1987 ACEC are in the Wyoming Governor's greater sage-grouse Core Area. The alternatives vary in the management of surface disturbance that would affect the Core Area.

All alternatives use an IPM approach that would result in the same impacts under all alternatives, although Alternative B includes more limits on the use of chemical treatment; however, this difference would likely not result in impacts to ACEC values. The alternatives would vary in the amount of funds available for vegetative treatment. Under all alternatives, the ACEC would be open to livestock grazing.

The Green Mountain ACEC contains extensive forest resources (28 percent of the area is forested) and the alternatives would vary in their silvicultural management. However, it is unlikely that the environmental impacts would vary by alternative because of the low demand for timber from this area.

Although there are developed recreation sites on Green Mountain, management of these sites would not vary by alternative or impact elk in the existing ACEC or the ACEC expansion area.

Alternative B designates an additional 10,248 acres adjacent to the existing ACEC, that elk use for parturition habitat, for a total of 24,860 ACEC acres. This analysis refers to this area as the "expanded area" and analyzes it separately from the ACEC designated in 1987 if the impacts would be different.

4.7.5.3.8.3. Alternative A

4.7.5.3.8.3.1. Program Management

Alternative A management limits surface occupancy for oil and gas development to protect important elk values, primarily crucial winter range. Alternative A does not withdraw any portion of the Green Mountain ACEC from mineral leasing, but is otherwise protective of resource values. However, this management would result in adverse impacts to other programs. Alternative A designates 14,612 acres as an ACEC.

4.7.5.3.8.3.2. Resources

The Green Mountain ACEC is for the benefit of the elk herd with special emphasis on protecting the long-term functionality of crucial winter range; management actions from other programs that protect physical and biological resources would directly benefit elk by protecting forage and maintaining intact habitat. Alternative A manages vegetation to provide forage for the elk population, a beneficial impact to elk in the existing ACEC. Alternative A manages air, soil, and water resources with standard stipulations which would beneficially impact elk in the ACEC by limiting surface disturbance.

Under Alternative A, there would be some vegetative treatment in the existing ACEC and the expanded area to improve elk habitat. These treatments would result in long-term beneficial impacts to habitat by contributing to vegetative diversity and health. There would be a short-term adverse impact to elk during the time of treatment; however, treatments would be subject to seasonal protection stipulations in crucial winter range and parturition habitat. Due to seasonal stipulations to protect winter and parturition habitat, conflicts with fall hunting seasons, and a short summer season, vegetative treatment and forest management actions would be limited. Impacts would be the same in the existing ACEC and the expanded area.

Alternative A wildlife management in the ACEC includes seasonal closures for the benefit of wintering elk, which would also protect the expanded area. Alternative A allows the construction of fences, which would limit big game movement, create movement hazards, and cause habitat fragmentation, resulting in adverse impacts to elk in the ACEC. Alternative A applies minimal protections to greater sage-grouse habitat in the 9,934 acres of Core Area in the ACEC, but those minimal protections would result in a beneficial impact to ACEC values because surface disturbance is not allowed within the buffer around leks.

Alternative A cultural and paleontological resources management protects the Sparhawk cabin. In addition, protections adopted as a result of heritage resources in the existing ACEC and expanded area would limit surface disturbance that would adversely impact ACEC forage and habitat.

Alternative A VRM management would adversely impact elk in the existing ACEC and expanded area by allowing more surface-disturbing activities. Adverse impacts would result from activities that increase human presence causing elk to avoid the area and from activities that cause habitat fragmentation.

4.7.5.3.8.3.3. Resource Uses

Oil and gas development in the existing Green Mountain ACEC is subject to NSO restrictions under Alternative A, which limits surface-disturbing activities that cause loss of vegetation and avoids habitat fragmentation, would beneficially impact elk. Alternative A opens the expanded area to oil and gas leasing with standard stipulations which would result in adverse impacts to the parturition habitat. Alternative A does not withdraw the ACEC or the expanded area from locatable mineral entry, and development of the area's uranium resources would adversely impact elk habitat. Alternative A requires a Plan of Operation for exploration of 5 acres or less in the ACEC, which would help limit adverse impacts from small exploratory activities in the ACEC. Alternative A does not require Plans of Operations in the expanded area. Alternative A does not close the ACEC or the expanded area to other mineral leasing, such as phosphate; however, the area has limited solid leasable mineral potential. Alternative A generally manages the ACEC as closed to mineral material disposals, which, if allowed, would adversely impact

elk. Because Alternative A does not close the expanded area to such disposals, there could still be adverse impacts to ACEC values in that area from mineral material disposals conducted to support uranium and oil and gas development and road building.

Alternative A manages the ACEC as an avoidance area for major ROWs and corridors, but not the parturition area in the expanded area. An increase in demand for ROWs to access oil and gas development sites and other mining activities could result in adverse impacts to elk and avoidance management might not be adequate to prevent potentially serious cumulative adverse impacts. Alternative A does not limit ROWs in the expanded area, and this would likely adversely impact elk.

Alternative A livestock grazing management allows construction of rangeland infrastructure, including fences and water projects, in the ACEC and the expanded area. Fences adversely impact elk because they inhibit elk movement, cause habitat fragmentation, and can increase vegetation utilization. Moderate utilization of forage by livestock would leave less forage available for wildlife use, adversely impacting elk and other resident wildlife. Additional water development could increase livestock use in areas traditionally used by elk and draw elk into other areas increasing the potential for conflict with livestock and private lands.

The seasonal limitation on motorized travel in the ACEC, which also limits travel in the expanded area, would beneficially impact wintering and calving elk. Otherwise, Alternative A limits motorized travel to designated roads and trails during the open period in the ACEC and to existing roads and trails in the expanded area. Alternative A does not limit mechanized cross-country travel but there is likely little adverse impacts that result from this management. Alternative A would allow over-snow cross-country motorized travel, which could adversely impact elk through harassment or human presence during the winter and calving seasons when elk are most vulnerable.

4.7.5.3.8.3.4. Special Designations

Other than the existing Green Mountain ACEC, Alternative A does not include special designation management.

4.7.5.3.8.4. Alternative B

4.7.5.3.8.4.1. Program Management

Alternative B expands the area designated as an ACEC and proposes to withdraw the ACEC from locatable mineral entry. It is closed to oil and gas leasing and has a 0.6-mile buffer around greater sage-grouse leks in the Core Area.

4.7.5.3.8.4.2. Resources

Alternative B designates a larger ACEC than Alternative A (10,248 more acres, approximately a 70 percent increase). To the extent that Alternative B management would adversely or beneficially impact ACEC values, those potential impacts would be greater than under Alternative A because it applies management actions over a larger area than Alternative A. Alternative B management of air quality, soil, and water would benefit wildlife and visual resources by limiting erosion and fugitive dust. Alternative B water management on the south side of Green Mountain limits surface disturbance which beneficially impacts elk (the south side is an important water

recharge area although the limits on the use of pesticide to control INNS may result in more adverse impacts to the elk than under Alternative A which does not restrict their use). Alternative B implements a more proactive approach to reduce emissions and improve air quality; however, except for limiting fugitive dust emissions which can adversely impact vegetation, this would result in little impact to elk in the expanded ACEC. Following a fire or a timber sale, Alternative B would result in more beneficial impacts to forest resources than Alternative A, because Alternative B mandates forest replanting. However, because of the low potential of a large timber sale, beneficial impacts would be modest. The extent of beneficial impacts cannot be assessed because large forest sales would not be likely under any alternative. Alternative B manages grassland and shrubland communities to support a diversity of wildlife and game, which would be more beneficial to wildlife than Alternative A.

Additional vegetation treatment under Alternative B (above the historic average of 160 acres per year) are likely. Depending on the area and type of treatment conducted, additional treatment acres would have short-term adverse impacts to elk and long-term beneficial impacts to elk habitat.

Wildlife management under Alternative B would be more protective of wildlife values than Alternative A. Alternative B would adjust livestock utilization as needed to meet big game herd objectives and manage vegetation to emphasize wildlife needs. Alternative B removes some existing fences and does not allow new fences to avoid habitat fragmentation and limits on movement, which would be a beneficial impact to ACEC elk and substantially more beneficial to elk in the expanded ACEC than Alternative A. Alternative B management to protect greater sage-grouse habitat would limit surface disturbance in a much larger buffer around leks in the Core Area than Alternative A. This management would limit adverse impacts from surface-disturbing and disruptive actions on more acres than under Alternative A.

Visual resources are more protected than under Alternative A because Alternative B would manage all of the expanded ACEC to limit the development of visually intrusive projects. Compared to Alternative A, this management would result in the secondary beneficial impact to elk of limiting habitat fragmentation and human presence.

4.7.5.3.8.4.3. Resource Uses

Locatable, leasable, and mineral materials management under Alternative B would be more protective of ACEC values than Alternative A. Alternative B locatable mineral management would result in more beneficial impacts because it proposes to withdraw the expanded ACEC rather than requiring Plans of Operation. There is substantial potential for oil and gas and uranium resources in the expanded ACEC. Exploration and development of these resources would result in adverse impacts to elk in the existing ACEC and greater adverse impacts in the expanded area. Alternative B closes the ACEC and expanded area to all non-oil and gas mineral leasing, but this would result in little beneficial impact to elk because the potential for these leasable minerals is not high in the expanded ACEC.

Alternative B management of wind-energy development and major ROWs and corridors, would result in substantially more beneficial impacts to ACEC values than Alternative A because Alternative B manages the ACEC as an exclusion area for these realty actions. Even if no other route was available, the realty action would be denied and surface disturbance prevented. The ACEC has high potential for wind-energy resources, and excluding wind-energy ROWs would protect elk from the highly disruptive activities of industrial wind-energy development.

Alternative B livestock grazing management would result in fewer adverse impacts to ACEC values than Alternative A. Alternative B manages grazing for rangeland health by reducing livestock utilization to light levels rather than developing rangeland infrastructure. This management would result in fewer adverse impacts to wildlife than Alternative A, which allows for higher utilization rates, and would decrease livestock concentrations near new water developments and fences. Lower livestock utilization in the expanded ACEC would benefit elk from a forage standpoint, but could slow progress on riparian-wetland health if exclosure fences were not allowed. The funds Alternative A would spend on range projects could be utilized for vegetation treatments under Alternative B to improve rangeland health, resulting in short- and long-term beneficial impacts. However, while fencing on BLM-administered lands would not increase, it is likely that fencing on private lands would increase to meet light utilization levels. It is not possible to estimate the extent to which such fencing would increase as many private lands already have extensive fencing, but fencing generally results in adverse impacts to wildlife.

Alternative B travel management would be more beneficial to ACEC values than Alternative A because Alternative B limits travel in the expanded ACEC to designated roads and trails with seasonal limitations, which is the same as Alternative A. Alternative B also limits mechanized travel to designated roads and trails seasonally, which would limit adverse impacts to elk from encounters with humans in new areas. It is not possible to estimate the extent of this benefit because of terrain and weather limitations to cross-country usage.

4.7.5.3.8.4.4. Special Designations

Other than designation as an ACEC, Alternative B does not include special designation management that would impact ACEC values.

4.7.5.3.8.5. Alternative C

4.7.5.3.8.5.1. Program Management

Alternative C emphasizes resource uses over resource protection, which would adversely impact ACEC values because Alternative C manages the Green Mountain area (and adjoining areas) with standard stipulations.

4.7.5.3.8.5.2. Resources

The Alternative C emphasis on resource uses over physical and biological resources would result in more adverse impacts to resident elk. Unlike Alternative B, Alternative C does not proactively manage air quality, but this would result in minimal impact because visual resources are not a specific value for the ACEC. Alternative C has the same standard stipulations for soil and water resources as Alternative A. Alternative C grassland and shrubland management would be less beneficial to ACEC wildlife than Alternative B because it emphasizes forage production for all grazing animals.

Alternative C non-ACEC wildlife management would result in more adverse impacts to wildlife, and therefore impacts to elk, than Alternative B. Forage allocations under Alternative C emphasize livestock grazing use rather than wildlife. Alternative C does not limit habitat fragmentation or increase vegetation by closing roads or limiting the footprint of projects, which would adversely impact elk. Alternative C would manage greater sage-grouse habitat similar to

Alternative A, which limits surface disturbance in a smaller buffer area than Alternative B. See the *Fish and Wildlife Resources – Wildlife* section which describes these impacts in more detail.

VRM under Alternative C would be more likely to adversely impact ACEC values than Alternative B, because Alternative C would allow for substantially more surface-disturbing activities over a greater area than Alternative B, with resulting adverse impacts to elk.

4.7.5.3.8.5.3. Resource Uses

Alternative C locatable and leasable minerals management would result in more adverse impacts to ACEC values than Alternative A or Alternative B. Alternative C opens the ACEC and the expanded area to mineral leasing with surface occupancy. Alternative C does not require Plans of Operation for locatable mineral exploration on 5 acres or less, which means the BLM would have little ability to limit adverse impacts to soil, vegetation, water, and visual resources from smaller locatable mineral exploration. In light of the identified locatable mineral potential in the area, Alternative C could result in greater adverse impacts to ACEC values than Alternative B. Alternative C opens the ACEC to mineral leasing with surface occupancy which could adversely impact vegetation through increased surface use and disturbance. Alternative C allows geophysical exploration, which would result in short-term adverse impacts to wildlife and visual resources due to vegetation and soil compaction if the process was repeated multiple times, as sometimes happens.

Although Alternative C would make the ACEC available for solid mineral leasing, there is no identified solid-mineral potential in the ACEC or expanded area. Therefore, impacts under Alternative C would likely be similar to impacts under alternatives A and B.

Alternative C management of major ROWs and corridors, including wind-energy development and transmission lines, and minor ROWs would result in more adverse impacts to elk than Alternative B, which would manage the area as an exclusion area for these developments. The Green Mountain ACEC has high potential for wind-energy development and the related need for transmission lines. Impacts from industrial wind-energy development would be generated by surface disturbance, human presence, and elk displacement. Elk are wary of human presence, and a 450-foot tall tower with moving blades would likely result in more adverse impacts to elk than a road or fence.

Alternative C allows major ROWs in the ACEC. Because of existing and anticipated mineral activities, there would likely be a demand in the ACEC for ROWs. If wind energy is developed in or near the ACEC, then ROWs for transmission lines might increase in the ACEC. It is not possible to quantify this demand, but if development occurs, it would result in a substantial increase in short- and long-term adverse impacts to ACEC values compared to alternatives A and B.

Alternative C livestock grazing management would result in impacts to ACEC values similar to Alternative A. Alternative C authorizes higher livestock forage utilization levels, thereby reducing vegetation available to wildlife, and would utilize additional infrastructure (i.e., water developments, fencing) to improve rangeland health where needed. See the analysis under Alternative B.

Travel management under Alternative C does not apply seasonal restrictions; therefore, it would result in more adverse impacts than Alternative A or Alternative B.

4.7.5.3.8.5.4. Special Designations

Alternative C does not designate Green Mountain as an ACEC and there are no other special designations.

4.7.5.3.8.6. Alternative D

4.7.5.3.8.6.1. Program Management

Alternative D would expand the area designated as an ACEC by 46 percent over Alternative A, but the ACEC is smaller than under Alternative B. The area of expansion under Alternative D would incorporate most of the important parturition area on the south side of Green Mountain, but would not expand to include all of the identified parturition habitat as under Alternative B. As under Alternative B, to the extent that Alternative D management would adversely or beneficially impact ACEC values, those impacts would be greater under Alternative D because it applies management actions over a larger area than Alternative A. In conjunction with other management actions, Alternative D's overall management emphasizes resource protections when specific priority resources are identified.

4.7.5.3.8.6.2. Resources

Similar to Alternative B, Alternative D's management of soil and water resources would beneficially impact wildlife by limiting erosion and fugitive dust. Alternative D's more restrictive management of activities that could degrade water quality would result in the same beneficial impacts to the elk as Alternative B. Alternative D provides NSO management for lands to the south (within the viewshed of the ACEC or on lands likely used by area wildlife). Outside the ACEC, this management would beneficially impact ACEC values, although less than under Alternative B. The Required Design Features would reduce the adverse impacts associated with surface disturbance in the ACEC and in the adjoining habitat.

Alternative D manages grassland and shrubland communities to support a diversity of wildlife, which would be somewhat more beneficial to wildlife than Alternative A. Like Alternative B, Alternative D limits the use of chemicals for INNS treatment, however, Alternative D would allow chemical treatment if other methods were not successful. Similar to Alternative B, Alternative D could result in more beneficial impacts to vegetation by allowing the Authorized Officer to require livestock flushing before they are turned out on the public lands, if it appears they have ingested INNS feed. Alternatives B and D are also more proactive in addressing the link between BLM-permitted activities and the spread of invasive plant species, which would avoid some of the adverse impacts that could result under alternatives A and C.

Unlike Alternative B, which does not allow most range improvement projects, Alternative D would allow them when pursuant to a Comprehensive Grazing Strategy and to where they benefit ACEC values. Therefore, there would be less funding available for fire and fuels treatment, including for INNS treatment, under Alternative D. In this regard, Alternative D would result in adverse impacts similar to alternatives A and C, which focuses funding on infrastructure and not on vegetative treatments.

Alternative D wildlife management would result in more beneficial impacts to ACEC wildlife values than Alternative A, substantially more than Alternative C, and fewer than Alternative

B. Alternative D forage management would be similar to Alternative A, which would be less beneficial to wildlife than Alternative B. As under Alternative A, Alternative D would allow for new road development in crucial winter range. Alternative B would close the ACEC to new road development for wildlife protection and would be more proactive in closing redundant roads to reduce adverse impacts to habitat.

Alternative D would include the same raptor buffers as Alternative A, resulting in fewer beneficial impacts than Alternative B, which doubles the buffer. The ACEC has many raptor nests, so the seasonal limitation on surface disturbance is important. Alternative C would result in the most adverse impacts because it limits surface disturbance around raptor nests on half of the total acres in alternatives A and D.

Like Alternative A, Alternative D would manage forage and adjust livestock utilization as needed to meet big game herd objectives, and manage vegetation emphasizing wildlife needs. This would result in impacts similar to but possibly less beneficial to ACEC wildlife than Alternative B. Alternative D special status species management would be similar to Alternative B, as greater sage-grouse management would beneficially impact the portions of the ACEC that are in the Core Area.

Alternative D cultural resource protections that limit surface disturbance would result in the same beneficial impacts as Alternative A, which would be slightly less beneficial than Alternative B, and less adverse than Alternative C. Alternative D VRM would limit more surface-disturbing activities than Alternative A or Alternative C, but less than Alternative B with corresponding impacts to elk.

4.7.5.3.8.6.3. Resource Uses

Similar to Alternative A, Alternative D applies NSO restrictions to oil and gas development in the Green Mountain ACEC, which would result in beneficial impacts to elk by preventing surface disturbance and animal disturbance and/or displacement. The area elk are protected in a larger area (both in the expanded ACEC and in the parturition area to the south that is included in the ACEC under Alternative B). This impact would be somewhat less beneficial than the impact under Alternative B, which closes the expanded ACEC to oil and gas development. There is moderate oil and gas potential in the existing ACEC and in the expanded area, oil and gas development could result in substantial adverse impacts to elk. Like alternatives A and C, Alternative D opens the entire area to solid mineral leasing; however, given the low potential for phosphate, this is likely to have little adverse impacts to the elk. The area would be open to mineral material disposal, but due to the value of the area to elk, it is likely mineral materials disposals would not be authorized in the ACEC. The Required Design Features would result in fewer adverse impacts associated with mineral development.

The greatest difference among the alternatives is in the management of locatable minerals. Green Mountain and the surrounding area have high potential for uranium, and historic uranium mining likely contributed to the decline in elk numbers in the 1970s and 1980s. Only Alternative B proposes to withdraw the ACEC and the expanded area; therefore, Alternative B would be the only alternative under which locatable mineral management would beneficially impact elk. Alternatives A and D require Plans of Operation (Alternative D would require Plans of Operations for a larger area than Alternative A) for small uranium exploration projects, which would result in some potential to limit adverse impacts to elk. However, this management would result in only modest beneficial impacts to elk, because it does not preclude uranium mines.

Whether mines would be developed is uncertain as it would depend on many factors including, but not limited to, uranium prices.

While the withdrawal under Alternative B does not affect existing claims, not all of the ACEC or the expanded area are currently under claims. While alternatives A and D would result in a modest beneficial impact to elk, Alternative C would result in adverse impacts. Alternative B would be substantially more beneficial to ACEC values. Similar to Alternative A, the area would be excluded for major ROWs and avoided for minor ROWs. Alternative D would have greater beneficial impacts than alternatives A and C.

Alternative D livestock grazing management would result in fewer adverse impacts to ACEC values than Alternative A, because Alternative D would allow range improvement projects only to enhance ACEC values and pursuant to a Comprehensive Grazing Strategy, whereas Alternative A has no such requirement. This would likely result in more beneficial impacts to wildlife than Alternative B, which prohibits range improvements of any kind. Alternative C would result in more adverse impacts because it does not limit range improvement projects and does not include a requirement that range improvement projects be pursuant to a Comprehensive Grazing Strategy. Livestock utilization levels under Alternative D are the same as under alternatives A and C; however, similar to Alternative B, Alternative D protects wildlife forage resources. This would avoid the adverse impacts under Alternative C, which allows higher forage utilization and does not have wildlife forage protection as an objective.

Similar to Alternative B, Alternative D travel management would be more beneficial to wildlife than Alternative A or C, which do not include such limitations. Travel restrictions would help limit the number of user-created trails and their adverse impacts to ACEC values. Alternatives B and D designation of roads and trails would be followed with implementation-level planning, which would deter user-created routes and unauthorized road expansions that have been allowed to proliferate under current management (Alternative A) or would continue under Alternative C.

Alternatives B and D limit over-snow motorized travel to a snow depth of at least 12 inches; neither Alternative A nor Alternative C include such a limitation. Restricting over-snow travel would beneficially impact vegetation in the area, which would beneficially impact ACEC values.

4.7.5.3.8.6.4. Special Designations

Other than the ACEC, Alternative D does not include special designation management that would impact ACEC values. This is less beneficial than Alternative B, which designates a large ACEC for Congressionally Designated Trails and greater sage-grouse, which would protect the area around the ACEC and elk habitat in the area.

4.7.5.3.9. Detailed Analysis of Alternatives – South Pass Historic Mining Area

In the 1960s and 1970s, there was a concerted effort to save the historic mining towns and sites in the historic South Pass gold mining area. The State of Wyoming purchased South Pass City, and the BLM began to develop the historic mining area as a historical, recreational, and scenic destination. Under all alternatives, the BLM would work with the State of Wyoming Abandoned Mine Division to reclaim or stabilize abandoned mine safety and environmental hazards in the South Pass area that pose a danger to the public. The BLM acquired several abandoned structures and partially stabilized them, including the ghost town of Miner's Delight,

and developed campgrounds and access roads in the area. There was preservation work in the 1980s, especially at Miner's Delight.

Adverse impacts to important historical resources in the South Pass Historic Mining Area ACEC would typically result in a loss of integrity of the resource, or in some cases, in a loss of information. Adverse impacts to significant historical resources in the mining area may occur in several ways, including actions that physically damage or destroy all or parts of a historic site; actions that alter a significant element of a site or landscape; actions that introduce visual, atmospheric (air), or audible (noise) elements that can diminish the historical integrity of a site or the area; or a lack of action, which would cause a historical resource to deteriorate. Adverse impacts may also result from increases in access to areas that contain historical resources and structures, resulting in increases in use, erosion, looting, and vandalism.

The South Pass Historic Mining Area ACEC is significant for its associations with important events in American history, and for its good historical settings, which help visitors imagine what it was like in the area during the mining booms of the mid to late 1800s. Adverse impacts to these values may occur as a result of the actions described above, and impacts can be short- and long-term because some impacts can be reversed while others cannot. In some cases, the area's historical resources are also significant for their scientific data potential. Actions that cause physical damage or destruction, and sometimes neglect, can adversely impact these resources. Adverse impacts to these types of resources would be long-term because once they are damaged or disturbed, impacts cannot be reversed.

Special management measures that might enhance the quality of resources would result in beneficial impacts to the South Pass Historic Mining Area ACEC. Data recovery, stabilization and repair of historic structures at Miner's Delight, and fencing at gravesites near Miner's Delight and South Pass City are examples of beneficial impacts. Most of these beneficial impacts would be long-term, but eventually, adverse natural and/or human influences would require more measures to keep these resources from degrading.

Alternative D manages some of the area designated as an ACEC under Alternative A and Alternative B, as an ACEC to support heritage and recreation management of the Congressionally Designated Trails and their settings. Because the ACEC designation would be to support the trails, the analysis of the impacts from ACEC management under Alternative D, with comparisons to impacts under alternatives A, B, and C, is provided in the *Congressionally Designated Trails* sections.

4.7.5.3.9.1. Summary of Impacts

Impacts to the South Pass Historic Mining Area ACEC would vary by alternative in the following ways: Alternative C would have the most adverse impact because it would authorize more surface-disturbing mineral and realty actions that would damage the historic mining resources and their setting including from exploratory actions that would disturb less than 5 acres; Alternative A would allow the next most disturbance followed by Alternative D; Alternative B would result in the fewest adverse impacts because it has far more limits on surface disturbance.

Alternative A would retain the existing ACEC and provide moderate to good protection for many of the historic values in the area. Alternative B would extend those protections by enlarging the ACEC to include historic sites along and between Rock Creek and Willow Creek. In addition, Alternative B would also provide for more intensive management of the historic sites in the

existing ACEC and the expanded area. Alternative C does not designate any portion of the South Pass area as an ACEC and would not provide much protection for the historic resources in the historic mining area. Alternative D would incorporate the old South Pass Historic Mining Area ACEC and additional nearby lands into a new ACEC (the South Pass Historical Landscape ACEC) for lands along the Congressionally Designated Trails that have the potential to experience adverse impacts from mining. Alternative D would extend ACEC management to a larger area than the other alternatives; however, it has fewer prescriptions than Alternative B, except in the part of the ACEC within the Hudson-Atlantic City area that is withdrawn from locatable mineral entry.

4.7.5.3.9.2. Impacts Common to All Alternatives

Standard procedures have been developed to help address adverse impacts to significant historical resources. Standard BLM cultural resource management and protection procedures, guided by cultural resource laws such as the NHPA and the Archeological Resources Protection Act (ARPA) include archival research, on-the-ground inventories, site recordation and evaluation, avoidance, data recovery excavations, condition assessments, stabilization, and historical research. These standard procedures have protected historical resources in the South Pass Historic Mining Area from damage. If protection is not feasible, the standard procedures provide for the recordation of architectural data and/or the collection of archeological data that documents information on the peoples who once lived in this area. All of the alternatives would be guided by these standard procedures.

Standard procedures sometimes do not protect all types of cultural resources. Development projects that directly impact cultural resources can impact resources where the setting is important. For example, projects that intrude on historic settings can adversely impact historic sites with historical settings (such as South Pass City and Miner's Delight). A modern powerline or open-pit gold mine built near South Pass City would affect the historical setting of the town, and would adversely impact its historical integrity.

Another type of adverse impact on historic resources common to all alternatives would be from increased public use of lands, which can occur for several reasons. One is improved access to formerly remote areas. This is common in areas where development allows for the creation of new roads. Another reason is the increased popularity and availability of OHVs, which also allow access to formerly remote areas. A third reason is increased public interest in specific historic sites or areas. As public use of lands increases, so can the adverse impacts to historic resources. As more use occurs, more sites in the South Pass Historic Mining Area are visited or driven over. Some of these resources have been looted or vandalized. This impact would occur under any of the alternatives because access, OHV use, and public use and interest in the South Pass Historic Mining Area are all expected to increase.

A beneficial impact common to all alternatives would be the indirect protection provided by management for greater sage-grouse. While the acres vary by alternative, management that limits surface disturbance in the Wyoming Governor's Sage-grouse Core Area would result in secondary beneficial impacts to ACEC values. Approximately 40 percent of the South Pass Historic Mining Area is in the Core Area (see the *Special Status Species – Wildlife* section and the sections below). Fire suppression activities in this ACEC, including the use of heavy equipment, does not vary by alternative. Therefore, the adverse and beneficial impacts of that management would not vary and are not further analyzed here. There are several pre-FLPMA withdrawals in the South Pass Historic Mining Area that protect historical resources (such as Miner's Delight and around South

Pass City) and offer protection from the impacts of mining. These withdrawals do not vary by alternative and are not further analyzed here

AML protections in the South Pass area that provide for public health and safety are the same under all the alternatives.

4.7.5.3.9.3. Alternative A

4.7.5.3.9.3.1. Program Management

The 1987 RMP and EIS ROD designated 12,576 acres as the South Pass Historic Mining Area ACEC. ACEC management includes restrictions on activities such as oil and gas development and land sales and exchanges; requires Plans of Operation for mining exploration activities; conforms with South Pass City zoning ordinances; includes further stabilization and research at Miner's Delight; and retains the rustic character of the historic mining area. This management has largely succeeded in maintaining the historic character and setting of the South Pass Historic Mining Area ACEC, which has resulted in beneficial impacts to ACEC values that would continue into the future.

4.7.5.3.9.3.2. Resources

Air quality management under Alternative A would result in neutral or slightly adverse impacts to the South Pass Historic Mining Area ACEC. Efforts to maintain air quality in the area would help maintain its important qualities. However, degradation in air quality would result in adverse impacts to ACEC values. Alternative A management of soil and water resources would result in beneficial impacts to ACEC values to the extent that management limits surface disturbances. Other limitations on surface disturbances for the benefit of wildlife and special status species would protect the historic setting. Alternative A would limit surface disturbance within ¼ mile of a greater sage-grouse lek and does not limit the number of disturbances or cap acres of disturbance for the benefit of greater sage-grouse. Therefore, Alternative A would result in only a limited benefit to the South Pass Historic Mining Area ACEC.

VRM Class ratings that protect natural viewsheds by limiting surface disturbance would also protect South Pass Historic Mining Area ACEC values. Alternative A would manage most of the ACEC as VRM Class II, which would substantially limit surface-disturbing activities that would adversely impact the South Pass Historic Mining Area ACEC. Alternative A manages the area outside the Class II area as Classes III and IV, which would allow many more intrusions, and therefore would result in more adverse impacts to the ACEC, especially from modern disturbances and intrusions that would be visible from the south. Therefore, Alternative A VRM management to protect natural viewsheds would result in beneficial and adverse impacts.

Alternative A restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) would provide additional protections for South Pass Historic Mining Area resources.

4.7.5.3.9.3.3. Resource Uses

Alternative A provides the South Pass Historic Mining Area ACEC limited protections from the adverse impacts of locatable mineral exploration. The protections afforded by requiring a Plan of Operations are more important in the South Pass Historic Mining Area ACEC than in other

ACECs because mining operations in the area have historically been smaller than 5 acres. The Plan of Operations, thus, provides meaningful protections to the historic features and their setting. Alternative A leasable fluid minerals management would prevent surface disturbance with NSO stipulations, which would have a beneficial impact to the ACEC. Alternative A would open the South Pass Historic Mining Area ACEC for leasable solid minerals exploration. However, the historic mining area is not located in proximity to any known leasable solid minerals exposures, so adverse impacts to the ACEC from this type of activity would be unlikely. Mineral material disposals are not precluded, but it is unlikely that such sales would be authorized if adverse impacts to historic resources would result.

The South Pass Historic Mining Area would be avoided for highly visible ROW projects, such as wind-energy developments, gas plants, power plants, and large transmission lines which would benefit the ACEC. The area has high potential for commercial wind-energy development and this management would have important beneficial impacts to the historic resources and their setting.

Livestock grazing management would not preclude adverse impacts to the historic setting through development of range improvement projects.

4.7.5.3.9.3.4. Special Designations

Under Alternative A, the South Pass Historic Mining Area is an ACEC. Other special designation management in the area is an ACEC of ¼-mile buffer around the Congressionally Designated Trails and the Red Canyon ACEC. While these ACECs are not contiguous with the South Pass Historic Mining Area ACEC, their management would limit ROWs which would beneficially impact the South Pass Historic Mining Area ACEC by limiting demand for ROWs through the South Pass area.

4.7.5.3.9.4. Alternative B

4.7.5.3.9.4.1. Program Management

Compared to Alternative A, Alternative B increases proactive management. Alternative B would expand the existing ACEC to cover additional significant historic resources, and would give more attention to the protection and recreational uses of the historic resources in the South Pass Historic Mining Area ACEC.

4.7.5.3.9.4.2. Resources

Alternative B specifies that air quality management would reduce emissions and improve air quality. This action would beneficially impact the ACEC more than management under Alternative A.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) would be greater under Alternative B, would provide additional protection for South Pass Historic Mining Area resources, and would reduce adverse impacts compared to Alternative A. Alternative B management of greater sage-grouse would restrict surface disturbance in more areas of the South Pass Historic Mining Area ACEC than Alternative A. Alternative B manages the entire existing ACEC and the proposed expanded ACEC as VRM Class II, which would substantially reduce adverse impacts from visual intrusions into the historic setting compared to Alternative A.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) are greatest under Alternative B, provide additional protection for South Pass Historic Mining Area resources, and would reduce adverse impacts compared to Alternative A.

4.7.5.3.9.4.3. Resource Uses

Alternative B proposes to withdraw all of the existing and expanded ACEC from locatable minerals entry which would result in more beneficial impacts than Alternative A. Beneficial impacts from this management could be substantial because of locatable mineral potential (this is an ACEC because of historic mining). Modern, mechanized mining would adversely impact ACEC values because it would adversely impact the historic setting. Withdrawal would not preclude casual use by nonmechanized recreational gold panners or mining by claimants with valid existing rights. Compared to Alternative A, Alternative B closes the existing and expanded ACEC to leasable fluid/solid minerals and mineral materials exploration and development, or imposes major constraints on those activities. This would protect the South Pass Historic Mining Area from potential disturbances over more area. Alternative B restricts industrial wind-energy development, power and gas plants, and large ROWs to a greater extent and over a larger area than Alternative A. Alternative B would manage the ACEC as an exclusion area for ROWs and would protect the South Pass Historic Mining Area from the impacts of wind-energy development, large mines, and ROWs. Alternative B would result in considerably more beneficial impacts to the area than Alternative A, particularly regarding large ROWs, because these projects could be allowed under Alternative A if South Pass could not be avoided.

Alternative B would not authorize range improvement projects that would adversely impact the historic setting. Therefore, livestock grazing management would be more beneficial to South Pass Historic Mining Area ACEC values.

4.7.5.3.9.4.4. Special Designations

Alternative B would expand the South Pass Historic Mining Area ACEC to include more historic sites near Willow and Rock creeks. This would enhance protection of the general mining area by reducing the potential for adverse impacts to its intact historical settings. This alternative provides better protection for the historic mining area than Alternative A. In addition, other special designations under Alternative B, such as the Government Draw/Upper Sweetwater Sage-Grouse ACEC would limit or close surrounding areas to surface disturbance and would manage more areas as VRM Class II. This would beneficially impact the South Pass Historic Mining Area values of concern.

4.7.5.3.9.5. Alternative C

4.7.5.3.9.5.1. Program Management

Alternative C includes less proactive management than Alternative A. Alternative C would apply the minimum actions necessary to comply with regulations, which would increase adverse impacts to the historic mining area. Alternative C does not designate any portion of the South Pass area as an ACEC and would manage the area with standard stipulations.

4.7.5.3.9.5.2. Resources

Alternative C air quality management would be the same as management under Alternative A, and would result in the same minimally adverse impacts to the South Pass Historic Mining Area. Because Alternative C does not designate the area as an ACEC and places a greater emphasis on resource use, it would place fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations). This management would result in more adverse impacts to the mining area's historical resources than alternatives A and B.

Alternative C would manage the South Pass Historic Mining Area as VRM Class III, and the surrounding areas as Class IV. This management would allow far more surface disturbance than is allowed under any other alternative, with commensurate adverse impacts to the historical setting.

4.7.5.3.9.5.3. Resource Uses

Alternative C would provide minimal protection from the impacts of locatable mineral entry. Alternative C only prevents undue or unnecessary degradation. It does not require a Plan of Operations unless the mining project would disturb more than 5 acres; therefore, new and relatively uncontrolled mining operations could adversely impact historic sites in the mining area. There is high potential for locatable minerals in the area, including iron and gold. The absence of a requirement for Plans of Operation would result in particularly adverse impacts to the historic setting; as many of these prospects would be smaller than 5 acres, but would have locatable minerals potentials high enough for claimants to want to use mechanized equipment that could substantially disturb the surface. Under Alternative C, adverse impacts to the South Pass Historic Mining Area from leasable fluid minerals, leasable solid minerals, mineral materials disposals, wind-energy development, gas and power plants, and large ROWs would be similar to impacts from locatable minerals entry although the area is low potential for leasable minerals.

Wind-energy development, large ROWs, and mineral materials disposals would be the most likely to result in adverse impacts. There is outstanding wind energy potential nearby, with a related demand for ROWs. In addition, there could be increased demand because the areas immediately to the north (Red Canyon and the Lander Slope) are also open to ROWs. Therefore, Alternative C would be much more likely to result in adverse impacts than Alternative A, and substantially more likely than Alternative B.

4.7.5.3.9.5.4. Special Designations

Under Alternative C, there are no special designations other than Congressionally Designated Trails which are protected by a ¼-mile buffer. To support the emphasis on resource use under Alternative C, development outside the ¼-mile buffer around trails would be authorized, including industrial wind-energy development that would be within the viewshed of historic sites. In addition, demand for ROWs to support activities in the Red Canyon and Lander Slope areas would be higher because these areas are managed with standard stipulations under Alternative C, rather than avoided as under Alternative A, or closed as under Alternative B. Alternative B's other special designations would result in far more beneficial impacts than Alternative C.

4.7.5.3.9.6. Alternative D

4.7.5.3.9.6.1. Program Management

Alternative D would include more proactive management of ACEC values than alternatives A and C but less than Alternative B. Alternative D would designate all of the original South Pass Historic Mining Area ACEC, as well as additional lands, as a new ACEC: the South Pass Historical Landscape ACEC. Alternative D would manage 124,229 acres in this historic landscape ACEC for the protection and recreational uses of the historic resources within the broad South Pass area. Management prescriptions for minerals for that part of the ACEC located in the Lander Front-Hudson-Atlantic City area have strong protections for ACEC values, including locatable mineral withdrawals and closed to major ROWs.

4.7.5.3.9.6.2. Resources

Alternative D would manage air quality similar to alternatives A and C and would therefore result in modestly fewer beneficial impacts than Alternative B. Alternative D water, soil, and vegetation management would be the same as Alternative A and would result in the same moderate beneficial impacts. Alternative D wildlife management is more protective of resources than Alternative A, but less protective than Alternative B, therefore, Alternative D beneficial impacts to historic resources would fall somewhere between the beneficial impacts of alternatives A and B, and would be substantially greater than under Alternative C. The greatest beneficial impacts to ACEC values would result from management for the protection of greater sage-grouse. Although Alternative D does not designate a large sage-grouse ACEC, it would prohibit or severely limit surface disturbance in the Lander Front-Hudson-Atlantic City area for many resource values, including general and crucial winter habitat, special status species, cultural values and viewsheds. ACEC values would benefit from these protections, but not as much as under Alternative B.

Extending the boundaries of the South Pass Historical Landscape ACEC past South Pass Historic Mining Area ACEC boundaries would increase the area managed as VRM Class II, which would preclude more surface disturbance and allow fewer developments that contrast with the historic setting. This would result in more beneficial impacts to historic resources than Alternative A, and almost as many beneficial impacts as Alternative B. Alternative C would result in a greater amount of adverse impacts than Alternative D.

4.7.5.3.9.6.3. Resource Uses

Alternative D would include the same prescriptions for locatable minerals entry as Alternative B with the same limits on adverse impacts as that alternative. Alternative D management of leasable minerals is the same as Alternative A, except NSO management is extended to a larger area. This management would provide substantially less protection than Alternative B, which closes the area to oil and gas leasing, and substantially more protection than Alternative C, which opens the entire area to exploration under standard mineral regulations. Alternative D management of the Lander Front-Hudson-Atlantic City area would have beneficial impacts to the ACEC very similar to those under Alternative B. There would be fewer adverse impacts to ACEC values because of the closure of the area to ROWs, similar to Alternative B.

4.7.5.3.9.6.4. Special Designations

Alternative D would incorporate the existing South Pass Historic Mining Area ACEC into the newly proposed South Pass Historical Landscape ACEC, which is part of the NTMC. This would enhance protection of the general mining area by reducing the potential for adverse impacts to its intact historical settings. This alternative would provide better protection for the historic mining area than alternatives A and C, but less than Alternative B.

Other special designations under Alternative D would beneficially impact historic and recreational resources in the ACEC. Protective management in the NTMC would limit visual intrusions into the historic setting and preclude large-scale ROWs, such as industrial wind-energy developments and transmission lines, outside the ACEC. In addition, the Alternative D designation of the Lander Slope and Red Canyon as ACECs, which are exclusion areas for major ROWs, would help reduce the demand for ROWs through the South Pass area.

4.7.5.3.10. Detailed Analysis of Alternatives – National Historic Trails

See the *Congressionally Designated Trails* sections for a discussion of the impacts related to the NHTs ACEC. The determination not to designate the entire length of the NHTs as an ACEC, as was done in 1987, but to instead designate only the western portion of the Congressionally Designated Trails that are within the South Pass Historical Landscape ACEC, was predicated on the assumption that the many resource protections under in Alternative D, including the NTMC, the Beaver Rim MLP, avoidance areas for ROWs, designated corridors, and other protections, would be in place. See the *Impacts Common to All Alternatives* section regarding implementing the entire alternative. Of particular importance to not designating the NTMC as an ACEC is the withdrawal of the ruts and swales of the NHTs, the generally protective management of the Lander Front-Hudson-Atlantic City area, and the Beaver Rim MLP, from locatable mineral entry.

4.7.5.3.11. Detailed Analysis of Alternatives – Continental Divide National Scenic Trail

See the *Congressionally Designated Trails* sections for a discussion of the impacts related to the CDNST ACEC. Limiting the designation of an ACEC associated with the Congressionally Designated Trails, including the CDNST, is predicated on the total management of Congressionally Designated Trails, including management of the NTMC and the withdrawal of the ruts and swales of the NHTs, the generally protective management of the Lander Front-Hudson-Atlantic City area, and the Beaver Rim MLP.

4.7.5.3.12. Detailed Analysis of Alternatives – Cedar Ridge

Located in northeastern Fremont County and northwestern Natrona County, the regionally significant prehistoric site of Cedar Ridge is a spiritual/sacred/traditional site very important to the cultural continuity of several Native American tribes. This extensive site was first studied and recorded in the 1990s, and was recognized by BLM and the Wyoming SHPO as a TCP soon after. Most of the property is in the Casper Field Office planning area, but a small part of it extends into the Lander Field Office planning area. The Casper 2007 RMP designated Cedar Ridge as a Management Area, with special provisions to protect the TCP and its surroundings.

The Cedar Ridge site is significant for two reasons: it contains important spiritual/religious associations and has scientific data potential. Impacts to the site may result from actions that (1) physically damage the site; (2) alter a significant element or elements of the site; (3) introduce visual, atmospheric (air), or audible (noise) elements that diminish the integrity of the site and its surroundings; and (4) increase access to more parts of the site, resulting in increases in use, erosion, looting, and vandalism. Impacts may also result from a lack of management actions, which would allow the site to deteriorate. Adverse impacts can result in a loss of integrity and/or information of the resource, and are considered long-term because, generally, they cannot be reversed.

Beneficial impacts may result from special management measures that enhance the quality of the site. Closure of trails and roads that run through the site's special features, and stabilization of features that have been disrupted are ways to introduce beneficial impacts by improving site setting and features. Most of these beneficial impacts would be long-term, but eventually, adverse natural and/or human influences would require more measures to keep the site from deteriorating.

4.7.5.3.12.1. Summary of Impacts

Impacts to Cedar Ridge would vary by alternative in the following ways: alternatives A and C are similar in their protections, however, Alternative A would offer more protection than Alternative C and would be likely to result in somewhat fewer adverse impacts to Cedar Ridge. Both alternatives focus on protecting the immediate Cedar Ridge TCP, but do not address impacts farther away from the TCP, referred to as the "periphery," which is not only the setting for the TCP but also contains important cultural resources. Both would have more adverse impacts than Alternative B or D. Alternative B would provide greater protection for the TCP and protect the natural and historic setting of the area to a moderate to high degree and thus, would result in the most beneficial impacts to values of concern. Alternative D would provide fewer protections for the TCP and its setting than Alternative B, but more protections than Alternative A, and substantially more than Alternative C. While Alternative B would manage 6,784 acres around the TCP as a periphery buffer; Alternative D would specifically manage 3,284 acres around the TCP as the periphery. Accordingly, Alternative D would result in more beneficial impacts to the TCP's setting (and the cultural resources located in the periphery) than Alternative A or C, but less than Alternative B.

4.7.5.3.12.2. Impacts Common to All Alternatives

The lands to the west and southwest of Cedar Ridge have long been developed to extract and transport oil and gas resources, resulting in numerous wells, roads, pipelines, powerlines, and gas plants. To the south, major utility corridors have also been established and contain large pipelines and transmission lines. These developments are visible from the top of Cedar Ridge, and have likely resulted in adverse impacts to the natural viewshed that originally made Cedar Ridge a highly important spiritual site for Native Americans. Adverse impacts to the natural viewshed would continue as long as oil and gas production continues in these areas.

Fire suppression management, including the use of heavy equipment, would be similar under all alternatives, so impacts to the TCP would be the same. All alternatives would protect Cedar Ridge ACEC values.

Cedar Ridge is not in the greater sage-grouse Core Area. Therefore, there would be no impacts to Cedar Ridge from the management of greater sage-grouse habitat under the alternatives.

Mineral management would vary by alternative, although all alternatives would include minimal protections required by the NHPA. However, Cedar Ridge is in an area with low potential for minerals and the potential for adverse impacts would be minimal. Therefore, mineral management is not further analyzed.

Wind-energy development and related transmission lines would result in adverse impacts to the Cedar Ridge setting. However, Cedar Ridge is in a low potential area where wind-energy development is unlikely. Accordingly, although wind-energy management varies by alternative, there would likely be no difference in the impacts by alternative.

The alternatives do not vary in their recreation or comprehensive travel management. All alternatives would allow livestock grazing, so impacts from grazing are not analyzed. The alternatives would vary in the way range improvement projects are managed and the resulting impacts are described below.

The Cedar Ridge site and its surroundings are not within any existing ACECs, Congressionally Designated Trails, or WSAs. Cedar Ridge is located far enough away from ACECs under any alternative to be beneficially impacted. Accordingly, special designation management does not vary by alternative except as to whether or not Cedar Ridge and its periphery are designated as an ACEC.

4.7.5.3.12.3. Alternative A

4.7.5.3.12.3.1. Program Management

Awareness of the importance of Cedar Ridge to Native Americans is recent. Therefore, there has been no proactive management of Cedar Ridge in the past. Future program plans proposed under Alternative A would be to maintain the existing condition of the site and its immediate surroundings, without ACEC management of Cedar Ridge or any special management for the area in the periphery around it.

4.7.5.3.12.3.2. Resources

Air quality management under Alternative A would result in a neutral or slightly adverse impact to Cedar Ridge by allowing activities that could degrade the viewshed and historical setting. Efforts to maintain air quality around Cedar Ridge would help maintain its important natural qualities, but if air quality degradation occurred, it would adversely impact the natural character of the site. Soil and water management under Alternative A, with standard stipulations would result in little beneficial impact to Cedar Ridge. This management in the past has not prevented degradation of the visual setting of the TCP. This downward trend would be likely to continue under Alternative A, although it could moderate with the fairly recent understanding of the importance of the TCP.

Alternative A management of wildlife and special status species would result in very little beneficial impact to Cedar Ridge. The ¼-mile raptor buffer would likely not prevent future adverse impacts to Cedar Ridge, because it has not prevented development in the past that adversely impacted Cedar Ridge's setting. There is very little area around Cedar Ridge that is precluded from development for the protection of sage-grouse habitat. VRM that protects natural viewsheds can protect cultural resource sites where the setting is considered important. However, under Alternative A, the Cedar Ridge site is management as Class II, the surrounding area is VRM Class IV and therefore, subject to adverse impacts through the addition of modern intrusions.

4.7.5.3.12.3.3. Resource Uses

Highly visible ROWs and projects, such as mines, gas plants, power plants, and large transmission lines, would (and already have) resulted in adverse impacts to Cedar Ridge in several different ways. New large and visible projects could adversely impact the setting of the Cedar Ridge area, and Alternative A does not include protections from the impacts of these types of projects.

Range improvement projects could adversely impact Cedar Ridge itself or the periphery, if placement were not controlled to protect TCP values and setting.

4.7.5.3.12.3.4. Special Designations

See Impacts Common to All Alternatives.

4.7.5.3.12.4. Alternative B

4.7.5.3.12.4.1. Program Management

Alternative B would provide for a very high level of program management compared to Alternative A. Alternative B would designate the Cedar Ridge site and the area within a 3-mile radius as an ACEC with protective prescriptions for 7,039 acres.

4.7.5.3.12.4.2. Resources

Alternative B would specify that air quality management reduce emissions and improve air quality. This action would beneficially impact Cedar Ridge compared to the less beneficial management under Alternative A, although the difference is likely to be minimal. Alternative B water and soils management would be more beneficial to Cedar Ridge because the alternative closes a larger area to surface disturbance to protect these values. The more area closed to surface disturbance around Cedar Ridge, the more beneficial the impacts to the TCP would be. Alternative B wildlife management in the Cedar Ridge area is more protective of values of concern because a $\frac{3}{4}$ -mile buffer would be closed to surface disturbance and would preclude adverse impacts to the historical setting.

Alternative B would result in similar adverse impacts as Alternative A because development is not precluded to protect habitat.

Alternative B would result in greater beneficial impacts to the TCP values than Alternative A, which manages the TCP and periphery area as VRM Class IV. Alternative B VRM Class II objectives would prevent most adverse impacts to the TCP setting, including future disturbances that could further disrupt its natural setting.

4.7.5.3.12.4.3. Resource Uses

Alternative B would protect more land around Cedar Ridge from the impacts of large ROWs (e.g., power plants, and gas plants) than Alternative A. This would protect more cultural resources from potential disturbances than Alternative A. Given the low mineral potential in the area, excluding large ROWs would result in substantially more beneficial impacts than Alternative A, because large ROWs would be the most likely intrusion into the setting that would be likely to occur.

4.7.5.3.12.4.4. Special Designations

See Impacts Common to All Alternatives.

4.7.5.3.12.5. Alternative C

4.7.5.3.12.5.1. Program Management

Alternative C would maintain proactive management in a similar level as Alternative A. Both alternatives provide for a very low level of management for Cedar Ridge that would likely continue the downward trend in its values of concern that have been observed over the last 30 years.

4.7.5.3.12.5.2. Resources

Alternative C, like Alternative A, would allow adverse impacts to air quality (although not below state standards) which would have a minor adverse impact to the historical setting. Alternative C would include the same prescriptions for air quality and fire and fuels management as Alternative A, and would result in the same adverse impacts to Cedar Ridge. Alternative C wildlife management would be similar to Alternative A, with similar, moderately adverse impacts to values of concern.

Alternative C VRM would be the same as Alternative A (VRM Class IV, in which major modifications of the existing landscape are allowed). Similar to Alternative A, Alternative C would result in adverse impacts to the setting, and those impacts would be greater compared to impacts under Alternative B.

4.7.5.3.12.5.3. Resource Uses

Highly visible projects, such as mines, gas plants, power plants, and large transmission lines, would adversely impact Cedar Ridge. Similar to Alternative A, Alternative C would not include protections from these types of projects. The potential for adverse impacts from this management would be much greater than under Alternative B. Range improvement projects could, like under Alternative A, adversely impact Cedar Ridge and its periphery, if located in a way that would adversely impact the setting and TCPs.

4.7.5.3.12.5.4. Special Designations

See Impacts Common to All Alternatives.

4.7.5.3.12.6. Alternative D

4.7.5.3.12.6.1. Program Management

Alternative D does not designate any part of Cedar Ridge or its surroundings as an ACEC. This alternative would manage the 255 acres of the TCP with prescriptions that are basically the same as those adopted by the Casper Field Office in 2007, for the portion of Cedar Ridge in the Casper Field Office planning area. Alternative D would include special prescriptions for 3,284 acres in

the periphery around Cedar Ridge, slightly less than half of the periphery area specially managed under Alternative B. Unlike Alternative B, Alternative D would specially manage the periphery with less restrictive prescriptions than in the TCP. Required Design Features would limit adverse impacts associated with development, and VRM would provide additional protections.

4.7.5.3.12.6.2. Resources

Alternative D manages air quality the same as alternatives A and C, which would result in fewer beneficial impacts to Cedar Ridge than Alternative B. Alternative D water and soil management would be more similar to alternatives A and C than to Alternative B, which closes more area to surface disturbance to protect TCP values. The more area that would be closed to surface disturbance around Cedar Ridge, the more beneficial the impacts to the TCP.

Alternative D VRM would result in greater beneficial impacts to TCP values than Alternative A or Alternative C although somewhat less beneficial than Alternative B, because the Alternative D periphery would be smaller and managed as VRM Class III. VRM Class III would allow more development that would adversely impact the setting than Alternative B. Whether this difference would be substantial would depend on the proposed activities on a site-specific basis. Class II VRM objectives would prevent most of the adverse impacts to the TCP setting, including future disturbances that could further disrupt the natural setting of Cedar Ridge.

4.7.5.3.12.6.3. Resource Uses

Alternative D manages Cedar Ridge and lands around it the same as alternatives A and C for locatable mineral entry, which would be much less beneficial than the withdrawal under Alternative B. The difference in impacts among the alternatives might mean little because the potential for locatable minerals around Cedar Ridge is low and the likelihood of impacts from locatable mineral entry would be remote. Alternative D would be more similar to Alternative B in its management of leasable minerals and mineral materials disposals, than to Alternative A or C. Within the 255 acres of the TCP, Alternative D management would maintain an NSO restriction, not closed as under Alternative B. However, the NSO restriction would still beneficially impact TCP values. In the smaller periphery, Alternative D protects the TCP setting with CSU management and adverse impacts would be avoided or mitigated. This smaller area and lower level of protection would result in more adverse impacts than the Alternative B extension of an NSO restriction to a larger periphery. The impact of this difference would depend on the extent of demand for mineral development as mineral potential in the Cedar Ridge area is considered low. Alternative D would result in substantially more beneficial impacts than alternatives A and C.

Similar to Alternative B, Alternative D would protect TCP values by managing the TCP as an exclusion area for major ROW projects, including wind-energy development. Alternative D would manage the periphery as an avoidance area for ROWs, rather than an exclusion area similar to Alternative B however, the VRM Class III objectives for the periphery would be likely to limit adverse impacts from large visual intrusions such as wind turbines. Alternatives B and D would result in greater beneficial impacts than alternatives A and C, which do not preclude these types of developments and under which VRM management (Class IV) would allow them.

4.7.5.3.12.6.4. Special Designations

See Impacts Common to All Alternatives.

4.7.5.3.13. Detailed Analysis of Alternatives – Castle Gardens

Located in eastern Fremont County, the regionally significant prehistoric rock art site of Castle Gardens is a classic example of Plains-style incised shield and representational rock art of the Late Prehistoric period. This extensive petroglyph/pictograph site was first studied and recorded in the 1930s, and was written about in regional newspapers. By the 1950s, this site had become well known, but was also suffering from major vandalism and theft. The BLM and the NPS developed and implemented a site protection plan in the 1970s that included fencing around the rock art panels, a parking lot, toilets, picnic benches, a small amount of interpretative information, and fencing around the general site area.

The Castle Gardens rock art site is significant for several reasons, including its scientific data potential, its unique artistic and representational characteristics, and its important spiritual and/or religious associations. Impacts on the site may include actions that (1) physically damage the site; (2) alter a significant element or elements of the site; (3) introduce visual, atmospheric (air), or audible (noise) elements, which diminish the integrity of the site and its surroundings; and (4) increase access to more parts of the site, resulting in increases in use, erosion, looting, and vandalism. Impacts would also result from a lack of management actions, which may allow the site to deteriorate. These actions result in impacts including the loss of information and/or integrity of the resource. All of these impacts would be long-term because damage or disturbance, generally, cannot be reversed.

Beneficial impacts would result from special management designed to enhance the quality of the site. Management actions that would enhance the quality of the site include stabilizing and repairing petroglyph panels; removing graffiti; removing or reconfiguring fences, walkways, and parking areas to improve the natural setting of the site area; erosion control; and interpretational and educational improvements. Most beneficial impacts would be long-term, but eventually, adverse natural and/or human influences would require additional measures to keep the site from deteriorating.

Castle Gardens and its surrounding periphery is in the Wyoming Governor Core Area.

4.7.5.3.13.1. Summary of Impacts

Impacts to Castle Gardens would vary by alternative in the following ways: Alternatives A and C are similar in their protections, but Alternative A would provide greater protection than Alternative C. Both alternatives focus on protecting the immediate Castle Gardens site area, but do not address impacts farther away from the 80 acre site. Alternative B would provide greater protections for Castle Gardens and its periphery, and would protect the natural and historic setting of the area to a greater degree by designating 8,469 acres, including BLM-administered lands within a 3-mile radius of the TCP as part of an ACEC. Alternative D does not designate any portion of the area as an ACEC and would include management prescriptions to protect Castle Gardens over a much smaller area (1,656 acres).

Beneficial impacts to Castle Gardens would be greatest under alternatives B and D because Castle Gardens and its periphery would have limits on surface disturbance to protect the greater sage-grouse Core Area. Alternative B energy management would be more restrictive, but may not result in more beneficial impacts to Castle Gardens because the area is low to moderate potential. Minimal difference in impacts is anticipated among the alternatives in regard to energy development. Both alternatives would beneficially impact the area by limiting ROWs and other

visually intrusive surface disturbance. See the *Special Status Species – Wildlife* section for a detailed analysis of protections by alternative for greater sage-grouse limitations on disturbance. These limits would also benefit Castle Gardens and its periphery.

4.7.5.3.13.2. Impacts Common to All Alternatives

Protective measures instituted in the 1970s and formalized in the 1987 RMP and EIS ROD included fencing an area of approximately 80 acres around the Castle Gardens Rock Art Site and Picnic Area, and restricting mineral and realty actions within the fenced area. These actions protected the immediate site area from development-related impacts. Subsequently, this area was more clearly defined using technological advances and is now known to include 80 acres. However, there are additional sites and art locations in the periphery around the 80 acre site. Protections for the periphery would vary by alternative.

Over the last 10 years, more cultural resources personnel have been available to try and improve management around the Castle Gardens area. During the last 5 years, the BLM has obtained funding to have a conservation expert study and recommend measures to stabilize/repair/improve the site; remove the dilapidated toilet; and inventory the area around Castle Gardens (referred to herein as the periphery; the size of the periphery would vary by alternative) to determine if there is more rock art, or other evidence of prehistoric occupation. Future plans are to consult with Native American groups and eventually write a management plan to improve protection and use of the site as well as the surrounding areas. This basic management does not vary by alternative.

The remaining threat to the rock art site itself, are mostly related to visitor use impacts. There are several reasons for these impacts. Hundreds of people visit the Castle Gardens Rock Art Site and Picnic Area every year. The visitors come to view and learn about the rock art, the natural setting, and the unique landscape of the area. Unfortunately, the site is not well developed or managed, and the lack of planning and attention has adversely impacted the site. For example, no walkways were built and unplanned paths have formed over time, causing erosion along the walkways and near the petroglyph panels. OHV users have gone around parking lot barriers and have caused disturbance and erosion in the site. Fences around the panels designed to protect the petroglyphs are difficult to see through and have been breached. Graffiti has been drawn on top of and around the petroglyphs, and on many of the unfenced rock faces in the area. In addition, the petroglyphs have been chipped out of the rock and stolen. Even with mitigative measures such as those recommended under the various alternatives, these types of impacts are expected to continue to some degree.

The alternatives do not vary in the use of heavy equipment for fire suppression and all alternatives assume that the Fire Program has been made aware of the importance of the cultural properties of Castle Gardens and the periphery around it.

The 80 acres of the Castle Gardens TCP was withdrawn from mineral entry in a pre-FLPMA action that does not vary by alternative. This withdrawal is managed under all alternatives as closing the cultural resources site to all mineral activities. Accordingly, impacts from minerals activities associated with the 80-acre site do not vary by alternative and are identified below only as needed to clarify the impacts analysis. Improved mapping techniques since the 1987 EIS have identified that this area is really 80 acres and the alternatives all use 80 acres as the Castle Gardens site.

Castle Gardens and its periphery have low potential for locatable minerals and phosphate, and moderate potential for oil and gas. The impacts to Castle Gardens (beneficial and adverse) would not be likely to vary in more than a low degree, although management would vary by alternative.

Although Castle Gardens itself has high potential for commercial wind-energy development, BLM obligations under the NHPA and Native American religious protections would preclude development in the 80 acres and probably in the periphery, under all alternatives. Accordingly, there would be no difference in impacts for wind energy management among the alternatives in Castle Gardens and its periphery. Outside this area, the alternatives would vary in the impacts to the setting of Castle Gardens. These differences are discussed under each alternative.

4.7.5.3.13.3. Alternative A

4.7.5.3.13.3.1. Program Management

The 1987 RMP and EIS ROD designated Castle Gardens as a unique management area and restricted most non-recreational uses within an 80-acre area around the main site area. Current management is largely the same, but since the late 1990s, the BLM has become more aware of the importance of Castle Gardens to regional Native American tribes as a spiritual/sacred place. Management is to minimally protect the identified cultural sites in Castle Gardens. The area outside of Castle Gardens but within its viewshed is managed with standard stipulations. Alternative A greater sage-grouse management does not incorporate the Core Area strategy and would have minimal limits on surface disturbance. Therefore, fewer areas in the Castle Gardens viewshed would be protected.

4.7.5.3.13.3.2. Resources

Air quality management under Alternative A would result in neutral or minimal adverse impacts to Castle Gardens. Efforts to maintain air quality around the site would help maintain its important qualities. However, if the air quality degrades, it would adversely impact the site. Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, and biological resources) would provide additional minimal protection for Castle Gardens.

VRM Classes that protect natural viewsheds may protect cultural resource sites where the setting is considered important. However, under Alternative A, the Castle Gardens site and its surroundings area is located in Class IV areas, and would be subject to adverse impacts from the introduction of modern intrusions into the historical/natural setting.

4.7.5.3.13.3.3. Resource Uses

Although Alternative A does not limit mineral development in the periphery; as indicated in *Impacts Common to All Alternatives*, this would not likely result in adverse impacts to the cultural resource except to a minimal degree.

Highly visible ROW and development projects, such as wind-energy development, mines, gas plants, power plants, and large transmission lines, would adversely impact Castle Gardens in several different ways. Although these activities are prevented in the immediate site area, these large and visible projects would adversely impact the historical/natural setting of the Castle Gardens area. For example, an industrial wind-energy development or gas plant near the Castle

Gardens site would adversely impact the site's value to Native American tribes. Alternative A does not protect the site's setting from these types of projects.

4.7.5.3.13.3.4. Special Designations

The Castle Gardens site and its surroundings are not located within any existing ACECs and are not protected by any management for Congressionally Designated Trails, WSAs, or WSRs.

4.7.5.3.13.4. Alternative B

4.7.5.3.13.4.1. Program Management

Alternative B would designate an 8,469 acre ACEC including Castle Gardens and the BLM-administered lands in a 3-mile radius around it as an ACEC. Alternative B would provide for more proactive management than Alternative A. This alternative would increase the focus on revamping public use of the area to better protect the site, enhance the natural character of this area, and increase public enjoyment of the site.

4.7.5.3.13.4.2. Resources

Alternative B would specify that emissions be reduced to improve air quality. This action would beneficially impact Castle Gardens and would be more beneficial to the site than management under Alternative A. Alternative B would extend raptor protections over a greater area, which would result in more beneficial impacts than under Alternative A. Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources) would be greatest under Alternative B, providing additional protections for Castle Gardens and reducing the potential for adverse impacts to the extent that those protections would limit surface disturbance within Castle Gardens setting. Alternative B greater sage-grouse management limits surface disturbance to a far greater extent than Alternative A with beneficial impacts to Castle Gardens setting.

Alternative B would classify much more land around Castle Gardens as VRM Classes II and III than Alternative A. This would better protect the site from the introduction of development that would be out of character with the area's historical/natural settings.

4.7.5.3.13.4.3. Resource Uses

Alternative B protects more lands around Castle Gardens from the impacts of locatable mineral entry than Alternative A (8,469 acres, including the 80 acres that do not vary by alternative), which would protect more cultural resources from potential disturbances than Alternative A.

Alternative B would also protect the 8,469 acres from adverse impacts of leasable fluid/solid minerals development, mineral materials disposals, and large ROWs (e.g., wind-energy developments, power plants, and gas plants). Management under Alternative B would protect more cultural resources from potential disturbance than Alternative A. This protection is most important for oil and gas exploration and large ROWs, which would have the highest potential to occur in the area.

Alternative B ROW management, in general, would result in more beneficial impacts to the Castle Gardens area than Alternative A. Alternative A manages ROWs with standard stipulations;

Alternative B manages the area as an exclusion area from major and minor ROWs, which would provide more protections for the individual sites and their settings.

4.7.5.3.13.4.4. Special Designations

Alternative B would designate the Castle Gardens site and the area within a 3-mile radius as an ACEC. This would enhance protection of the site and its surroundings by reducing the potential for adverse impacts to its intact historical and natural settings. This would also provide adequate protection for spiritual values important to Native Americans in this special area. There are no other special designations that would benefit Castle Gardens except to the extent that the RHT&EHs ACEC would protect Castle Gardens's viewshed and setting. Any beneficial impacts could be determined only with a project-specific viewshed analysis.

4.7.5.3.13.5. Alternative C

4.7.5.3.13.5.1. Program Management

Alternative C would maintain the proactive management described for Alternative A, with no portion of the area designated an ACEC. Alternative C manages the 80 acres within the pre-FLPMA withdrawal, but would provide little additional management. In general, the impacts associated with management under Alternative C would be similar to those under Alternative A.

4.7.5.3.13.5.2. Resources

Alternative C air quality, and biological management would be similar to Alternative A, and would result in the same moderate adverse impacts to Castle Gardens. However, there would be fewer beneficial impacts than under Alternative B. Alternative C's greater sage-grouse management would be the same as Alternative A.

Alternative C manages the 80-acre site as VRM Class III rather than Class II as under alternatives A and B, which would result in more adverse impacts by allowing more contrast with the existing landscape. Other management prescriptions for the 80 acres would likely limit the adverse impacts of this less-protective VRM. However, Alternative C would manage the periphery as VRM Class IV, resulting in more adverse impacts to the setting than Alternative B, and somewhat greater adverse impacts than Alternative A. Under Alternative C, most of the area around Castle Gardens would be in VRM Class IV areas, which would provide little or no protection to the historical/natural setting of the site.

4.7.5.3.13.5.3. Resource Uses

Alternative C manages ROWs similar to Alternative A, which would result in the same adverse impacts to Castle Gardens (outside the 80 acres). Both alternatives would result in greater adverse impacts to Castle Gardens than Alternative B depending upon the demand for larger-scale ROWs. Alternative B management of all ROW projects, including large-scale projects such as wind-energy developments, would be more protective and would result in more beneficial impacts than Alternative A or C.

4.7.5.3.13.5.4. Special Designations

Similar to Alternative A, the Castle Gardens site and its surroundings would not be located within any existing ACECs and would not be protected by management for Congressionally Designated Trails, WSAs, or WSRs.

4.7.5.3.13.6. Alternative D

4.7.5.3.13.6.1. Program Management

Alternative D would include more proactive management than alternatives A and C, and would provide a similar level of management as Alternative B. However, Alternative D would not designate the area as an ACEC and would provide protective management to a smaller area (a periphery of 1,656 acres). Similar to Alternative B, Alternative D would increase the focus on revamping public use of the area to better protect the site, enhance the natural character of this area, and increase public enjoyment of the site. Required Design Features in the area near Castle Garden would limit the adverse impacts associated with development that could occur given the management of the area as VRM Class IV.

4.7.5.3.13.6.2. Resources

Similar to Alternative B, Alternative D would specify that emissions be reduced to improve air quality. This action would beneficially impact Castle Gardens more than alternatives A and C. Alternative D restrictions on surface-disturbing activities designed to protect other resources (e.g., soil, water, biological resources) would be greater than under alternatives A and C, and similar to, but moderately less, than under Alternative B because less area would be protected. Alternative D greater sage-grouse management would be similar to Alternative B, although less restrictive, which would result in fewer beneficial impacts to Castle Gardens. In light of the limited mineral potential, it is only in the ROW program where this difference could be even moderate.

Alternative D would classify much more land around Castle Gardens as VRM Class II than alternatives A and C, and more than Alternative B. However, Alternative D classifies less land as VRM Class III which would allow far more visually intrusive disturbances than Alternative B. The overall impact of Alternative D would be greater protection for lands closer to the site than the other three alternatives, but less protection than Alternative B for lands farther away. Alternative D would protect most of the sensitive lands from the introduction of development that would be out of character with the area's historical and natural settings.

4.7.5.3.13.6.3. Resource Uses

Alternative D would include the same management of Castle Gardens and lands around it for locatable mineral entry as alternatives A and C. This management would be much less protective than management under Alternative B, which would require Plans of Operation and would better protect the historic and natural setting around the site. However, the potential for locatable minerals around Castle Gardens is low, so the likelihood of impacts from locatable minerals exploration would be remote.

Alternative D would protect 1,656 acres around the periphery of Castle Gardens from adverse impacts as a result of leasable/solid minerals development, mineral materials disposals, and

large ROWs (e.g., wind-energy developments farms, power plants, and gas plants). Alternatives A and C would not protect these acres while Alternative B would protect many more acres (8,391). Alternative D management would protect the majority of the historic and natural setting of the cultural resources from potential disturbance, although not as much as Alternative B. This protection would be most important for oil and gas exploration and large ROWs, which have the highest potential to occur in the area.

ROW management under Alternative D would result in greater beneficial impacts to the Castle Gardens area than Alternative A or C. Alternatives A and C would manage ROWs with standard stipulations, while similar to Alternative B, Alternative D would manage the area as an avoidance area for ROWs rather than as an exclusion area. This would provide more protections for the individual sites and their settings.

4.7.5.3.13.6.4. Special Designations

Similar to Alternative A, the Castle Gardens site and its surroundings would not be located within any existing ACECs and would not be protected by management for Congressionally Designated Trails, WSAs, or WSRs.

4.7.5.3.14. Detailed Analysis of Alternatives – Sweetwater Rocks

4.7.5.3.14.1. Summary of Impacts

All alternatives would continue to manage the 118,165 acres in the four WSAs in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*. Alternative B would designate 152,347 acres as an ACEC (including the 118,165 acres of the WSAs) and the other alternatives would have varying types of management with no ACEC designation. Alternative C would result in the most adverse impacts because it would allow the most surface disturbance in the ACEC which would adversely impact the viewshed. Alternative A would have fewer adverse impacts, because the Sweetwater Rocks area (which is not defined) would be avoided for ROWs which would limit surface disturbance and degradation of the viewshed. Alternative D would be similar to Alternative A as a result of adverse impacts from livestock grazing. However, Alternative D would have fewer adverse impacts because ROWs would be required to be within the designated corridor except in limited circumstances. Alternative B would be the least adverse because the ACEC designation would have prescriptions designed to prevent almost all surface disturbance in the ACEC. Because of low mineral potential, this difference may be only moderate in impact to values of concern.

There is no difference among the alternatives with regard to WSA management, with the exception of travel management where Alternative B would have greater beneficial impacts. Alternative B would have greater beneficial impacts due to protections for greater sage-grouse, the extensive buffer around the NHTs that would protect the viewshed, and the mineral withdrawal that would limit adverse impacts from mineral material disposals. Alternative D would have a similar greater sage-grouse buffer as Alternative B, but would have fewer limits on surface disturbance to protect the NHTs. However, Alternative D's VRM may limit the difference between the alternatives. There would be very little difference in beneficial impacts to values of concern between alternatives B and D.

4.7.5.3.14.2. Impacts Common to All Alternatives

The Sweetwater Rocks consist of the granite outcroppings visible to the north along Highway 287. The Sweetwater Rocks include four WSAs identified in the 1987 RMP and EIS ROD, which are separated by narrow bands of non-WSA lands. The granite is unusual geologically because it tops an otherwise buried ancient mountain range. See the *ACEC Report* for additional information. The area is an international and national tourist destination, where recreationists, particularly rock climbers, use the area extensively. The values of concern are the view of the Sweetwater Rocks from the south, and the viewshed looking out of the WSAs.

Under all alternatives, limitations on surface disturbance would beneficially impact ACEC values, including viewshed and habitat. Conversely, surface disturbance would adversely impact ACEC values.

Fuels and fire management objectives are the same under all alternatives, although the alternatives would vary in the amount of vegetative treatment within view of the Sweetwater Rocks each year. Forest and grassland-shrubland management would not result in impacts under any alternative. The ACEC is not significant for wildlife values and impacts to these values are not analyzed.

All alternatives would allow livestock grazing. Impacts to the ACEC from livestock grazing would not vary by alternative and are not analyzed.

None of the alternatives analyze whether the granite in the ACEC is subject to claim as a locatable mineral. Such a determination could only be made in response to a specific application when the quality of the granite as a locatable mineral would need to be analyzed. The likelihood of such a proposal is considered low. If a proposal were made, it would need to be evaluated in a site-specific EIS and approved only through an RMP amendment. Although the alternatives would vary in locatable mineral management, because of the low potential, the difference in impacts is anticipated to be minimal and is not analyzed.

Alternative B would designate 152,347 acres as an ACEC which includes the four WSAs as well as the area around them, to protect the view of the Sweetwater Rocks and the view from the WSAs. This area is called “the ACEC” under all alternatives to refer to the same 152,347 acres, although none of the other alternatives would designate this area as an ACEC.

Under alternatives B, C, and D, Lost Creek would be designated as a ROW corridor. Alternative A does not designate Lost Creek as a ROW corridor because it was not addressed in the 1987 ROD. However, Lost Creek is currently managed as a ROW corridor and existing management practice is to co-locate other ROWs with existing ROW. Therefore, Lost Creek is not further analyzed. The alternatives would vary in their management of other ROWs within the ACEC.

4.7.5.3.14.3. Alternative A

4.7.5.3.14.3.1. Program Management

The 1987 RMP and EIS ROD designated four areas in the ACEC as WSAs, but did not apply any special management to the area around the WSAs that make up the rest of the ACEC. The WSAs were found to be significant visual and geologic resources, and the view of the WSAs as well as the view from the WSAs were found to be significant. No portion of the area is managed under an MLP.

4.7.5.3.14.3.2. Resources

Management actions from other programs that protect physical values and viewsheds would directly benefit ACEC values.

Because the view from the ACEC is considered a contributing value, management that protects against INNS infestation would beneficially impact ACEC values. Alternative A would continue vegetative treatments in the ACEC at historic levels. Alternative A would result in more adverse impacts from INNS because it does not require weed-free feed or livestock flushing.

Alternative A wildlife management includes limited protections for greater sage-grouse. The alternative would close ¼ mile around leks to surface disturbance and would not limit the number of energy developments or place caps on surface disturbance in the ACEC or the area outside the ACEC within its viewshed.

Alternative A VRM would result in beneficial impacts to visual and geologic resources in the ACEC by retaining the existing character of the landscape within and adjacent to the ACEC with VRM Class II and Class III management, which should limit visual intrusions and surface-disturbing activities. This would beneficially impact visual resources.

4.7.5.3.14.3.3. Resource Uses

Alternative A manages fluid/solid minerals leasing in the ACEC with standard stipulations and does not require an MLP in any portion of the ACEC. However, the potential for fluid/solid leasable minerals in the area is low to none, as would be expected in light of the ACEC geologic formation as a granite mountain range. Alternative A does not withdraw the ACEC from locatable mineral entry, but there is no identified potential for locatable minerals in the area. If potential were identified, Alternative A would not require Plans of Operation, which would adversely impact ACEC values. Alternative A manages the ACEC to allow mineral materials disposal on a case-by-case basis, which could adversely impact ACEC values. Previous mineral materials disposals have caused irreversible adverse impacts to geologic resources.

Alternative A manages the WSAs and the lands between them as avoidance areas for major ROWs and corridors, which would adversely impact ACEC values when ROWs are authorized. Increasingly, the areas between the WSAs are becoming filled or are otherwise unsuitable for ROW use, but surface disturbance from ROWs could adversely impact the parts of ACEC outside the WSAs. While it is possible that some projects could be sited in a way that would minimize or mitigate adverse impacts, it is more likely that a ROW, particularly a high-profile development such as an industrial wind-energy development, would adversely impact ACEC values if placed near VRM Class II visual resources. The ACEC has high potential for wind-energy resources, the development of which would adversely impact the viewshed.

Alternative A recreation management does not address ACEC values and does not guarantee the recreational setting. Therefore, there would be no beneficial impacts to ACEC values, particularly the view from the WSAs. Alternative A limits motorized vehicle travel to existing roads and trails, which would not protect ACEC values. However, the adverse impact of this management would be minimal because of the limited number of roads in the area.

4.7.5.3.14.3.4. Special Designations

Alternative A manages the four WSAs in accordance with BLM Manual 6330, *Management of Wilderness Study Areas*. There is no other special designation management, including ACEC designation. Alternative A management of the NHTs would not beneficially impact the ACEC because that management primarily prohibits surface disturbance within ¼ mile of NHTs, but in most cases, not beyond. Therefore, it is not anticipated that Alternative A would result in beneficial impacts to the setting of the ACEC.

4.7.5.3.14.4. Alternative B

4.7.5.3.14.4.1. Program Management

Alternative B would designate 152,347 acres as an ACEC for recreation values, unique geological values, and scenic values. Alternative B's management emphasizes resource protections which support values of concern. Alternative B would limit surface disturbance and would provide the most protections for wildlife and cultural resources which beneficially impacts ACEC values. Alternative B would close the entire ACEC to oil and gas leasing and does not require an MLP in any portion of the ACEC.

4.7.5.3.14.4.2. Resources

Alternative B management of air quality, soil, and water resources would limit surface disturbance by expanding the riparian-wetland buffer from 500 feet to 1,320 feet, and would close slopes steeper than 15 percent to surface disturbance. This management would be more beneficial to ACEC values than Alternative A, which restricts surface disturbance in a smaller area. Alternative B would implement a proactive approach to reduce emissions and improve air quality, which could improve the view of the ACEC from Highway 287 and the view from the ACEC. Alternative B would be more proactive in addressing the link between BLM-permitted activity and the spread of invasive plant species. The presence of invasive plant species would adversely impact visual resources, not only because of the different appearance of invasive plant species than native vegetation but because of the more intense fire regimes associated with heavy invasive plant species infestation. Additional impacts from INNS management are discussed below under livestock grazing.

Alternative B wildlife management would result in substantially more beneficial impacts to the ACEC because of protections for greater sage-grouse habitat. The ACEC is in the sage-grouse Core Area and limitations on surface disturbance for the protection of greater sage-grouse would beneficially impact the ACEC viewshed. Alternative B wildlife management closes the ACEC to mineral and realty disturbances and prohibits other surface disturbance, such as range improvement projects, within the lek boundaries. Outside the ACEC, Alternative B would limit the number of mineral leasing and energy ROW projects per section and would apply a cap on surface disturbance.

Alternative B VRM would result in greater beneficial impacts to the ACEC than Alternative A because changes in the characteristic landscape would be low and not attract the attention of the casual observer. This management would limit obtrusive development that would adversely impact the ACEC setting and view.

4.7.5.3.14.4.3. Resource Uses

Alternative B management of locatable, leasable, and mineral materials disposals would be more protective of ACEC values than Alternative A. Alternative B would close the ACEC to all mineral activity, including withdrawing it from locatable mineral entry. The primary benefit of this management would be the protection of ACEC values from adverse impacts of mineral materials disposals. The granite in the ACEC is desirable for AML projects and road building, and additional disposals would result in adverse impacts to the granite in the ACEC and the ACEC viewsheds. Alternative B would result in minimal beneficial impacts from the other minerals management compared to Alternative A because the potential for such minerals is so low.

Alternative B management of wind-energy development and major ROWs and corridors, would be more beneficial to ACEC values than Alternative A, because Alternative B would manage the area as an exclusion area for these realty actions, whereas Alternative A avoids the Sweetwater Rocks area, which is undefined. Demand is anticipated to be moderately high for ROWs.

Alternative B livestock grazing management would be less adverse to values of concern than Alternative A because rangeland health would be achieved through non-infrastructure management. Fences and water developments would cause surface disturbance and tend to concentrate livestock in a manner that could intrude on the views of and from the ACEC. Alternative B could result in more beneficial impacts to vegetation and thus visual resources by allowing the Authorized Officer to require livestock flushing before animals are turned out on public lands, if it appears they have ingested INNS. In addition, the INNS program could benefit from additional vegetation treatments that would be undertaken since range improvement projects under Alternative B would be limited to non-infrastructure projects such as vegetation treatment.

Alternative B recreation management would be similar to Alternative A and would result in similar impacts. Alternative B would limit travel to designated roads and trails, with implementation-level planning to meet management requirements. This would beneficially impact the ACEC, but only in the long term. Alternative B travel management would have modest beneficial impacts to recreation values in the WSAs but would also limit access. The ACEC has few roads so this difference in impacts would be minimal.

4.7.5.3.14.4.4. Special Designations

Alternative B management of other special designations (in addition to the Sweetwater Rocks ACEC) would beneficially impact the viewshed from the ACEC. The entire area around the ACEC would be closed to surface disturbance from mineral development and ROWs because of the management prescriptions for the Government Draw/Upper Sweetwater Sage-Grouse ACEC and the NHT ACEC. This would beneficially impact the ACEC setting more than management under Alternative A. There is uranium potential to the north and east of the Sweetwater Rocks ACEC. It is possible that the Alternative B withdrawal of the greater Government Draw/Upper Sweetwater Sage-Grouse ACEC from minerals development would benefit the Sweetwater Rocks ACEC by limiting disturbance in its viewshed from the development of that uranium. However, that determination would require a site-specific analysis.

4.7.5.3.14.5. Alternative C

4.7.5.3.14.5.1. Program Management

Alternative C would not designate the Sweetwater Rocks ACEC. Rather, Alternative C management would emphasize resource use and could adversely impact the ACEC and its viewshed. Alternative C designates the Lost Creek corridor but would consider other locations for ROW. Alternative C would manage greater sage-grouse similar to Alternative A, although with fewer limits on surface disturbance. Alternative C would not manage any portion of the area under an MLP.

4.7.5.3.14.5.2. Resources

The Alternative C emphasis on resource uses over physical and biological resources would result in more impacts to raptors and the visual and geologic resources in the ACEC. Unlike Alternative B, Alternative C does not proactively manage air quality, and manages water and soil with standard stipulations. INNS management under Alternative C would be comparable to Alternative A and would have fewer beneficial impacts to values of concern than Alternative B. Alternative C wildlife habitat management, particularly for greater sage-grouse, is the same as Alternative A and would not result in similar beneficial impacts as described under Alternative B.

Alternative C VRM in the ACEC and the surrounding area, would result in more adverse impacts to ACEC values than Alternative B, because Alternative C allows changes to the landscape that would adversely impact the viewshed.

4.7.5.3.14.5.3. Resource Uses

Alternative C management of minerals would result in more adverse impacts to ACEC values than either Alternative A or B since the entire area is open to development and an MLP is not required. Alternative C management of major ROWs and corridors, including wind-energy development and transmission lines, would result in more adverse impacts to visual resources than Alternative B, which manages the area as an exclusion area for these developments. The area north of the ACEC has high potential for wind-energy development but it is likely that transmission would travel out to the Casper Field Office. However, demand for pipelines and other ROWs could adversely impact viewshed.

Alternative C could result in fewer beneficial impacts to vegetation because it does not allow the Authorized Officer to require livestock flushing. Since livestock grazing management would continue to develop infrastructure, although at a lower rate than Alternative A, there would be fewer vegetation treatments undertaken than would occur under Alternative B. Alternative C would have the same risk of INNS infestation that is present under Alternative A that is associated with the surface disturbance in constructing infrastructure.

Alternative C does not guarantee recreational setting or experience and therefore would not provide protections to ACEC values. Recreation *per se* would not be expected to result in adverse impacts to ACEC values. Impacts to the ACEC from travel management would be slightly more adverse under Alternative C than Alternative B, and similar to impacts under Alternative A. This impact would be long-term and would not be evident in the short term.

4.7.5.3.14.5.4. Special Designations

Management in general without ACEC designation would result in long-term adverse impacts similar to Alternative A over portions of the ACEC not in the WSAs, although likely more severe because of Alternative C's less restrictive ROW management. See the Alternative B analysis contrasting the Alternative B proactive management and the management under alternatives A and C.

4.7.5.3.14.6. Alternative D

4.7.5.3.14.6.1. Program Management

Alternative D would not designate the area as an ACEC. Program management under Alternative D is very similar to Alternative A except in the portion of the ACEC that is managed with an MLP. The primary differences are that Alternative D would have more limits on authorizing ROWs, limit substantially more surface disturbance to protect greater sage-grouse and limit mineral material disposals to identified existing areas, which would all protect values of concern. Required Design Features would help to limit the adverse impacts that would otherwise result from development that would be allowed under the VRM classification of the area.

4.7.5.3.14.6.2. Resources

Alternative D management of air quality, soil, and water resources would limit surface disturbance in the same way as Alternative A, which would be somewhat less protective of ACEC values than Alternative B. Alternative D would also be more proactive in addressing the link between BLM-permitted activities and the spread of invasive plant species than Alternative A or Alternative C. The presence of invasive plant species would adversely impact visual resources, not only because of the different appearance of invasive plant species than native vegetation, but also because of the more intense fire regimes associated with heavy invasive plant species infestation which would adversely impact visual resources.

Alternative D includes wildlife management that would result in beneficial impacts to the ACEC viewshed similar to Alternative B. The limits on surface disturbance for the protections of greater sage-grouse would make 3,147 acres closed to surface-disturbing activities but to a smaller degree. Alternative D would designate fewer areas as ACECs than Alternative B and the protections for greater sage-grouse habitat under Alternative D would become more important in the protections they afford the Sweetwater Rocks viewshed. Alternative D would limit surface disturbance on 3,147 acres in the ACEC for protection of leks and a substantial number of acres in the viewshed outside the ACEC. While the beneficial impacts of this management would have to be identified in a site-specific analysis, this benefit would likely be substantial because there are a number of leks in the viewshed. In addition, the Alternative D adoption of the Core Area concept with one energy development per section and a cap on surface disturbance (although an area twice as large as the one under Alternative B) would limit unreclaimed surface disturbance inside and outside the ACEC.

Alternative D VRM is very similar to Alternative B, and would result in many more beneficial impacts to ACEC values than Alternative A or Alternative C. Under Alternative D, the change in the characteristic landscape would be minimal and would not attract the attention of the casual

observer. This management would limit obtrusive development that would adversely impact the ACEC setting and view.

4.7.5.3.14.6.3. Resource Uses

Alternative D locatable, leasable, and minerals material disposals management would result in adverse impacts to ACEC values very similar to alternatives A and C, and more adverse than Alternative B. Unlike Alternative B, Alternative D would not close the ACEC to all mineral activity. However, there is low potential for locatable or leasable minerals in the ACEC, so any impacts would be low. Moreover, the relevant and important benefits of the area would be protected by other mineral management including the Beaver Rim MLP and the NTMC as well as limits on surface disturbance in greater sage-grouse Core Area. Alternative D would result in the same important beneficial impacts to ACEC values as Alternative B by closing the area to mineral material disposals except in existing mineral disposal sites. Materials disposal would be the primary threat to ACEC values because the granite in the ACEC is desirable for AML projects and road building, and additional disposals would adversely impact the granite in the ACEC and the viewsheds. Similar to Alternative B, Alternative D would guard against this threat.

ROW management would result in similar beneficial impacts to values of concern as Alternative B and fewer adverse impacts than alternatives A and C because Alternative D would constrain visually intrusive ROWs. Alternative D's livestock grazing management could result in similar adverse impacts to vegetation as Alternative C by increasing surface disturbance with the potential for INNS spread. Vegetation treatments would have a small to moderate adverse impact on the viewshed but less so than Alternative A.

Alternative D recreation management would be similar to Alternative B except that the undeveloped SRMA is smaller. This would beneficially impact ACEC values because no development or structures are likely to be proposed that would adversely impact the ACEC. There would be little difference in impacts from recreation management among the alternatives. Similar to alternatives A and C, Alternative D would limit travel to existing roads and trails. This would result in fewer beneficial impacts to ACEC values than Alternative B, but only in the long term.

4.7.5.3.14.6.4. Special Designations

Alternative D management of other special designations would result in fewer beneficial impacts to ACEC values than Alternative B, but more than Alternative A or C. Part of the Sweetwater Rocks ACEC is outside the NTMC, but would be beneficially impacted by the NTMC. The limits on surface disturbance for the protection of trails would beneficially impact the ACEC and its viewshed. Coupled with the management of greater sage-grouse habitat, Alternative D management would result in beneficial impacts more similar to Alternative B than to Alternative A or Alternative C.

4.7.5.3.15. Detailed Analysis of Alternatives – Regional Historic Trails and Early Highways

Several historic wagon roads and stage trails played prominent roles in the settlement and development of South Pass, the Wind River Basin, and the Sweetwater Valley in the latter half of the 19th Century. These trails originated in the Rock Springs area (the Green River to South Pass to Fort Washakie Stage Trail and the Point of Rocks to South Pass Stage Trail), Rawlins

(the Rawlins to Fort Washakie Stage Trail), and the Casper area (the Bridger Trail and the Casper to Lander Road Trail). Some of the early trails also led into the Bighorn Basin, and were instrumental in the settlement and development of that area (the Bridger Trail and the Birdseye Pass Stage Trail). A little later, early automobile roads that advertised the way to Yellowstone and other national parks became important arteries for development, commerce, and tourism (the Yellowstone Highway/National Park to Park Highway). All of these historic trails and early highways are eligible for listing on the NRHP and are considered worthy of protection. Their intact portions are often in good shape, and they often have historic settings that still evoke the appearance of the landscape in the late 1800s or early 1900s.

Adverse impacts to these types of resources typically result in a loss of integrity of the resource, or in some cases, in a loss of information. Adverse impacts to significant trails resources on BLM-administered lands happen for several reasons, including actions that physically damage or destroy all or parts of a historic trail or highway; actions that alter a significant element of a trail; actions that introduce visual, atmospheric (air), or audible (noise) elements that can diminish the historical integrity of a trail or highway; or a lack of action, which can allow a trail resource to deteriorate. Increased access to areas also can adversely impact trails resources by increasing use, erosion, looting, and vandalism.

These regionally significant historic trails and early highways are all significant for their associations with important events in American history. In the planning area, these resources also are significant for their good to excellent historical settings, which help visitors imagine what it was like along these trails in the 1800s and the early 1900s. Adverse impacts to these values can result from the actions described above, and the impacts would be short-term and long-term because some of the impacts could be reversed but others cannot.

In some cases, historic trail and highway resources also are significant for their scientific data potential, especially at associated historic sites along the trails and highways. Actions that cause physical damage, and sometimes neglect, can adversely impact these resources. Adverse impacts to these types of resources would be long-term because, once they are damaged or disturbed, the impacts cannot be reversed.

Beneficial impacts to trails and highways occur from special management measures that could enhance the quality of that resource. Stabilization of historic inscriptions along the Bridger Trail and erosion control measures along the trails are examples of actions that result in beneficial impacts. Most beneficial impacts would be long-term, but eventually, adverse natural and/or human influences would require more measures to keep these resources from degrading.

4.7.5.3.15.1. Summary of Impacts

Impacts to RHT&EHs would vary by alternative in the following ways: alternatives A and C are similar in their protections, but Alternative A generally provides more protection than Alternative C. Alternatives A and C focus on protecting the immediate area around the RHT&EHs, but do not address impacts to visual resources farther from the trails. Alternatives B and D would provide much better protection for these resources and protect their historic settings to a moderate to high degree.

4.7.5.3.15.2. Impacts Common to All Alternatives

Standard procedures have been developed over the years to help address potential adverse impacts to regionally-significant historic trails and early highways. Standard management and protection procedures, guided by the NHPA, include avoidance, screening projects from the trails behind natural features, innovative redesign or camouflaging of projects, and using existing disturbances near trails for the placement of projects. These standard procedures have protected trails resources from adverse impacts in many cases. If these procedures have not been feasible, other measures (e.g., historical research, interpretive signage, special easements, and land purchases) have been used to offset impacts to the trails. All of the alternatives are guided by these standard procedures.

However, the standard procedures have not always adequately protected the historic settings of historic trails and highways. For example, large and visible projects some distance away have affected their intact historic settings. A modern gas plant a few miles from the Bridger Trail and a well pad near the Rawlins-Fort Washakie Stage Trail have resulted in adverse impacts to the historical setting of the trails and their historical integrity.

The standard procedures also do not apply to locatable mineral exploration projects of 5 acres or less, which do not require Plans of Operation. These operations do not require BLM approval, and could adversely impact historic trail and early highway resources if necessary for mining operations to proceed. Locatable minerals projects over 5 acres are subject to the 43 CFR 3809 regulations, which offer minimal protections to trails resources.

Another type of adverse impact on trails resources common to all alternatives would be from increased public use of lands, which can occur for several reasons. One reason would be improved access to formerly remote areas which is common in areas where development allows for the creation of new roads. Increased popularity and availability of OHVs, also allows access to formerly remote areas. A third reason would be increased public interest in specific historic sites or areas. As public use of lands increases, so can the adverse impacts to historic trail and early highway resources. As more use occurs, more trails are driven over. Some of these resources have been looted or vandalized. This impact would occur under any of the alternatives because access, OHV use, and public use and interest along the historic trails and early highways are all expected to increase.

A beneficial impact common to all alternatives would be the indirect protection provided by the greater sage-grouse Core Area management policy. Approximately 60 percent of the RHT&EHs and their surroundings are located within the Core Area. This would reduce impacts to their settings.

Fire management, including the use of heavy equipment, does not vary substantially by alternative when culturally sensitive resources are involved. Accordingly, the impacts from fire suppression activities would not vary by alternative.

4.7.5.3.15.3. Alternative A

4.7.5.3.15.3.1. Program Management

In the 1980s, the Wyoming BLM began applying stipulations to oil and gas leases that specified that development projects would be avoided within ¼ mile of a historic trail. This stipulation, together with NHPA regulations, provided some protection for historic trails and early highways

from modern impacts. The protection and management procedures developed at that time, are still in use. Impacts to trails from this management are considered to be beneficial near the trails, while farther away from the trails, they are considered adverse because of the potential to introduce new intrusions into the historical setting.

4.7.5.3.15.3.2. Resources

Alternative A air quality management would result in a neutral or slightly adverse impact to RHT&EHs. Efforts to maintain air quality around the trails would help maintain their important qualities. However, if air quality degrades, it would adversely impact the trails.

VRM Class ratings that protect natural viewsheds would beneficially impact RHT&EHs by moderating modern development in an area. However, Alternative A manages most of the trails and highways as VRM Class IV, which would allow a wide range of visual intrusions. Therefore, Alternative A VRM would adversely impact these resources.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) under Alternative A would provide additional protections for historic trail and highway resources.

4.7.5.3.15.3.3. Resource Uses

Alternative A provides mostly minimal protection from locatable mineral exploration, except where there are withdrawals or ACECs. This alternative provides minimal protection from locatable mineral exploration under the standard of preventing unnecessary or undue degradation. No Plan of Operations is required for exploration projects unless they would disturb more than 5 acres, so historic trails and highways would be subject to less protection from mineral exploration impacts. Some of the trails are in areas of high potential for locatable minerals (the Rawlins-Fort Washakie Trail in uranium areas, and the Green River to South Pass to Fort Washakie and the Point of Rock to South Pass Trails in gold mining areas); some are in areas with low potential. Therefore, Alternative A impacts to historic trails and highways would be both adverse and neutral.

Alternative A would provide more protections from leasable fluid minerals, leasable solid minerals, and mineral materials disposals than for locatable minerals. Alternative A includes NSO restrictions within $\frac{1}{4}$ mile on either side of trails, and enforces close-type stipulations to protect trails resources. However, outside the $\frac{1}{4}$ -mile on either side buffer, there are no protections for historic trails and highways specific to development which could adversely impact the historic settings of trails. At present, these impacts are managed on a case-by-case basis, and current protection measures usually focus on reducing impacts rather than preventing them. The most likely impact to the trails and early highways would be from oil and gas development in the middle and northern Wind River Basin, which would impact the Bridger Trail, the Yellowstone/National Park to Park Highway Trail, the Casper to Lander Road, and the Rawlins to Fort Washakie Stage Trail. Current management protects the immediate foreground of the RHT&EHs, but is limited in protecting the historic settings of the trails outside of this area. Therefore, impacts under Alternative A would be both beneficial and adverse.

Highly visible ROW and other development projects, such as wind-energy developments, mines, gas plants, power plants, and large transmission lines, would adversely impact historic trails and highways in substantial ways. For example, a wind-energy development or gas plant near a trail

with good historical settings would introduce a modern contrast that would adversely impact the trail's value as a historic resource. Alternative A includes no protections from these types of projects other than standard NHPA measures.

Adverse impacts to RHT&EHs under Alternative A from range development projects would be similar to other developments. However, because of their lower profile, they often have a lower contrast with the historic settings. Avoidance-type stipulations for range developments within ¼ mile either side of trails are enforced to protect trails resources. However, outside the ¼-mile buffer, there are no protections specific to development for the trails, and their historic settings would be subject to adverse impacts. At present, these impacts are managed on a case-by-case basis, and current protection measures usually focus on reducing impacts rather than preventing them. The most likely adverse impact to historic trails would be from fencing projects that cross them. Such fences are periodically proposed. Therefore, the impacts under Alternative A would be both beneficial and adverse.

4.7.5.3.15.3.4. Special Designations

Under Alternative A, RHT&EHs would not be covered by any special designations and would not be protected unless they traverse a specially designated area.

4.7.5.3.15.4. Alternative B

4.7.5.3.15.4.1. Program Management

Alternative B would provide for a somewhat higher level of proactive management than Alternative A. Actively pursuing opportunities to reduce modern visual intrusions along the regional trails and highways would be a beneficial impact.

4.7.5.3.15.4.2. Resources

Alternative B would specify that air quality management reduce emissions and improve air quality. This action would have a beneficial impact on the historic trails and highways, and would make Alternative B more beneficial to the RHT&EHs than Alternative A.

Wildlife management under Alternative B is much more protective than under Alternative A and would prohibit surface disturbance in many more areas than under Alternative A. This would result in greater beneficial impacts to ACEC values than under Alternative A. By limiting fences and roads in crucial big game winter range and prohibiting surface disturbance within 0.6 miles of sage-grouse leks, Alternative B would reduce the amount of surface disturbance which would beneficially impact the RHT&EHs by limiting modern intrusions into the historic settings. In addition, the Alternative B Government Draw/Upper Sweetwater Sage-Grouse ACEC (see below) would result in additional beneficial impacts to RHT&EHs.

Alternative B classifies more lands as VRM Class I or II than Alternative A, and this would help protect some of the RHT&EHs from potential disturbances caused by developments. While VRM for the trails and highways in the northern half of the planning area is not substantially different than under Alternative A, the trails in the southern half of the planning area are in a VRM Class II area under Alternative B, which would provide substantially better protection for these resources than Alternative A.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) would be greatest under Alternative B, providing additional protection for RHT&EHs and reducing adverse impacts.

4.7.5.3.15.4.3. Resource Uses

Alternative B would propose to withdraw lands for ½ mile on each side of RHT&EHs from locatable minerals entry. This would better protect RHT&EHs than Alternative A. This ½-mile withdrawal means more of the historical setting of the trails and highways would be protected from the impacts of locatable minerals development. This would be a substantial benefit for trails in the South Pass and south of Green Mountain areas, where mining impacts would be most likely along the trails.

Leasable fluid minerals management under Alternative B closes 1,851,349 more acres than Alternative A which would help protect some of the trail and highway resources from potential disturbances. While fluid minerals management for the trails and highways in the northern half of the planning area would not change substantially, the trails in the southern half of the planning area (the Rawlins to Fort Washakie, Green River to South Pass to Fort Washakie, and Point of Rocks to South Pass Stage Trails) are in a closed area, which would provide much better protection for these resources than Alternative A.

Alternative B would close or place major constraints on solid mineral exploration and development, and mineral materials disposals on most of the lands in the planning area. This would protect RHT&EHs from potential disturbances. Most of the trails and almost all of their historical settings are closed to development, so Alternative B would provide much better protection than Alternative A. No impacts are expected from solid minerals activities and mineral materials disposals under Alternative B.

Alternative B would restrict wind-energy developments, power and gas plants, and large ROWs to a much greater extent than Alternative A. Alternative B protects most of RHT&EHs, which would more beneficially impact those resources than management under Alternative A.

Alternative B avoids visible range development projects on more land than does Alternative A and this management would protect RHT&EHs from potential disturbances. The trails are closed to visible range developments for a distance of 2 miles on either side, therefore, Alternative B would provide much better protection than Alternative A and no impacts would be expected. This mostly affects fencing projects that would cross the trails, which are periodically proposed.

4.7.5.3.15.4.4. Special Designations

Under Alternative B, the RHT&EHs ACEC would extend to ½ mile on each side of the trails. This would enhance the protection of trails and highways by reducing the potential for adverse impacts to their intact historical settings. This alternative would provide more protection for the trails over Alternative A. The regional trails in the southern part of the planning area overlap with the Government Draw/Upper Sweetwater Sage-Grouse ACEC and some with the Congressionally Designated Trails and South Pass Historic Mining Area ACECs, so the setting for these trails is further protected by the limits on surface disturbance from the other ACECs.

4.7.5.3.15.5. Alternative C

4.7.5.3.15.5.1. Program Management

Alternative C would maintain proactive management of the regional trails to a similar level as Alternative A. Both alternatives are designed to remove modern intrusions along the trails and highways on a case-by-case basis. Alternative C would not designate any ACECs.

4.7.5.3.15.5.2. Resources

Alternative C would have the same impact on air quality as Alternative A, and the same neutral to slightly adverse impacts to the RHT&EHs. Alternative C has the same or slightly less soil and riparian-wetland protections as Alternative A, and would result in the same limited beneficial impacts to trails by limiting surface disturbance.

Because Alternative C would place a greater emphasis on resource use and include fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations). This alternative would result in more adverse impacts to RHT&EHs than alternatives A and B. Alternative C manages habitat for greater sage-grouse in the same way as Alternative A and would result in the same limited beneficial impacts to the trails' historic setting. Alternative C would result in a much less beneficial impact than management under Alternative B.

Alternative C includes 179,138 fewer acres of VRM Class I and II than Alternative A, which would result in less protection for RHT&EHs. Almost all of the historic trails and highways are in VRM Class III or IV, so Alternative C would allow more modern developments around the trails, and would cause more adverse impacts than Alternative A and substantially more than Alternative B.

4.7.5.3.15.5.3. Resource Uses

Alternative C would provide no protection for RHT&EHs from locatable mineral exploration, applying only minimal protection from locatable mineral exploration via standard prevention of undue or unnecessary degradation requirements. A Plan of Operations would not be required unless the mining project covers more than 5 acres of disturbance. Impacts would be most likely to occur in areas of high potential for mining activity, such as trails in the South Pass gold mining and south of Green Mountain uranium areas. Alternative C would provide the same level of protection for RHT&EHs as Alternative A, and less than Alternative B.

Under Alternative C, adverse impacts to the regionally-significant historic trails and highways from leasable fluid/solid minerals and mineral materials would be similar to impacts from locatable minerals. Very few areas are closed to these uses, so almost all of the RHT&EHs would be subject to impacts. Impacts would be managed on a case-by-case basis and protection measures would focus on reducing impacts rather than preventing them. Therefore, Alternative C would provide less protection for RHT&EHs than Alternative A. The most likely areas to experience adverse impact from oil and gas development would be the middle and northern Wind River Basin.

Alternative C manages wind-energy development, mines, and large ROWs in the same manner as Alternative A and the same limited beneficial impacts to trails would occur.

Adverse impacts to the RHT&EHs from range development projects would be similar under Alternative C as under Alternative A.

4.7.5.3.15.5.4. Special Designations

Under Alternative C, there would be no special designations except the Congressionally Designated Trails. Under this alternative, the historic trails and highways would be open to adverse impacts along most of their lengths since any protections provided by ACEC designation would not occur. Therefore, Alternative C would have more adverse impacts than Alternative A.

4.7.5.3.15.6. Alternative D

4.7.5.3.15.6.1. Program Management

Alternative D would maintain proactive management to the same level as alternatives A and C. These alternatives were designed to remove modern intrusions along the trails and highways on a case-by-case basis. This would be less beneficial management than Alternative B, which establishes intact portions of the trails as an ACEC comprised of the areas extending out ¼ mile on either side of the regional historic trails. Alternative B would provide much better protection for the regional historic trails than Alternative D and reduce the adverse impacts of development in the settings of the trails. Required Design Features would reduce the adverse impacts that would result from development. However, segments of the Rawlins-Fort Washakie State Trail, the remaining segments of the Green River to South Pass to Fort Washakie Stage Trail, and the Point of Rocks to South Pass Trail in the Lander Front-Hudson-Atlantic City area, which has extensive limits on mineral development, would have beneficial impacts similar to those under Alternative B.

4.7.5.3.15.6.2. Resources

Alternative D air quality management is the same as alternatives A and C, and would result in the same impacts to regional trails and highways. Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, and special designations) would be greatest under alternatives B and D, providing additional protections for regional trails and reducing adverse impacts to the extent that those protections limit surface disturbance within the settings of the trails.

Alternative D management of habitat for greater sage-grouse would be somewhat less restrictive of surface disturbance than Alternative B. Nevertheless, Alternative D would limit development within 0.6 mile of leks, limit the number of disturbances per section, and cap surface disturbance in the Core Area. This management should reduce the intrusion of modern development in the historic setting of the trails, which would be a long-term beneficial impact. The Core Area approach would result in beneficial impacts to the Casper to Lander Road which would not be protected by any special designation but are located within the greater sage-grouse Core Area. The segments of the Rawlins-Fort Washakie Stage Trail that are outside of the Hudson-Atlantic City area (that are part of the sage-grouse ACEC under Alternative B) would benefit from the limits on disturbance to protect Core Area and the protections afforded by the NTMC.

Alternative D would classify much more land around trails and highways as VRM Class II than Alternative A or C, and slightly more than Alternative B. However, this alternative classifies more

land as VRM Class III compared to Alternative B. The overall beneficial impact of Alternative D management would be to protect lands closer to the site better than the other three alternatives, but to afford less protection than Alternative B for lands farther away. Alternative D would protect most sensitive lands from the introduction of developments that would be out of character with the area's historical and natural settings.

4.7.5.3.15.6.3. Resource Uses

Alternative D would provide little or no protection for RHT&EHs from locatable mineral exploration. Similar to alternatives A and C, Alternative D would provide minimal protection from locatable mineral exploration under the standard of preventing undue or unnecessary degradation. No Plan of Operations is required for exploration projects unless they would disturb more than 5 acres, so historic trails and early highways would be subject to less protection from exploration impacts. This management could adversely impact historical trails, especially in areas of high potential for mining activity, such as trails in the South Pass gold mining and south of Green Mountain uranium areas. Therefore, Alternative D would provide for a similar level of protection for historic trails and highways as alternatives A and C, and less than Alternative B.

The regional trails in areas where locatable mineral withdrawals will be pursued would have similar beneficial impacts to those under Alternative B. Impacts to the other segments, unless they fall within the NTMC, would have more adverse impacts. This would be especially likely to occur on the section of the Rawlins-Fort Washakie Stage Trail going south from Jeffrey City, which would be adversely impacted by uranium development and by the Bison Basin and Bison Basin Extension designated corridors. The setting of the Stage Trail has been severely compromised by existing disturbance, a trend that would likely continue under all alternatives.

For leasable fluid and solid minerals, mineral materials disposals, and ROWs, Alternative D breaks management of the RHT&EHs into two categories: within DDAs and outside DDAs. Within DDAs, resource uses would be open while outside DDAs, resource uses would be subject to protection of historic settings up to 2 miles through the use of BMPs. Alternative C would not protect trails, Alternative A would protect them to a lesser extent than Alternative D (up to ¼ mile either side), and Alternative B would protect them up to 5 miles on either side. Therefore, Alternative D would protect RHT&EH resources better than alternatives A and C, but not as well as Alternative B.

4.7.5.3.15.6.4. Special Designations

No portions of the RHT&EHs would be managed as a special designation under this alternative, except those in an area managed as an ACEC for other values, such as the Point of Rocks to South Pass Stage Trail. This would result in fewer beneficial impacts than the Alternative B ACEC designation, which enhances the protection of the site and its surroundings by reducing the potential for adverse impacts to its intact natural settings. However, Alternative D would beneficially impact segments of the regional trails through limits on surface disturbance and VRM designed to benefit other programs, including the NTMC, the Lander Front-Hudson-Atlantic City area, and the South Pass Historical Landscape ACEC. Management in these areas would help protect the historic settings of regional trails.

4.7.5.3.16. Detailed Analysis of Alternatives – Government Draw/Upper Sweetwater Sage-Grouse

4.7.5.3.16.1. Summary of Impacts

Alternatives A and C would have similar adverse impacts in that neither designates the area as an ACEC and manages with standard stipulations. Both have more limited greater sage-grouse protections from surface disturbance and thus would have a greater potential to adversely impact more acres of greater sage-grouse habitat. Alternatives B and D would have far fewer adverse impacts because surface disturbance would be more limited under both alternatives, although more so in Alternative B than Alternative D.

Alternative B would have the most beneficial impacts because it designates 1,246,791 acres as an ACEC with management prescriptions to protect sage-grouse habitat; Alternative D manages 35,102 acres as the Twin Creek ACEC. Alternative B greater sage-grouse management would reduce the amount and intensity of energy development to a greater extent than Alternative D, but this is not likely to result in a major difference in beneficial impacts because of the low potential for oil and gas development. Requirements for Plans of Operations, triggered by ACEC designation, would apply to both alternatives B and D but would result in more beneficial impacts under Alternative B because a larger area is designated as an ACEC and therefore subject to Plans of Operations requirements. However, the relative benefits from a Plan of Operations under alternatives B and D are to a large extent a moot point given that both areas recommend withdrawing large areas from locatable mineral entry. Alternative B would pursue withdrawal of the entire Government Draw/Upper Sweetwater Sage-Grouse ACEC (1,246,791 acres). Under Alternative D, the western-most portion of the area designated as the Government Draw/Upper Sweetwater Sage-Grouse ACEC under Alternative B, which includes the Twin Creek ACEC, is withdrawn from locatable mineral entry for the benefit of wildlife habitat (including mule deer, moose, elk, and greater sage-grouse) and other values. This area, called the Hudson-Atlantic City area, has other management prescriptions that benefit the relevant and important values of the area, but only to the north and west of the Sweetwater River. The lands outside the NTMC have no management protections beyond those afforded by the Core Area strategy.

4.7.5.3.16.2. Background Information

Before the Wyoming Governor's Sage-grouse Core Area was established, the Local Sage-Grouse Working Group identified an area in Government Draw and the Upper Sweetwater River as an important area for greater sage-grouse and recommended that the BLM implement special management for the area because of its very high concentration of greater sage-grouse leks and associated habitats. Data for this population provides information regarding its year-round movement and this information was used to establish the boundaries of the Local Working Group's proposed ACEC. This area contains 306,360 acres.

Subsequently, the WGFD proposed a much larger geographic area for management as an ACEC because this area also had high concentrations of greater sage-grouse in locations that had not been leased for oil and gas development. There is no site-specific data for the year-round movement of greater sage-grouse populations for all of this expanded area. The BLM agreed that greater sage-grouse values in the larger area met the relevance and importance criteria and that designation of the ACEC should be analyzed. Afterward, the WGFD stated that the position of

the State of Wyoming is that Core Area management adequately protects greater sage-grouse values and that ACEC designation is not needed.

However, this determination by the State of Wyoming only addressed the third leg of ACEC designation: Is special management needed? It did not determine that the values were not relevant or important. In fact, since the WGFD nomination, the prominence of greater sage-grouse has become elevated nationally. This change in policy, following the warranted but precluded decision by the USFWS regarding the listing of the greater sage-grouse under ESA, has identified greater sage-grouse for special protections. This policy is described in the Chapter 3.

Having determined that the area did meet the relevance and importance criteria for ACEC designation because of the concentrated, unfragmented nature of the habitat, all alternatives analyze the impacts of the management decision for the 1,246,791 acres expanded area for the ACEC. Under alternatives A and C, which do not designate any portion of the expanded area as an ACEC for the benefit of greater sage-grouse, the impacts from the management of the expanded area is fully analyzed in the *Special Status Species – Wildlife* section. Rather than repeat this analysis, reference is made in each of these sections to the *Special Status Species – Wildlife* section with a general statement of the impacts. Alternatives B and D analyze the site-specific management within the expanded area, which includes the area the Local Working Group originally proposed as an ACEC. Reference to the *Special Status Species – Wildlife* section is still made but site-specific analysis is offered as appropriate.

Consideration of all Core Area and all occupied greater sage-grouse habitat as an ACEC is analyzed in the *Considered But Not Further Analyzed* section.

4.7.5.3.16.3. Impacts Common to All Alternatives

The BLM manages greater sage-grouse as a sensitive species under all alternatives. The prescriptions associated with this approach would vary by alternative with resulting variation in the impacts to values of concern.

Management actions that protect physical and biological resources through less surface disturbance or other management restrictions result in beneficial impacts to greater sage-grouse. All alternatives use an IPM approach, which would result in the same impacts to sage-grouse in all alternatives. All INNS treatments require site-specific analysis to determine impacts to greater sage-grouse and other values.

Prescribed and wildland fire can adversely impact greater sage-grouse. Since greater sage-grouse are a BLM sensitive species, it is likely that prescribed fire would be avoided in greater sage-grouse habitat. Therefore, while the alternatives vary in the acres of vegetation treatment that would likely occur, the management of wildland fire and the use of prescribed fire would be likely to be the same under all alternatives in areas identified by the Wyoming Governor's Executive Order.

Forest management would not result in impacts to greater sage-grouse because forests are generally not suitable habitat for the species.

Visual resources are not part of the ACEC relevant and important features, but VRM can result in beneficial impacts to habitat by limiting surface disturbance and precluding vertical structures that could serve as raptor perches and increase greater sage-grouse predation. Management under all alternatives would be consistent with general VRM for the area and would not be

specially managed as an ACEC prescription as is the case in Red Canyon and other ACECs for which visual resources meet relevance and importance criteria. Generally, the lower the VRM Class (III or IV) for the area, the greater the likelihood of adverse impacts to greater sage-grouse through surface disturbance.

All mineral development and other surface-disturbing or disruptive activities such as ROWs and road development would result in adverse impacts to greater sage-grouse, both from habitat loss and habitat fragmentation as well as the introduction of structures that would offer a predator perch and a collision hazard. While more surface disturbance results in more adverse impacts, impacts are thought to be the most important if they occur near a lek or in nesting habitat. See the *Special Status Species – Wildlife* section for more information.

4.7.5.3.16.4. Alternative A

4.7.5.3.16.4.1. Program Management

Alternative A would not designate any portion of either the Local Working Group area or the expanded area as the Government Draw/Upper Sweetwater Sage-Grouse ACEC (although portions of the expanded area would be designated for other values such as the NHTs). Alternative A would manage the Local Working Group area and the expanded area for a variety of uses and with a variety of prescriptions. To the extent that this management would benefit wildlife and sagebrush habitat, it would beneficially impact greater sage-grouse. The *Special Status Species – Wildlife* section provides more details about the impacts to greater sage-grouse from Alternative A and this section does not repeat the information. Generally, Alternative A would utilize management prescriptions for greater sage-grouse that are less protective than current research indicates and would be the same as those that have contributed to the downward trend in greater sage-grouse numbers.

4.7.5.3.16.4.2. Resources

Alternative A management in the expanded area is consistent with management described in the *Special Status Species – Wildlife* section and impacts would be the same.

4.7.5.3.16.4.3. Resource Uses

Impacts (generally adverse) to the greater sage-grouse values in the expanded area are the same as those described in the *Special Status Species – Wildlife* section.

Much of the expanded area contains high-value wind-energy potential. While Alternative A places some management limitations on the development of industrial wind energy, it is likely that wind energy would be developed in large reaches of the area, which would result in severe adverse impacts to greater sage-grouse from loss of habitat unless precluded by the State of Wyoming through the Industrial Siting Board. Wind-energy development and ROWs require substantial surface disturbance, and the high profile nature of the turbines, including movement and noise, would likely be very disruptive to greater sage-grouse and cause the birds to avoid the development area. The presence of nearby high profile structures can adversely impact male attendance and breeding success at leks. Industrial wind-energy development would likely result in irretrievable adverse impacts to greater sage-grouse, a fact the USFWS recognized in its recent determination that wind-energy development – including site testing – is incompatible with

greater sage-grouse in the Core Area (USFWS 2010). Adverse impacts from ROW management under Alternative A could be moderated by the Wyoming Industrial Siting Board-imposed limits on industrial wind-energy development in the Core Area, but not all development requires the Board's approval.

4.7.5.3.16.4.4. Special Designations

Management under Alternative A would result in the same impacts to the expanded ACEC area described in the *Special Status Species – Wildlife* section under *Special Designations*. There would be beneficial impacts to Government Draw/Upper Sweetwater Sage-Grouse ACEC values where other special designations, such as the NHT ACEC, limit surface-disturbing and disruptive activities.

4.7.5.3.16.5. Alternative B

4.7.5.3.16.5.1. Program Management

Alternative B would designate the expanded area (1,246,791 acres) as an ACEC. In addition, Alternative B management generally protects resources, even at the expense of resource uses. The impacts to greater sage-grouse from management of resources and resource uses are generally described in the *Special Status Species – Wildlife* section.

4.7.5.3.16.5.2. Resources

Alternative B manages the ACEC to have fuels reduction treatments performed at appropriate times of the year so as to improve the grass and forb understory on which greater sage-grouse rely while minimizing long-term impacts to the sagebrush community. The additional acres likely to be treated under Alternative B would result in a more beneficial impact to greater sage-grouse habitat than the reduced acres in Alternative A.

Visual resources are more protected under Alternative B than Alternative A because Alternative B manages all of the ACEC (the expanded area) as VRM Class II, which would limit new development and other surface-disturbing activities that would adversely impact greater sage-grouse habitat. Because VRM under Alternative A allows much more surface disturbance, Alternative B would result in a substantial benefit to greater sage-grouse. However, this benefit cannot be quantified in the absence of a site-specific analysis.

4.7.5.3.16.5.3. Resource Uses

Alternative B locatable, leasable, and mineral materials management would be much more protective of ACEC values than Alternative A since Alternative B would pursue withdrawal from locatable mineral entry and closes the area to mineral leasing. See the *Special Status Species – Wildlife* section for an analysis of how these uses would adversely impact greater sage-grouse habitat. The ACEC has high potential for uranium and bentonite and some potential for gold. Exploration and development of these locatable minerals include intensive development that would result in the long-term loss, if not the permanent loss, of greater sage-grouse habitat. While areas having high bentonite potential generally do not support suitable greater sage-grouse habitat, strip mining of bentonite would fragment habitat that is suitable, particularly in the area where four-season habitat has been identified. The ACEC has moderate potential for leasable

minerals, including oil and gas and phosphate. Alternative B closes the ACEC to mineral leasing, which would result in a greater beneficial impact to greater sage-grouse than Alternative A, which opens the ACEC subject to standard stipulations.

Alternative B management of wind-energy development and major ROWs and corridors would be substantially more beneficial to ACEC values than Alternative A because Alternative B closes the area to such actions. Approximately 254,839 acres of the ACEC have high potential for wind-energy development.

Alternative B livestock grazing management would result in fewer adverse impacts to ACEC values than Alternative A management. This difference is analyzed in the *Special Status Species – Wildlife* section. Over the twenty year life of the plan, the difference in acres treated to improve habitat would result in more beneficial impacts than emphasizing infrastructure development.

Alternative B travel management would be more beneficial to ACEC values than Alternative A because Alternative B limits travel in the expanded area to designated roads and trails. Alternative B also limits mechanized travel to designated roads and trails, which would limit adverse impacts from wildlife encounters with humans in new roadless areas.

4.7.5.3.16.5.4. Special Designations

The ACEC for the benefit of greater sage-grouse contains within it several ACECs or portions of ACECs including NHT ACEC, South Pass Historic Mining Area ACEC, Lander Slope, Red Canyon, Beaver Rim, and Green Mountain. The impacts of these underlying ACECs would be similar to the management in the expanded area ACEC management. These ACEC designations would beneficially impact greater sage-grouse to the extent that surface disturbance in or near habitat is limited. These limits on surface disturbance would be applied in the expanded Green Mountain ACEC, the northern most extension of the Beaver Rim ACEC, the eastern portion of the Congressional Trails ACEC and the expanded South Pass Historic Mining Area ACEC. Other than designation as an ACEC, Alternative B does not include special designation management that would impact ACEC values.

4.7.5.3.16.6. Alternative C

4.7.5.3.16.6.1. Program Management

Alternative C would not designate any portion of the Local Working Group area or the expanded area as an ACEC. The Alternative C emphasis on resource uses over physical and biological resources would result in more adverse impacts to ACEC values. Alternative C management in the expanded area is consistent with management described in the *Special Status Species – Wildlife* section, and impacts would be the same. As with Alternative A, Alternative C would likely result in the continued downward trend of greater sage-grouse.

4.7.5.3.16.6.2. Resources

As with Alternative A, impacts to greater sage-grouse by resource management actions are described in the *Special Status Species – Wildlife* section. Alternative C management would have generally the same impacts as under Alternative A except to a greater extent because more surface disturbance would be authorized. Alternative C would have the same amount of vegetation treatment as Alternative A with the same limited beneficial impacts to greater

sage-grouse in comparison to Alternative B. Alternative C VRM would be more likely to adversely impact ACEC values than under Alternative B because more surface disturbance and vertical construction, such as fences and power poles (with resulting adverse impacts to ACEC values) would be allowed under Alternative C than under Alternative B.

4.7.5.3.16.6.3. Resource Uses

Adverse impacts to greater sage-grouse from resource uses are analyzed in the *Special Status Species – Wildlife* section. These impacts would generally be somewhat more adverse under Alternative C than Alternative A, and far more adverse than under Alternative B, primarily because of special designation management and limits on surface disturbance under Alternative B. The ACEC has locatable minerals (uranium, bentonite, and some gold), leasable phosphate and extensive mineral materials.

Alternative C management of major ROWs, including wind-energy development, transmission lines would result in substantially more adverse impacts to greater sage-grouse resource than Alternative B. Except for the special designation management identified below, the impacts of major ROWs would be similar to Alternative A but somewhat greater because uses are anticipated to be higher.

Alternative C would allow major ROWs in the expanded area. There is demand in the area for ROWs due to existing and anticipated mineral activities, and industrial wind-energy development and associated transmission lines (also high-profile structures). With no barriers to north south transmission lines (see below under Special Designations), high potential areas such as in the Rattlesnake Mountains and Gas Hills, would be far more likely to be developed, with transmission lines running south through the expanded area. The potential adverse impact to greater sage-grouse would be limited by State of Wyoming Industrial Siting Board rules, but those rules are not applied to non-Core Area.

Livestock grazing management under Alternative C would result in more adverse impacts than Alternative B and similar adverse impacts as Alternative A, except to a greater degree as impacts from more intensive grazing and less controlled range improvement projects would be greater. See the *Special Status Species – Wildlife* section. Increased infrastructure concentrates livestock, adversely impacting vegetation, and fences can fragment habitat and migration corridors. Fences result in adverse impacts to greater sage-grouse because they are both a hazard to flight and a potential perch for predators.

The impacts of travel management under Alternative C would be the same as under Alternative A and less beneficial than under Alternative B.

4.7.5.3.16.6.4. Special Designations

There would be no special designation management of the ACEC under Alternative C and adverse impacts to greater sage-grouse would occur in the expanded area. The degree of adverse impact would depend on what activities would be authorized by the State of Wyoming in issuing mine permits for locatable mineral activities in the Core Area and the approval of the Wyoming DEQ Industrial Siting Board in the Core Area. With only minor exceptions, all of the expanded area is located within the Core Area. ROWs, including transmission lines, would be authorized and not excluded as under Alternative B or avoided in certain areas as under Alternative A where

other ACECs underlying the expanded would limit ROWs. See Alternative B's identification of these other protections.

4.7.5.3.16.7. Alternative D

4.7.5.3.16.7.1. Program Management

Alternative D would designate 35,102 acres in the area identified by the Local Sage-Grouse Working Group as the Twin Creek ACEC (a small portion of the area designated as the Government Draw/Upper Sweetwater Sage-Grouse ACEC under Alternative B) to protect important wildlife resources including greater sage-grouse. The Twin Creek ACEC would be managed as NSO for oil and gas leasing, closed to solid mineral leasing, closed to mineral materials disposals, closed to geophysical operations, withdrawn from locatable mineral entry, and avoided for major and minor ROWs.

In addition to the protections afforded by the Twin Creek ACEC, the area identified by the Local Sage-Grouse Working Group would be protected through management of the Lander Slope, Red Canyon, and South Pass Historical Landscape ACECs. The area includes many important resource values including greater sage-grouse and other wildlife (the area contains important habitat, including winter habitat and crucial winter habitat for all of the big game species present in the planning area) and historic and visual resources. Generally, this area is collectively referred to as the Lander Front-Hudson-Atlantic City area. This area is withdrawn from locatable mineral entry and managed as NSO for oil and gas, avoided in part and excluded in part from ROWs, and closed to solid mineral leasing. Although less protective than the management under Alternative B, the management is more protective of important values in the area, including greater sage-grouse. Alternative D applies Required Design Features to reduce the adverse impacts to area resources from surface disturbance.

Given the importance of the area to greater sage-grouse and other values, the following analysis describes impacts to values of concern beyond the geographical boundary of the Twin Creek ACEC. The area of analysis encompasses the entire Hudson to Atlantic City area (so named because the Hudson to Atlantic City Road makes a large loop through the area) which includes the Twin Creek ACEC. When the larger protected area including Red Canyon and South Pass is referred to, it is called the Lander Front-Hudson-Atlantic City area, which includes all of the South Pass Historical Landscape ACEC. The analysis identifies the special management for only the greater sage-grouse component of management because greater sage-grouse were identified as the relevant and important values in the ACEC originally nominated by WGFD.

The impact of Alternative D general (resource and resource use) management to greater sage-grouse is analyzed in detail in the *Special Status Species – Wildlife* section.

4.7.5.3.16.7.2. Resources

Alternative D would manage physical and biological resources in the Hudson-Atlantic City area more similar to Alternative A than Alternative B. Therefore, beneficial impacts to ACEC values would be more like impacts under Alternative A. Alternative D general wildlife management includes more protections for greater sage-grouse and would result in more beneficial impacts to greater sage-grouse than alternatives A and C, although somewhat less than Alternative B (see the *Special Status Species – Wildlife* section). Alternative D would result in fewer beneficial impacts to greater sage-grouse than Alternative B because Alternative D allows more surface disturbance.

However, Alternative D lek protections and seasonal nesting protections would result in the same beneficial impacts as Alternative B.

Although no additional roads are contemplated under any alternative, Alternative D management of the Hudson-Atlantic City area would result in beneficial impacts to area values similar to Alternative B because Alternative D allows much less surface disturbance than alternatives A and C. Part of the beneficial impacts of reduced surface disturbance would arise from protection of the vegetation (which can take decades to reclaim to predisturbance condition) as well as from the reduced likelihood of INNS spread that accompanies surface disturbance.

Alternative D VRM would include some lands in the area managed as VRM III; therefore, more surface-disturbing and disruptive activities could be authorized than under Alternative B. However, beneficial impacts to greater sage-grouse values would likely be the same under these two alternatives because of the area's minerals and realty management discussed below and because of the Required Design Features.

4.7.5.3.16.7.3. Resource Uses

Locatable and leasable minerals management under Alternative D would result in more adverse impacts to ACEC values than Alternative B, but less than alternatives A and C. Alternative D applies an NSO restriction to oil and gas, which would result in similar beneficial impacts to greater sage-grouse as Alternative B, but would be applied to many fewer acres. Because there is some moderate to low potential for oil and gas in the area, management under Alternative D would result in fewer adverse impacts than Alternative A or C. Alternative D also closes the area to solid mineral leasing, geophysical exploration, and mineral materials disposals. This management would beneficially impact greater sage-grouse, particularly in the portions of the area that have phosphate potential. This management is the same as Alternative B, and would result in far more beneficial impacts than Alternative A or Alternative C.

Alternative D withdraws the Hudson-Atlantic City area, including the entire Twin Creek ACEC, from locatable mineral activities but not the balance of the Government Draw/Upper Sweetwater Sage-Grouse ACEC designated under Alternative B. However, the withdrawal would apply to the area with high to moderate bentonite potential. The area also contains a withdrawal for local, nonmotorized recreational use at Johnny Behind the Rocks, which would result in further beneficial impacts to greater sage-grouse that utilize the area.

The portion of the expanded area designated as an ACEC under Alternative B that is outside the withdrawal area would be managed according to Core Area management under Alternative D. Ninety-nine percent of the lands in the WGFD-nominated area in Alternative B that are outside the withdrawal area are located within Core Area. Although Core Area management would result in somewhat fewer beneficial impacts to greater sage-grouse than under Alternative B, it would be much more beneficial than management under alternatives A and C and would result in beneficial impacts from Required Design Features. However, potential adverse impacts to greater sage-grouse in areas with high to moderate potential for uranium development outside withdrawal areas would be the same under Alternative D as under alternatives A and C, because Alternative D does not restrict uranium development or subject uranium development to caps on surface disturbance as it does for oil and gas and wind-energy development.

The BLM would manage the Hudson to Atlantic City area as an avoidance area for major and minor ROWs, which would result in beneficial impacts to greater sage-grouse resources similar

to those under Alternative B. In the balance of the greater sage-grouse ACEC, Alternative D management for the protection of Congressionally Designated Trails would result in substantial beneficial impacts to greater sage-grouse by limiting surface disturbance in the NTMC. Although Alternative D would result in somewhat more adverse impacts to greater sage-grouse than Alternative B, it would result in greater beneficial impacts than Alternative A or Alternative C.

Impacts from livestock grazing management under Alternative D are described in the *Special Status Species – Wildlife* section and do not vary by any special management. Generally, these would be beneficial in comparison to alternatives A and C but less beneficial than Alternative B. Even if undertaken pursuant to a grazing management strategy, range infrastructure can have adverse impacts to greater sage-grouse. Increased infrastructure concentrates livestock, adversely impacts vegetation, and fragments habitat and migration corridors. Fences can be a considerable adverse impact to greater sage-grouse because they are both a hazard to flight and a potential perch for predators.

Alternative D travel management would result in impacts the same as alternatives A and C, and less beneficial than Alternative B.

4.7.5.3.16.7.4. Special Designations

The Hudson-Atlantic City withdrawal area, which encompasses the Twin Creek ACEC, includes special management that would beneficially impact greater sage-grouse values. Its southern boundary is the Sweetwater River, so it includes a portion of the Sweetwater WSA (which is common to all alternatives) and the ¼-mile buffer for the portion of the Sweetwater River through the Sweetwater Canyon managed as suitable for inclusion in the NWSRS. In addition, the South Pass Historical Landscape ACEC, all of the Beaver Rim ACEC, and the Beaver Rim MLP offer additional protections.

4.8. Socioeconomic Resources

4.8.1. Social Conditions

This section addresses the potential for the alternatives to impact social conditions in the planning area, including direct, indirect, short-term, and long-term impacts. Appendix A (p. 1427) identifies laws, regulations, policies, and guidance considered in the analysis of social conditions.

Potential impacts to social conditions include changes in population, such as fluctuations caused by economic boom-and-bust cycles; changes in the demand for housing and community services, along with community fiscal conditions, which can impact the ability of state, regional, and local governments to supply community services such as education; and changes in community character, culture, and social trends. The BLM does not directly manage social conditions in the planning area. However, BLM management actions have the potential to indirectly impact social conditions. For example, a decision to prohibit future oil and gas exploration or leasing on BLM-administered mineral estate could adversely impact job opportunities in the planning area, which may lead to reductions in populations in parts of the planning area as residents move away to find job opportunities elsewhere (or as fewer people move to the planning area for jobs).

4.8.1.1. Summary of Impacts

Under Alternative B, activities on BLM-administered land and mineral estate related to oil and gas, livestock grazing, and recreation would support an average of 2,621 full-time and part-time jobs per year, which represents approximately 2.1 percent of total employment in the planning area as of 2007 (Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258)). Compared to Alternative A, which essentially represents the continuation of current trends, this represents a decrease of 1,000 jobs (approximate 28 percent decrease), or approximately 0.8 percent of employment using 2007 employment statistics. These job losses would relate to restrictions on development of oil and gas resources and restrictions on grazing. Alternative B would result in more jobs related to recreation. It is possible that more oil and gas wells would be drilled on nearby state or private land, partially compensating for the projected employment decrease.

Table 4.45, “Overall Impacts to Social Conditions by Alternative” (p. 1241) summarizes impacts to social conditions as discussed in this section for alternatives B, C, and D compared to Alternative A. Although the table endeavors to summarize impacts and characterize them as low, medium, or high, it does not classify the impacts as beneficial or adverse. Some interest groups could view social impacts as beneficial; some interest groups could view impacts as adverse. For example, increased emphasis on resource conservation under Alternative B would result in a change from the current balance of uses, which wilderness advocates would likely view as a beneficial impact, but oil and gas development interests would view as adverse. In Table 4.45, “Overall Impacts to Social Conditions by Alternative” (p. 1241), high impacts are those that would result in substantial changes to an existing condition in a way that affects a large number of people and/or endures for a long period. Low impacts are those a limited number of people would experience for a limited time. Medium impacts are intermediate and would fall between high and low.

Table 4.45. Overall Impacts to Social Conditions by Alternative

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Impact on Population	Low Impact	Medium Impact (potential reductions focused in oil/gas service areas, which generally correspond to population centers)	Low Impact	Low Impact
Impact on Housing and Community Services	Low Impact	Medium Impact (due to potential population reductions)	Low Impact	Low Impact
Impacts on Quality of Life and Local Culture	Low Impact	Low Impact (change from recent trends will constitute greater emphasis on resource conservation)	Low Impact (change from recent trends will constitute greater emphasis on resource development)	Low Impact (emphasis on balanced use continues)
Source: Based on the analysis of impacts to social conditions, as described in the text.				
N/A Not applicable				

4.8.1.2. Methods and Assumptions

The BLM used the Impact Analysis for Planning (IMPLAN) model to estimate socioeconomic impacts from BLM management actions under the alternatives. IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model estimate how a specific economic activity translates into jobs and income for the region. It includes the "ripple effect" (or "multiplier effect") of changes in sectors that management actions might not directly impact, but are linked to industries management actions directly impact. In IMPLAN, these ripple effects are called indirect impacts (for changes in industries that sell inputs to the directly affected industries) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

For example, an increase in oil and gas production implies more money would be spent on the maintenance of existing oil and gas equipment and/or new oil and gas equipment; in turn, this implies more money would be spent in sectors that provide inputs to oil and gas support services or in equipment sectors. These production and consumption, or "input-output," relationships allow IMPLAN to estimate indirect and induced impacts based on changes in production that could result under an alternative. Appendix L (p. 1583) provides technical assumptions and additional information about the IMPLAN model.

Analysts compared potential impacts to social conditions associated with each of the alternatives to existing conditions and trends in the planning area to establish a context for impacts. Analysts broadly categorized social impacts as follows: impacts to population; impacts to housing and community services; and impacts to custom, culture, and social trends.

Methods and assumptions used in this impact analysis include the following:

- Economic conditions, especially jobs, labor earnings, and economic output, will continue to influence population growth or decline in the planning area (although this is not the only driver; non-labor income is also important, as noted in the *Economic Conditions* section).
- Any population change that can reasonably be associated with the alternatives will likely be due to changes in employment opportunities.
- Federal, state, and local taxes will continue to be collected on minerals produced in the planning area.
- The pace and timing of economic development in the planning area will continue to depend on many factors beyond BLM management actions. Because the pace of development in the planning area is largely driven by external forces such as worldwide economic trends and technological changes, it is difficult to predict. Therefore, the economic impact analysis – which influences the social impact analysis because of the link between employment opportunities and population – assumes a relatively constant rate of development. Therefore, actual social and economic impacts could differ if the rate of development changes.

4.8.1.3. Detailed Analysis of Alternatives

The analysis of alternatives focuses on the impacts of BLM actions. It is important to note that many other events outside of BLM control could alter economic and social trends. For example, oil and gas prices might change as a result of an expansion or contraction of world or national economic activity, and this, in turn, could affect the pace or amount of development. Similarly, state and local laws regulating the subdivision of land could alter land ownership and development patterns, which may in turn affect open space and physical landscapes. Where

the analysis finds that BLM actions would result in minimal or no change in social conditions, it does not necessarily mean that no change would occur; other forces influence changes in complex economic and social trends.

4.8.1.3.1. Impacts Common to All Alternatives

Humans and associated social and economic conditions are an integral part of ecosystem and community function in the planning area. Lifestyles, attitudes, beliefs, values, social structure, culture, and population characteristics affect and are affected by management actions such as those made by the BLM in the planning area. In addition, both planning area lands and BLM management of these lands have emotional meanings for many people. Varying viewpoints on economic development and conservation of natural resources are expected to cause controversy related to management of BLM-administered land and federal mineral estate.

Any population change that could reasonably be associated with the alternatives would likely be due to changes in employment opportunities. Employment opportunities related to activities on BLM-administered land and mineral estate include jobs in exploration, development, and production of minerals, including oil and gas, solid leasable minerals, and locatable and salable minerals; jobs in livestock production; and jobs in various recreation activities. The economic analysis provides quantitative estimates of employment in the planning area from oil and gas exploration and development, grazing, and recreation activities on BLM-administered lands and mineral estate. Analysts used these quantitative estimates to analyze the impacts of management on population.

The values associated with BLM-administered lands are comprised of market values and non-market values. Market values are those related to goods and services typically bought and sold in markets. For example, commodities such as oil, gas, bentonite, crops, and livestock products, and services such as outfitter trips and fishing guides, are traded in markets. The production and sale of these goods and services results in jobs and income, and the value of these goods to society can be readily expressed in monetary terms. Non-market values relate to things that people value, but are not generally bought or sold in a marketplace. For example, many people value the ability to see a mountain range from a certain vista point, without human-caused haze in the air. Some people value open vistas that lack structures, fences, wind turbines, or other signs of human development. Some people place a high value on their ability to hunt or fish on public lands, and the satisfaction they derive from this ability might exceed the equivalent monetary cost of purchasing the same amount of food from the grocery store or the amount of money they spend on gear. Other people value the knowledge that their great-great-grandchildren, should they choose to reside in Wyoming, would enjoy clean air, open vistas, and the ability to fish and hunt. The common feature of these values is that they are generally not bought and sold like tangible goods and services, and for that reason are difficult to assign a monetary value. Other examples of non-market values include the satisfaction people derive from resources such as clean water, threatened and endangered species, or cultural resources, or even the satisfaction they derive from the knowledge that BLM uses a particular fire management or INNS control regime.

Some of the value associated with open space and other features is captured in markets. For example, the price of a house that overlooks a pristine mountain range might be higher than the price of a house identical in almost every respect but overlooks a cement factory. However, the ability to see an open landscape while driving along a highway is not likely to be captured in the market. A related concept is that some changes in management could affect both market and non-market values. For example, industrial development that substantially alters the visual

characteristics of the landscape might, over time, result in fewer tourists visiting the area from afar and spending money in local hotels, restaurants, and shops. This decline in tourism would result in adverse impacts to employment and income. Such industrial development also could reduce the satisfaction of local residents who value open space, and therefore would result in adverse impacts to non-market values. Conversely, new industrial development also would generate jobs and income, and the net effect – if all values were to be expressed in the same metric (dollars), could be positive or negative.

Although economists have developed approaches to assign a monetary value to things that are not traded in the marketplace, the approaches for doing so are often complex, controversial (due to the subjective nature of assigning a dollar value to something that is neither bought nor sold), and require considerable resources and time to properly analyze and interpret. For example, stated-preference methods (surveys) are a common approach for placing a monetary value on clean air and open views. A survey might present people with images of a mountain vista with different degrees of haze superimposed, and ask people to express how much they would be willing to pay for the ability to see the vista with lower levels of haze for a certain number of days per year. However, research has shown that the survey design, sample size, and outreach methods can have a dramatic influence on the results. Furthermore, surveys are most effective when they focus on a single, specific type of non-market value and effects thereto (e.g., regional haze that affects visibility of a vista) rather than an agglomeration of effects (e.g., regional haze, industrial development on a landscape, clean water, preservation of cultural resources, preservation of wilderness, etc.). Due to the complexity and cost of implementing non-market valuation methods, quantifying these values is beyond the scope of this analysis. However, the BLM recognizes that changes in non-market values would be likely, and the severity of impacts would depend on the level of resource protection and development under each alternative. The development of oil and gas resources and other minerals, and development of ROWs, renewable energy facilities, and other structures, would likely result in adverse impacts to non-market values under all alternatives. Furthermore, alternatives that emphasize resource development over conservation likely would result in more impacts to non-market values.

Because of the close relationship between non-market economic values and how individuals in the planning area perceive their own quality of life, impacts to non-market values are discussed – qualitatively – under *Quality of Life and Local Culture*. Related to quality of life, it is important to note that a relatively large share of personal income in the planning area – especially in Fremont County (38 percent) and Hot Springs County (42 percent) – is from non-labor income. This means that a large proportion of the population in the planning area receives income from investments and dividends, and government transfer payments such as those from Social Security. To the degree that the local economy in these counties relies on non-labor income, and that people choose to retire to the area based on the quality of life available, overall quality of life – incorporating factors such as environmental amenities, cost of living, and cultural values – could result in a substantial impact to the continued economic viability and resilience of the counties.

With mounting economic pressures on the livestock sector, some ranch owners have raised money for retirement or other purposes by subdividing portions of their land into “ranchettes” and selling them to individuals. The sale of these ranchettes provides financial liquidity to ranchers who frequently have most of their assets in land, but generally results in increased building of fences, houses, and sometimes other structures (e.g., barns), changing the visual landscape. Under all alternatives, this trend would be likely to continue, because it is fundamentally related to (1) the nature of the ranching business (principally, the fact that most ranchers’ assets are in land, and the fact that profit margins are generally low and can turn negative in drought or other adverse

conditions) and (2) state laws that govern property subdivision, under which county zoning laws cannot regulate subdivisions of 35 acres and larger. However, alternatives that would adversely impact the profitability of ranching could serve to increase this trend. Because the subdivision of ranch land affects local culture and quality of life, impacts to this trend are discussed under *Quality of Life and Local Culture*.

The economic and social analysis incorporates variations in pace of development over time. However, under all alternatives, the pace of development could differ from the rate assumed in the analysis. The BLM has limited control over the pace of development because it only authorizes economic activities such as oil and gas drilling, and does not perform these activities. An abrupt shift in the pace of development could result in short-term impacts (beneficial or adverse) to the demand for housing and community services, and to the supply of tax revenues from residences or businesses to support community services, due to short-term changes in job opportunities and the resulting change in in-migration or out-migration trends. Any such impacts would likely be more severe for smaller communities, which are less likely to be able to absorb a sudden influx of new residents, or to continue to support existing infrastructure if out-migration were to increase suddenly.

Under all alternatives, the BLM continues to consider socioeconomic impacts of site-specific actions and incorporates socioeconomic issues into analyses of environmental, social, and economic impacts, such as the NEPA-required analyses for site-specific actions.

4.8.1.3.2. Alternative A

Impacts to Population

As noted under *Impacts Common to All Alternatives*, changes in employment opportunities could result in changes to population and demographics. Under Alternative A, activities on BLM-administered land and mineral estate related to oil and gas, livestock grazing, and recreation would support an average of 3,622 full-time and part-time jobs per year (Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258)), which represents approximately 2.9 percent of total employment in the planning area counties using 2007 employment statistics. The total number of supported jobs in oil and gas, livestock grazing, and recreation under Alternative A would be approximately 28 percent higher than under Alternative B, 5 percent higher than Alternative D, and approximately equal to Alternative C. It is important to note that this does not constitute an increase of 3,622 jobs per year over current employment; it more closely represents an estimate of the contribution of certain activities on BLM-administered lands and mineral estate to overall employment in the planning area.

As shown in the analysis of impacts to economic conditions, approximately 90 percent of the job opportunities from activities analyzed using the IMPLAN model would be related to oil and gas development and production (3,309 jobs). Livestock grazing would contribute approximately 5 percent of the job opportunities (180 jobs), and recreation would contribute the remainder (133 jobs). These jobs would be geographically dispersed across the planning area, because all three sectors operate across the planning area. BLM-administered lands provide recreational opportunities over the entire planning area, there are active oil and gas wells throughout the planning area, and livestock grazing is authorized on BLM-administered lands throughout the planning area. The average annual number of jobs supported by recreation activities would be lower under Alternative A than Alternative B; however, oil and gas development and production

would support approximately 30 percent more average annual jobs than Alternative B, and livestock grazing would support approximately 23 percent more jobs.

Job opportunities (and resulting increases or shifts in population) would likely concentrate in population centers such as Lander and Riverton, and especially in oil and gas service centers such as Casper, Rock Springs, and Green River. Management under Alternative A might not result in noticeable impacts to the current distribution of job opportunities in the planning area for several reasons. First, Alternative A maintains current management. Second, the current contribution of economic activity on BLM-administered lands accounts for a relatively small proportion of jobs in the planning area (2.9 percent, according to the IMPLAN analysis of oil and gas, livestock grazing, and recreation under Alternative A). Lastly, the IMPLAN analysis considers jobs in all sectors – including industries directly affected by BLM actions (e.g., mining) and those indirectly affected (e.g., retail jobs created by expenditures of workers in various industries). As a result, Alternative A would not alter the overall trend of BLM-authorized activities and associated population changes in the planning area.

Impacts to Housing and Community Development

Changes in population have the potential to change the demand for housing and community services such as roads, schools, and police and fire protection. As described in Chapter 3, county-wide vacancy rates in 2000 (the latest year for which data are available) were 26 percent in Carbon County, 13 percent in Fremont County, 17 percent in Hot Springs County, 10 percent in Natrona County, and 11 percent in Sweetwater County. These percentages represent approximately 2,200 vacant units in Carbon, 2,000 vacant units in Fremont, 400 in Hot Springs, 3,000 in Natrona, and 1,800 in Sweetwater counties. Vacancy rates for rental properties in the planning area have declined since 2001-2002. However, because Alternative A would not change the direction of current BLM management, it would not be expected to result in changes to either the total demand for housing and community services or its geographic distribution.

As noted under *Impacts Common to All Alternatives*, if development occurs slower or faster than the relatively steady pace assumed in the analysis, there could be short-term impacts to demand for housing and community services, and to the supply of tax revenues from residences or businesses to support community services. It would likely be more difficult for smaller communities to absorb sudden changes of this nature. If national and international energy prices, operator business strategies, or other factors lead to a rapid pace of development, there could be sudden short-term increases in demand for community services as a result of new jobs and increased population. However, local and state tax revenues collected from energy production could help mitigate short-term increases in demand for services, because tax revenues help pay for community services.

Impacts to Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative A will maintain existing BLM policies in their present state. Historically, these policies have contributed, along with other government policies and the actions of private firms and residents, to economic viability and resilience in the planning area. Alternative A would not preclude other forces

(beyond BLM-authorized actions) from driving any changes to the economic, physical, and social conditions in the planning area.

Although there are groups with particular interests regarding specific land uses (e.g., wilderness advocates, oil and gas interests, and ranchers), overall, the residents of the planning area tend to support both conservation of natural resources and the economic viability of resource-based industries. For this reason, residents generally support multiple use of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative A would continue current BLM management for multiple uses without a particular emphasis on conservation (as there would be under Alternative B) or resource use and development (as there would be under Alternative C).

Under Alternative A, continued development of oil and gas wells, ROWs, and other human-made structures on the landscape would continue to result in decreases in non-market values associated with open space and wilderness. Because the alternative essentially represents continuation of current management actions, these decreases would likely be consistent with historic trends. Under this alternative, subdivision of ranch land and related development and sale of ranchette parcels would continue, again generally consistent with historic trends.

As indicated under *Impacts Common to All Alternatives*, under this alternative, as under all the alternatives, the BLM would continue to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions.

4.8.1.3.3. Alternative B

Impacts to Population

Under Alternative B, activities on BLM-administered land and mineral estate related to oil and gas, livestock grazing, and recreation would support an average of 2,621 full-time and part-time jobs per year, which represents approximately 2.1 percent of total employment in the planning area as of 2007 (Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258)). Compared to Alternative A, which essentially represents the continuation of current trends, this represents a decrease of 1,000 jobs (approximate 28 percent decrease), or approximately 0.8 percent of employment using 2007 employment statistics. These job losses would relate to restrictions on development of oil and gas resources and restrictions on grazing; Alternative B would generate more jobs related to recreation. It is possible that more oil and gas wells would be drilled on nearby state or private land, partially compensating for the projected employment decrease.

A decrease in employment opportunities could result in a decrease in population in the planning area because people might leave the area to seek employment elsewhere. The expected magnitude of any such decrease would be similar to the magnitude of employment loss. However, the anticipated loss in population would likely be lower because some people (e.g., retired people) do not depend directly on employment for their economic well being. In addition, an action that results in decreased employment opportunities and improved environmental quality could result in more retirees or other people moving to the area, or remaining there for longer. Because these people support themselves on unearned income and do not depend directly on employment for their economic survival, a policy designed to enhance environmental quality may lead to more of these people moving in or less moving out. In other words, if 0.8 percent of employed people

and their families left the planning area, it could be argued that the population would likely decrease by less than 0.8 percent because there would be some offset to the indirect and induced employment impact of this alternative attributable to those residents attracted to the planning area who are retired or otherwise non-working.

As noted in the *Economic Conditions* section, approximately 88 percent of the job opportunities from activities analyzed using the IMPLAN model would be related to oil and gas development and production under Alternative B (2,305 jobs). Livestock grazing would contribute approximately 5 percent of the job opportunities (139 jobs), and recreation would contribute another 7 percent (178 jobs). These jobs would be geographically dispersed across the planning area, as under Alternative A. Compared to Alternative A, Alternative B would generate approximately 33 percent more jobs in recreation, but 23 percent fewer jobs in livestock grazing and 30 percent fewer jobs in oil and gas exploration and production.

Job opportunities and job losses (and resulting shifts in population) under Alternative B would be concentrated primarily in population centers. Because most job losses under Alternative B would be related to decreased oil and gas development, any population changes would focus on areas that service oil and gas fields, such as Rock Springs and Casper. There are oil and gas fields throughout the planning area, and overall, the distribution of any job losses would likely occur throughout the planning area. In addition, the IMPLAN analysis considers jobs in all sectors – including industries BLM actions directly affect (e.g., mining) and those that BLM actions indirectly affect (e.g., retail jobs created by expenditures of workers in various industries). As a result, Alternative B would not alter the overall trend of BLM-authorized activities and associated population changes in the planning area.

Impacts to Housing and Community Services

Alternative B could result in decreased population compared to other alternatives, which could result in decreased demand for housing and community services. However, using the same argument presented in the Alternative A narrative, these impacts may be somewhat mitigated by the emphasis on enhancing environmental quality. Alternative B also would result in a reduced tax base for providing community services, as described in the *Economic Conditions* section. The geographic distribution of these changes is difficult to predict because tax losses in specific jurisdictions are driven by oil and gas well locations. There is oil and gas potential throughout the planning area, and the RFD does not predict specific well locations (BLM 2009c).

Impacts to Quality of Life and Local Culture

As described for Alternative A, quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative B would reduce economic opportunities, but would also result in decreased air pollution and other adverse environmental impacts associated with oil and gas development compared to alternatives A, C, and D.

As noted for Alternative A, residents generally support multiple use of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative B would continue the BLM current practice of allowing multiple uses, but would prioritize resource conservation over resource uses such as oil and gas development. This might be inconsistent with the culture advocated by some interest groups

(e.g., oil and gas interests) and could promote the culture advocated by others (e.g., wilderness advocates).

Under this alternative, continued development of oil and gas wells, ROWs, and other human-made structures on the landscape would continue to result in decreases in non-market values associated with open space and wilderness. However, because this alternative emphasizes resource conservation, the magnitude of these decreases would be less than historic trends and less than under Alternative A. Under Alternative B, subdivision of ranch land and related development and sale of ranchette parcels would continue. This continuation could be more intense than historic trends because Alternative B would likely result in measurable impacts to allotments for many operations that use federal land for forage.

4.8.1.3.4. Alternative C

Impacts to Population

Under Alternative C, activities on BLM-administered land and mineral estate related to oil and gas, livestock grazing, and recreation would support an average of 3,617 full-time and part-time jobs per year (Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258)), which represents approximately 2.9 percent of total employment in the planning area using 2007 employment statistics. Compared to Alternative A, which essentially represents the continuation of current trends, Alternative C would result in approximately the same number of jobs (a decrease of five jobs). Alternative C would generate slightly fewer jobs in livestock grazing and recreation, and slightly more jobs related to the development of oil and gas resources.

As noted in the *Economic Conditions* section, approximately 92 percent of the job opportunities from activities analyzed using the IMPLAN model would be related to oil and gas development and production (3,324 jobs). Livestock grazing would contribute approximately 5 percent of the job opportunities (170 jobs), and recreation would contribute the remainder (123 jobs). These jobs would be geographically dispersed across the planning area, as described for Alternative A.

Compared to Alternative A, this alternative would result in essentially the same number of jobs, based on the IMPLAN results. Likewise, compared to Alternative A, a change in population would not be expected. Moreover, while the IMPLAN results suggest slight job declines in both livestock grazing and recreation, and a minor increase in oil and gas, these changes would not have a measurable impact on the population distribution compared to current conditions and historic trends, for the same reasons described under Alternative A.

Impacts to Housing and Community Services

Alternative C would result in about the same population and, therefore, about the same demand for housing and community services as Alternative A. Alternative C would result in essentially an identical tax base for providing these services, as described in the *Economic Conditions* section.

Impacts to Quality of Life and Local Culture

Alternative C would result in about the same economic opportunities in the planning area as Alternative A. However, because of the greater emphasis on resource use under Alternative C, it

could result in additional adverse impacts to air quality, wildlife, and other resources that improve quality of life related to natural characteristics.

Alternative C will continue BLM current practice of allowing multiple uses, but prioritizes the use of resources such as oil and gas development over the conservation of resources such as air quality and wildlife. This might be consistent with the culture advocated by some interest groups (e.g., oil and gas interests) and inconsistent with the culture advocated by others (e.g., wilderness advocates).

Under this alternative, continued development of oil and gas wells, ROWs, and other human-made structures on the landscape would continue to result in decreases in non-market values associated with open space and wilderness. However, because this alternative emphasizes resource development, the magnitude of these decreases would be greater than historic trends and greater than impacts under Alternative A. Under Alternative C, subdivision of ranch land and related development and sale of ranchette parcels would continue. This continuation would generally be consistent with historic trends, because Alternative C would result in relatively little impact to the economics of ranching.

4.8.1.3.5. Alternative D

Impacts to Population

Under Alternative D, activities on BLM-administered land and mineral estate related to oil and gas, livestock grazing, and recreation would support an average of 3,423 full-time and part-time jobs per year (Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258)), which represents approximately 2.8 percent of total employment in the planning area using 2007 employment statistics. Compared to Alternative A, which essentially represents the continuation of current trends, Alternative D would result in a small decrease in the number of jobs. Alternative D would result in slightly fewer jobs in livestock grazing and the development of oil and gas resources, and slightly more jobs related to recreation.

The decrease in employment opportunities, which amounts to 0.1 percent of current employment, could result in a small decrease in population in the planning area as people leave the area in search of work elsewhere. A decrease in employment opportunities could result in a decrease in population in the planning area because people might leave the area to seek employment elsewhere. The expected magnitude of any such decrease would be similar to the magnitude of employment loss. However, the anticipated loss in population would likely be lower because some people (e.g., retired people) do not depend directly on employment for their economic well being. In addition, an action that results in decreased employment opportunities and improved environmental quality could result in more retirees or other people moving to the area, or remaining there for longer. Because these people support themselves on unearned income and do not depend directly on employment for their economic survival, a policy designed to enhance environmental quality may lead to more of these people moving in or less moving out. In other words, if 0.1 percent of employed people and their families left the planning area, it could be argued that the population would likely decrease by less than 0.1 percent because there would be some offset to the indirect and induced employment impact of this alternative attributable to those residents attracted to the planning area who are retired or otherwise non-working.

As noted in the *Economic Conditions* section, approximately 91 percent of the job opportunities from activities analyzed using the IMPLAN model would be related to oil and gas development

and production (3,109 jobs). Livestock grazing would contribute approximately 5 percent of the job opportunities (163 jobs), and recreation would contribute the remainder (152 jobs). These jobs would be geographically dispersed across the planning area, similar to Alternative A.

Alternative D would result in a population similar to Alternative A, with relatively small changes overall. Therefore, Alternative D would not substantially affect population distribution, increase, or movement compared to current conditions and historic trends, for the reasons described under Alternative A.

Impacts to Housing and Community Services

Alternative D would result in about the same population and, therefore, about the same demand for housing and community services as Alternative A. Alternative D would result in a slightly smaller tax base for providing these services, as described in the *Economic Conditions* section. The geographic distribution of these changes is not possible to predict because higher tax revenues in specific jurisdictions are driven by oil and gas well locations. There are oil and gas resources throughout the planning area, and the RFD does not predict specific well locations (BLM 2009c).

Impacts to Quality of Life and Local Culture

Alternative D would result in about the same economic opportunities in the planning area as Alternative A. However, it would also result in some beneficial impacts to air quality, wildlife, and other resources that improve quality of life related to natural characteristics. The balanced management approach under Alternative D could increase the quality of life in the long term and increase the economic viability and sustainability of communities.

Alternative D balances the use of resources such as oil and gas reserves with the conservation of resources such as air quality, open space, and wildlife habitat. The balanced use approach is intended to support the culture advocated by some interest groups (e.g., oil and gas interests) and interest groups (e.g., wilderness advocates). Alternative D provides for resource development and associated job opportunities while managing for non-market values associated with open space and natural characteristics.

Under this alternative, subdivision of ranch land and related development and sale of ranchette parcels would continue. This continuation would generally be consistent with historic trends, because Alternative D would result in relatively little impact to the economics of ranching.

4.8.2. Economic Conditions

This section addresses the potential for the alternatives to impact economic conditions in the planning area, including direct, indirect, short-term, and long-term impacts. Appendix A (p. 1427) identifies laws, Executive Orders, regulations, policies, and guidance considered in the analysis of economic conditions.

Potential impacts to economic conditions include changes in regional economic output, employment, and earnings, and in tax revenues for local, state, and federal governments. In terms of economic modeling analysis, direct and indirect impacts are assumed to occur simultaneously, although in reality these impacts could take time to work their way through the economic sectors in the analysis area. For example, an action to permit gas exploration and production could result in the direct infusion of money into several economic sectors, and indirect infusions into related

sectors such as retail, accommodation and food services, and education and other social services. In economic modeling, these impacts are assumed to occur instantaneously. Moreover, continued direct infusion of money into the planning area's economy created by the decision to lease oil and gas is analyzed over the life of the project, which in this case represents a multi-year period of production. Therefore, the analysis is designed to account for the economic activity produced by planning decisions over time. The impacts are estimated on an annual basis through 2027, based on the estimated annual direct impact of the alternatives.

Although the transfer of money from directly and indirectly affected sectors is assumed to be instantaneous (by the structure of the model), the model does incorporate gradual changes in the economy based on the gradual development of the various resources under the alternatives. For example, impacts to grazing allotments from surface-disturbing actions are expected to occur gradually over 20 years, and the drilling of new oil and gas wells is expected to occur gradually over a similar period. Appendix L (p. 1583) provides details about the time-phasing assumptions for resource development, loss of AUMs for livestock grazing, and other changes.

The economic analysis is based on a set of assumptions that allow the BLM to compare the economic consequences of each alternative. As stated in multiple places, these assumptions are not predictions, ceilings, or caps as to what will occur in the future. Some of this is well known, such as the amount of acres of disturbance needed to accommodate an oil rig to drill a well to a specific depth. However, much is not known, such as which zones are targeted for development. Some of the wells that have been drilled in the planning area exceed 22,000 feet in depth; such a well requires a larger drill rig than a producing zone of less than 1,000 feet. The target zone will dictate whether it can be directionally drilled, which in turn determines the amount of surface disturbance associated with the well.

There are also things that the BLM cannot know at this time, such as technology changes that would make areas known to contain hydrocarbons accessible. Fracking or CBNG extraction are two such potential "game changers." If the technology changes so extensively that the basis for the analysis is undermined, new analysis can be necessary, particularly where the BLM identifies areas requiring additional protections or limitations that would have been evaluated had the extent of the development been properly understood. However, this "unknown" category should not be overstated. Oil shale-tar sands are a good example. Throughout Colorado, extensive hydrocarbon resources were known to exist but were not developed for decades because the technology did not support their economic recovery. Once the technology advanced, accompanied by increases in product price, recovery became possible. That technological advance, however, did not make any difference to the vast majority of the planning area that does not contain oil share-tar sands. Where mineral resources do not occur, improvements in technology will have no impact on economic outcomes. This is why the analysis of the economic impacts of prescriptions on mineral development are tempered by mineral potential.

The BLM has determined that there is value to the decision maker in comparing economic outcomes of the alternatives using the same knowledge base with the same possibility of errors in prediction. Because the BLM cannot have perfect knowledge, reasonably applying what we do know uniformly achieves a comparison that allows the decision maker to understand how the outcomes compare.

The BLM considered whether it was necessary to recalculate the economic and other consequences in the changes in management between the analysis of Alternative D in the Draft RMP and EIS and Alternative D in the Proposed RMP and Final EIS. Oil and gas development is

the highest contributor to economic output and the highest emitter of air pollution of all authorized activities (noting that the BLM did not analyze CH₄ production of livestock cattle grazing) and the sector that would lead to the most surface disturbance. The BLM compared the number of wells that would likely occur under Alternative D in the Draft RMP and EIS and Alternative D in the Proposed RMP and Final EIS. Based on the constraints applied under Alternative D, the BLM determined that across the planning area over a 20-year period, it is likely that 50 fewer wells or approximately 1.6 percent of the total wells analyzed under the Draft RMP and EIS would be drilled. This difference was considered so small, particularly in consideration of the uncertainties of the analysis, that further re-analysis was not required. The emissions, surface disturbance, income, wages, and royalties are not calculated with sufficient precision for a 2.5-well-per-year inaccuracy to be statistically significant. If this was true for the most important area of development, then the changes in other areas of development would be even less important.

The BLM oil and gas calculations (and others) use a 20-year period for analysis. This is by no means to suggest that the RMP will be in place for 20 years. It could be replaced before then if situations change that cannot be addressed by amendment, or it could be in place longer, as is the case with the 1987 RMP. The assumptions discussed above and throughout the analysis require a set period to provide analysis parameters. There is limited utility in making assumptions for actions farther out than 2 decades, given known data limits.

4.8.2.1. Summary of Impacts

Based on results from the IMPLAN model used to quantify economic activity measured by sectoral output, earnings, and employment in conjunction with estimated tax revenues and a qualitative analysis of activities on BLM-administered land and mineral estate, the impacts associated with alternatives A and C would be almost identical. Earnings, output, employment, and tax revenues would be somewhat lower under Alternative D, and substantially lower under Alternative B. Much of the difference is from projected oil and gas activity (highest under alternatives A and C). Earnings, output, and employment from recreation would be highest under Alternative B, second highest under Alternative D, and about the same under alternatives A and C. Economic activity related to grazing would be highest under Alternative A, lowest under Alternative B, and about the same under alternatives C and D, which are slightly lower than Alternative A. Economic activity related to other sectors not modeled using IMPLAN, including renewable energy, locatable minerals, and salable minerals, would be similar across all the alternatives, at least in the first 5 to 10 years of the planning period. In the latter half of the planning period, economic activity from renewable energy could be somewhat higher under alternatives A and C compared to alternatives B and D; however, the overall amount of activity is uncertain.

Table 4.46, “Comparison of Projected Earnings and Employment” (p. 1254) compares projected earnings and employment related to activities on BLM-administered lands to the levels in 2007 for the five-county region. As the table shows, Alternative A would result in about \$196 million in earnings annually, and 3,622 jobs annually, from BLM-administered land and resources. Alternative B would generate about \$139 million in earnings and 2,621 jobs; Alternative C would generate approximately \$196 million in earnings and 3,617 jobs; and Alternative D would generate about \$184 million in earnings and 3,424 jobs. Therefore, alternatives A and C would result in about the same amount of earnings and employment, and both would be somewhat higher than under Alternative B and slightly higher than under Alternative D.

It is useful to compare the differences in earnings and employment across alternatives not only in absolute terms, but also to the size of the regional economy. The earnings associated with Alternative A, compared to 2007 earnings for the planning area counties, represent about one-fourtieth (2.5 percent) of the magnitude of those earnings. The average employment associated with BLM-administered lands under Alternative A represents a little less than one-thirty-fifth of employment in year 2007, or 2.9 percent. Earnings associated with BLM-administered lands under alternatives B, C, and D, respectively, would constitute 1.8, 2.5, and 2.4 percent of year 2007 earnings. Employment associated with BLM-administered lands under alternatives B, C, and D constitute 2.1, 2.9, and 2.8 percent of employment in year 2007. This provides a useful perspective on the relative importance of BLM-administered lands in the overall regional economy, and also shows that the differences among alternatives – in relation to the regional economy – would be relatively small. For example, the difference in earnings projected under alternatives A and D would be just 0.1 percent of earnings in year 2007 (2.5 minus 2.4), which would be barely noticeable from a statistical perspective, and would not lead to wholesale changes in regional economic activity. Other national, state, and regional policies and trends, such as the value of the dollar, federal fiscal and monetary policy, and global oil and gas prices, would result in a substantially larger impact to economic activity in the planning area.

Table 4.46. Comparison of Projected Earnings and Employment

Measure	Alternative A	Alternative B	Alternative C	Alternative D
Forecasted annual earnings due to activities on BLM-administered surface ¹	\$195.6	\$138.8	\$195.9	\$184.2
Total labor earnings in 2007 dollars	\$7,718	\$7,718	\$7,718	\$7,718
Forecasted annual earnings as a percentage of 2007 earnings	2.5%	1.8%	2.5%	2.4%
Forecasted annual employment due to activities on BLM-administered surface ¹	3,622	2,621	3,617	3,424
Total employment in 2007 dollars	123,377	123,377	123,377	123,377
Forecasted annual employment as a percentage of 2007 employment	2.9%	2.1%	2.9%	2.8%
Source: Forecasted annual earnings and employment are calculated based on the IMPLAN model, as described in the text. Earnings and employment for 2007, for the five planning area counties, are from BEA 2009. Earnings are in millions of year 2007 dollars. ¹ Estimate of annual earnings and employment includes direct, indirect, and induced economic activity (the “multiplier effect”). BLM Bureau of Land Management IMPLAN Impact Analysis for Planning Model				

4.8.2.2. Methods and Assumptions

The analysis in this section is based on the IMPLAN model as described at the beginning of the *Social Conditions* section. IMPLAN focuses on all market transactions within the study area and serves as a tool for quantifying the earnings and employment associated with a given BLM alternative. However, it does not address benefits and costs nor does it address non-market impacts. It also does not specifically address the issues involved with non-earned income. This is an important consideration because some parts of the planning area, such as Fremont County, derive almost 40 percent of personal income from non-labor sources; in Hot Springs County, non-labor income accounts for more than 40 percent of personal income. From a public land policy perspective, it is important to recognize this distinction when interpreting the IMPLAN results.

Methods and assumptions used in this impact analysis include the following:

- Employment, earnings, and output continue to influence economic and population change in the planning area (although non-labor income also is a key influence, particularly in Fremont and Hot Springs counties, as noted immediately above).
- Economic benefits to the planning area accrue from BLM-influenced activities, such as oil and natural gas development, livestock grazing, and recreation. Economic benefits to the planning area also accrue from wildlife grazing, to the extent that wildlife grazing contributes to the availability of and demand for recreational activities.
- Indirect and induced benefits due to minerals, livestock grazing, and recreation can reasonably be estimated by the IMPLAN model. (The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the planning area.)
- Residents spend money on recreation in the planning area, but this does not represent new money coming into the planning area; therefore, the analysis of economic impacts from recreation considers only recreation expenditures of nonresidents in the five-county planning area. In other words, there is a multiplier effect associated with nonresident recreation-related spending because it results in an input of new money into the planning area. By comparison, it is assumed that recreation-related expenditures of people who live in the planning area will generally be spent in the area (although not necessarily on the same activities), given the set of possible management actions represented by the range of alternatives analyzed.
- For livestock grazing, the analysis reflects a “worst-case” assumption that all acres affected by surface-disturbing actions (from all the sources listed in Appendix T (p. 1641)) are lands currently authorized for grazing. Therefore, the number of acres available for grazing in 2027 is the number of acres currently available, minus acres affected in the long term by surface-disturbing actions. In addition, the analysis of grazing reflects the assumption that surface-disturbing actions occur at a constant rate over time.
- For livestock grazing, the analysis of baseline AUMs available and reductions in AUMs is adjusted for the ratio of actual use to permitted use, which is calculated based on the long-term average of authorized and permitted AUMs for the planning area from 1989 to 2008. This long-term average is 73 percent. For Alternative B, because there would be a substantial reduction in permitted AUMs, the estimated ratio of actual use to permitted use would be somewhat higher, moving steadily from 73 percent in the first year of analysis to 95 percent in the final year of analysis. Appendix L (p. 1583) provides more details regarding this adjustment. The data used for Alternative D for IMPLAN reflected AUM levels equal to Alternative C. However, as environmental analysis of the impacts from other management actions was assessed, BLM determined that over time there would be a reduction in AUMs in Alternative D to meet rangeland health standards in places with high resource conflict.

The pace and timing of economic development in the planning area depends on many factors beyond BLM management. These include national and international energy demand, supply, and prices; operator business strategies; production conditions in the planning area; and demand and supply for agricultural products. Because the pace of development in the planning area is driven largely by external forces such as worldwide economic trends and technological changes, it is difficult to predict. Therefore, this analysis assumes a relatively constant rate of development, and actual impacts might differ (e.g., there could be boom-and-bust type short-term impacts) if the rate of development changes substantially.

The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the planning area. As a result, the calibrated model does a better job of generating multipliers and the subsequent impacts that reflect the interaction between and among the sectors in the planning area compared to a model using unadjusted national coefficients. Specifically, worker productivity in oil and gas production is higher in Wyoming than nationally, and more of the hay used for livestock feed is produced in the planning area, compared to national averages. Key variables used in the IMPLAN model were filled in using data specific to Wyoming, including employment estimates, labor earnings, and total industry output.

4.8.2.3. Detailed Analysis of Alternatives

4.8.2.3.1. Impacts Common to All Alternatives

The focus of this analysis is the resource activities that land management decisions would most likely impact, including oil, gas, livestock grazing, and recreation. Actions from resource programs or constraints (as described for each alternative) that impact oil, gas, livestock grazing, and recreation (e.g., surface-disturbing activities that impact the amount of land available for grazing) are included by implication. Also included by implication are restrictions on ROWs and corridors, because the RFD scenario for oil and gas, which provides estimated numbers of oil and gas wells and production, incorporates the restrictions on ROWs and corridors (BLM 2009c). Restrictions on new ROWs tend to be a negligible factor in the decision to develop additional oil and gas wells in fields that are already producing, but could be an important factor in a decision to develop a new field.

Among renewable energy sources, wind and likely also solar have moderate potential in the planning area; geothermal energy has low potential, and the primary potential for biomass energy is from a pine-beetle kill. The primary drivers of the pace of wind-energy development will be market forces and policy variables outside the scope of this RMP. BLM decisions regarding management of BLM-administered land would result in some impacts in relation to economic opportunities related to wind-energy development, but the influence of BLM RMP decisions would be small in relation to the influence of market conditions and policies.

Changes in economic activity impact federal, state, and local tax revenues. While all sectors of the economy contribute to tax revenues, the analysis of impacts to tax revenues focuses on oil and gas production, because almost all of the measurable variation in economic activity among alternatives is in oil and gas.

The focus of the analysis is on regional earnings and output, employment, and tax revenue, with the region defined as the five-county planning area. The IMPLAN model is run at a regional (multi-county) scale, with the mathematical relationships that describe linkages between sectors aggregated to the five-county level. Because of this mathematical aggregation, it is not possible

to identify total economic impacts for an individual community. For additional information on the structure of the IMPLAN model and specific assumptions made for the economic modeling analysis, refer to Appendix L (p. 1583).

4.8.2.3.2. Alternative A

Impacts to Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative A for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$196 million per year between 2008 and 2027, and regional output would average approximately \$1,556 million per year, resulting from development and activities on BLM-administered land and mineral estate. The net present value of the stream of regional output, discounted at a 7 percent real discount rate (Office of Management and Budget 1992) would be approximately \$15.3 billion over 20 years. Table 4.47, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1258) summarizes and compares sector-level breakouts for earnings and output by alternative.

Regarding renewable-energy development, Alternative A maintains the current management approach of permitting renewable-energy development on a case-by-case basis. This could result in adverse impacts by increasing uncertainty for individual firms considering developing renewable energy in the planning area. Increased uncertainty can hinder development compared to having a well-established process. The market for wind energy is growing; however, the lack of transmission lines between areas of high wind-energy potential and population centers is still an issue that must be overcome before large-scale wind-energy generation would occur (see the *Renewable Energy* section for details). Because the renewable-energy market is still developing and necessary transmission infrastructure is lacking, long-term impacts to the regional economy related to renewable-energy development under Alternative A are uncertain. However, new energy-generation projects take several years to obtain financing and permitting – even where transmission lines exist – so it is likely that any economic impacts related to renewable energy policy would be relatively small for at least the first 5 to 10 years of the planning period.

Regarding economic activity associated with locatable mineral development and mineral materials disposals, the BLM generally expects to meet market demand and respond to applications and does not anticipate that the production of these minerals would vary across alternatives. Alternative A, in particular, will maintain the current management approach to leasing BLM-administered lands for exploration and development, and would likely not result in impacts compared to current conditions.

Impacts to Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, impacts to employment are closely related to impacts to economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative A for the modeled sectors would average approximately 3,622 jobs per year between 2008 and 2027 due to activities on BLM-administered lands and mineral estate. Note that the number of jobs is expressed as “annual job equivalents,” where one annual job equivalent represents 12 months of employment. For

example, 1 annual job equivalent could represent 2 jobs for 6 months each, or 1 job for 12 months. Annual job equivalents can represent full-time or part-time jobs. Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258) provides information on how these jobs break out by sector.

Note that the data in Table 4.47, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1258) and the other tables in this section showing the results of the economic model analysis, reflect direct, indirect, and induced impacts to economic conditions. For example, earnings and employment figures are for the oil and gas, livestock grazing, and recreation sectors, and all other sectors that relate to those sectors in the interlinkages of the economy, such as retail, food service, hotels and other accommodation services, and social services, such as education and health care.

Table 4.47. Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area

Sector	Alternative A	Alternative B	Alternative C	Alternative D
Impacts on Average Earnings (millions of 2007 \$)				
Oil and Gas	\$187.1	\$130.6	\$188.0	\$175.8
Livestock Grazing	\$5.6	\$4.3	\$5.3	\$5.0
Recreation	\$2.9	\$3.9	\$2.7	\$3.3
Total	\$195.6	\$138.8	\$195.9	\$184.2
Impacts on Annual Average Output (millions of 2007 \$)				
Oil and Gas	\$1,524.8	\$1,029.1	\$1,531.7	\$1,425.9
Livestock Grazing	\$19.1	\$14.7	\$18.0	\$17.3
Recreation	\$12.0	\$16.1	\$11.0	\$13.8
Total	\$1,555.8	\$1,059.9	\$1,560.8	\$1,457.0
Impacts on Net Present Value of Output Over 20 Years (millions of 2007 \$)				
Oil and Gas	\$14,959	\$10,109	\$15,027	\$13,991
Livestock Grazing	\$202	\$164	\$194	\$187
Recreation	\$111	\$141	\$104	\$125
Total	\$15,273	\$10,414	\$15,325	\$14,303
Source: Calculated using the IMPLAN model, as described in the text. Detail may not add to total due to rounding.				
¹ Net Present value from 2008 to 2027, discounted at 7 percent (rate from Office of Management and Budget 1992)				
IMPLAN Impact Analysis for Planning Model				

Table 4.48. Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area

Sector	Number of Jobs			
	Alternative A	Alternative B	Alternative C	Alternative D
Oil and Gas	3,309	2,305	3,324	3,109
Livestock Grazing	180	139	170	163
Recreation	133	178	123	152
Total	3,622	2,621	3,617	3,424
Source: Calculated using the IMPLAN model, as described in the text. Detail may not add to total due to rounding.				
IMPLAN Impact Analysis for Planning Model				

Average annual earnings per job would differ for each of these sectors. Based on the IMPLAN model, earnings per job (expressed in year 2007 dollars) would average:

- Approximately \$58,000 for jobs in oil and gas well drilling and completion.

- Approximately \$55,000 for jobs in oil and gas production.
- Approximately \$31,000 for jobs associated with cattle and sheep grazing.
- Between \$20,000 and \$22,000 for recreation-related jobs.

Impacts to Tax Revenue

Projected tax revenues under Alternative A due to oil and gas production on federal surface would average \$133.2 million per year for federal royalties, \$63.9 million per year for state severance taxes, and \$72.5 million per year for local ad valorem taxes. Because of limited data on specific locations of projected wells, there is not enough data to apportion the local tax receipts to individual communities. Table 4.49, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area” (p. 1259) summarizes and compares tax revenues from oil and gas production under the alternatives. Alternative A would result in a higher estimated oil and gas tax revenue compared to Alternative B, slightly higher than Alternative D, and slightly less than Alternative C.

Table 4.49. Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area

Tax Type	Alternative A	Alternative B	Alternative C	Alternative D
Federal Mineral Royalties	\$133.2	\$88.5	\$133.8	\$124.3
State Severance Taxes	\$63.9	\$42.5	\$64.2	\$59.6
Local Ad Valorem Production Taxes	\$72.5	\$48.2	\$72.8	\$67.6
Total	\$269.6	\$179.1	\$270.8	\$251.5
Source: Calculated based on the IMPLAN model and state, federal, and local tax rates, as described in the text. Detail may not add to total due to rounding.				
IMPLAN Impact Analysis for Planning Model				

4.8.2.3.3. Alternative B

Impacts to Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative B for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$139 million per year between 2008 and 2027, and regional output would average approximately \$1,060 million per year due to activities on BLM-administered lands and mineral estate. The net present value of the stream of regional output, discounted at a 7 percent real discount rate (Office of Management and Budget 1992), would be approximately \$10.4 billion over 20 years. Table 4.47, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1258) summarizes and compares sector-level breakouts for earnings and output by alternative.

Alternative B excludes 2.3 million acres from renewable-energy development, and manages an additional 24,000 acres as avoidance areas for renewable energy. Alternative B opens approximately 41,000 acres to renewable-energy development, a decrease of approximately 98 percent in area open for renewable-energy development compared to Alternative A. For wind-energy generation proposals for the open area, the change in management would decrease uncertainty for firms considering developing renewable energy in the planning area. However, because Alternative B restricts or excludes renewable-energy development in a much larger

portion of the planning area (compared to the potential for being open under Alternative A), there would likely be less economic activity associated with renewable-energy development under Alternative B than Alternative A. As noted for Alternative A, transmission infrastructure is generally lacking; however, the market for wind-energy is growing. Therefore, the regional economic impact related to renewable-energy development under Alternative B is uncertain, but likely to be lower in the long term than under Alternative A. In any case, due to the long time horizon associated with energy project planning and permitting, there would likely be no observable difference in economic impacts due to renewable-energy development between alternatives for at least the first 5 to 10 years of the planning period.

Regarding economic activity associated with locatable mineral development and mineral materials disposals, the BLM generally expects to meet market demand and respond to applications and does not anticipate that the production of these minerals would vary across the alternatives. Alternative B restricts the amount of land open to exploration and development of these minerals, as documented in the *Mineral Resources* section. However, this restriction would result in a minor impact to economic conditions compared to current conditions.

Impacts to Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, impacts to employment impacts are closely related to impacts to economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative B for the modeled sectors would average approximately 2,621 jobs per year between 2008 and 2027 due to activities on BLM-administered lands and mineral estate. Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258) provides information on how these jobs break out by sector. Average annual earnings per job would be the same under Alternative B as Alternative A, and are described above.

Impacts to Tax Revenue

Projected tax revenues under Alternative B due to oil and gas production on federal surface would average \$88.5 million per year for federal royalties, \$42.5 million per year for state severance taxes, and \$48.2 million per year for local ad valorem taxes. Because of limited data on specific locations of projected wells, there is not enough data to apportion the local tax receipts to individual communities. Table 4.49, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area” (p. 1259) summarizes and compares tax revenues from oil and gas production under the alternatives. Alternative B would result in the least amount of estimated oil and gas tax revenues compared to the other alternatives.

4.8.2.3.4. Alternative C

Impacts to Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative C for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$196 million per year between 2008 and 2027, and regional output would average approximately \$1,561 million per year due to

activities on BLM-administered lands and mineral estate. The net present value of the stream of regional output, discounted at a 7 percent real discount rate (Office of Management and Budget 1992), would be approximately \$15.3 billion over 20 years. Table 4.47, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1258) summarizes and compares sector-level breakouts for earnings and output by alternative.

Alternative C manages approximately 94,000 acres as renewable-energy development exclusion areas, and manages approximately 16,000 acres as renewable energy avoidance areas. Approximately 2.3 million acres will be open to renewable-energy development under Alternative C, an increase of 8 percent compared to Alternative A. The change in management would increase renewable-energy development compared to alternatives A and B, because it would decrease uncertainty for firms considering developing renewable energy in the planning area, and would provide more opportunity in terms of open lands. As noted in the discussion for Alternative A, transmission infrastructure is generally lacking; however, the market for wind energy is growing. Therefore, the long-term regional economic impact related to renewable-energy development under Alternative C is uncertain, but it would almost certainly be greater than under alternatives A and B. However, due to the long time horizon associated with energy project planning and permitting, there would likely be no observable difference in economic impacts due to renewable-energy development between alternatives for at least the first 5 to 10 years of the planning period.

Regarding economic activity associated with locatable mineral development and mineral materials disposals, the BLM generally expects to meet market demand and respond to applications and does not anticipate that the production of these minerals would vary across the alternatives. Alternative C increases the amount of land open to exploration and development of these minerals, as documented in the *Mineral Resources* section. However, this restriction would likely result in a minor impact to economic conditions compared to current conditions.

Impacts to Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, impacts to employment are closely related to impacts to economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative C for the modeled sectors would average approximately 3,617 jobs per year between 2008 and 2027 due to activities on BLM-administered lands and mineral estate. Table 4.48, “Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area” (p. 1258) provides information on how these jobs break out by sector. Average annual earnings per job would be the same under Alternative C as Alternative A, and are described above.

Impacts to Tax Revenue

Projected tax revenues under Alternative C due to oil and gas production on federal surface would average \$133.8 million per year for federal royalties, \$64.2 million per year for state severance taxes, and \$72.8 million per year for local ad valorem taxes. Because of limited data on specific locations of projected wells, there is not enough data to apportion the local tax receipts to individual communities. Table 4.49, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area” (p. 1259) summarizes and compares tax revenues from oil and gas production

under the alternatives. Alternative C would result in the greatest estimated oil and gas tax revenues compared to the other alternatives.

4.8.2.3.5. Alternative D

Impacts to Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative D for the modeled sectors (oil and gas, grazing, and recreation) would average approximately \$185 million per year between 2008 and 2027, and regional output would average approximately \$1,458 million per year due to activities on BLM-administered lands and mineral estate. The net present value of the stream of regional output, discounted at a 7 percent real discount rate (Office of Management and Budget 1992), would be approximately \$14.3 billion over 20 years. Table 4.47, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1258) summarizes and compares sector-level breakouts for earnings and output by alternative.

Alternative D excludes approximately 954,322 acres from renewable-energy development, and manages approximately 1,215,599 acres as avoidance areas for renewable energy. Approximately 224,289 acres will be open to renewable-energy development under Alternative D, a decrease of about 89 percent compared to Alternative A. The change in management would decrease uncertainty for firms considering developing renewable energy in the planning area compared to Alternative A, but it would also close substantial portions of the planning area to renewable-energy development. Therefore, the overall impact to economic activity related to renewable-energy development, compared to Alternative A, is uncertain. However, Alternative D would likely result in greater economic activity from renewable-energy development compared to Alternative B, and less compared to Alternative C. As noted in the discussion for Alternative A, transmission infrastructure is generally lacking; however, the market for wind energy is growing. However, due to the long time horizon associated with energy project planning and permitting, there would likely be no observable difference in economic impact due to renewable-energy development between alternatives for at least the first 5 to 10 years of the planning period.

Regarding economic activity associated with locatable mineral development and mineral materials disposals, the BLM generally expects to meet market demand and respond to applications and does not anticipate that the production of these minerals would vary across the alternatives. Alternative D increases the amount of land open to exploration and development of these minerals, as documented in the *Mineral Resources* section. However, this restriction would likely result in a minor impact to economic conditions compared to current conditions.

Impacts to Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Thus, employment impacts are closely related to impacts on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative D for the modeled sectors will average approximately 3,424 jobs per year between 2008 and 2027 due to activities on BLM-administered lands and mineral estate. Table 4.47, “Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area” (p. 1258) provides information on

how these jobs break out by sector. Average annual earnings per job would be the same under Alternative D as Alternative A, and are described above.

Impacts to Tax Revenue

Projected tax revenues under Alternative D due to oil and gas production on federal surface would average \$124.3 million per year for federal royalties, \$59.6 million per year for state severance taxes, and \$67.6 million per year for local ad valorem taxes. Because of limited data on specific locations of projected wells, there is not enough data to apportion the local tax receipts to individual communities. Table 4.49, “Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area” (p. 1259) summarizes and compares tax revenues from oil and gas production under the alternatives. Alternative D would result in greater estimated oil and gas tax revenues than Alternative B, and slightly less than Alternative A or C.

4.8.3. Health and Safety

As addressed in this section, health and safety includes AMLs, coalbed fires, physical hazards, hazardous substances, and hydrogen sulfide gas.

The generation, use, disposal, or accidental release of hazardous substances are subject to the federal and state laws and regulations identified in Appendix A (p. 1427). In addition, Onshore Order #6 addresses requirements for operations in areas known or with the potential to produce hydrogen sulfide gas. These laws and regulations are designed to safeguard human health and safety and to protect the environment and would minimize the short- and long-term risks associated with hazardous substances and hydrogen sulfide gas.

4.8.3.1. Summary of Impacts

All alternatives would result in beneficial impacts to health and safety from management of AML sites and coalbed fires. Under all alternatives, the BLM and the Wyoming DEQ will identify and plan for remediation of AML and coalbed fire sites that would adversely impact health and safety. Primary impacts to health and safety from physical hazards would result from management that increases activities in areas with physical hazards and subsequently increases the risk and potential for accidents in these areas. Providing warning signs or other institutional controls, such as fencing, would result in similar impacts under all alternatives.

Under all alternatives, impacts from management of hazardous substances would be the same. The potential for impacts would vary by alternative based on the level of mineral activity. Alternative C, with the greatest amount of mineral activity, could increase the generation, use, transportation, and disposal of hazardous substances. To reduce adverse impacts to health and safety, authorized users would adhere to hazardous spill response plans, stipulations, and all applicable laws and regulations pertaining to hazardous substances. These requirements would provide a detailed strategy and process for responding to hazardous substance releases, therefore reducing the short-term impacts from contamination.

4.8.3.2. Methods and Assumptions

Methods and assumptions used in this impact analysis include the following:

- The BLM will set as its highest AML physical safety action priority cleanup of AML sites situated (1) where a death or injury has occurred and the site has not already been addressed, or (2) on or in the immediate vicinity of lands with high visitor use (BLM 2000). AML sites that adversely impact watersheds also will be a high priority. The BLM continues to support the Wyoming DEQ AML Division in reclaiming AML sites on public surface.
- AML sites, especially open shafts and adits, pose a danger to livestock and wildlife as well as humans. AML sites not reclaimed adversely impact recreational users.
- No assumptions were identified for physical hazards.
- All new hazardous materials and waste sites are identified and characterized.
- Resource development activities identify any possible generation of hazardous waste.
- No substantial new hazardous materials uses or waste generation will occur.
- The BLM Hazard Management and Resource Restoration Program responds to all hazardous material releases on public surface. Emergency cleanup actions are implemented on sites posing a substantial threat to the public and the environment.

4.8.3.3. Detailed Analysis of Alternatives

The Required Design Features under Alternative D for the design of impoundment ponds is implicit in the limits on surface disturbance contained in Alternative B's closing of large areas of the planning area to development, including oil and gas leasing and withdrawing more than 1.6 million acres from locatable mineral entry. The Required Design Features would be less beneficial to health and human safety than the stricter limits under Alternative B. This management would result in far fewer adverse impacts, particularly with regard to WNV, a threat to humans and domestic and wild horses, and greater sage-grouse and other wildlife. The adverse impacts of authorizing impound ponds that do not utilize Required Design Features or equivalents as would likely occur under alternatives A and C could be severe, depending on weather and other factors. The impacts to greater sage-grouse are identified in that section.

Alternative D could, over time, result in adverse impacts to the economic activities resulting from federal authorization by reason of the calculation of disturbance for purposes of disturbance caps and limits of one development per 640 acres. This limit does not apply to activities under the 43 CFR 3800 regulations (locatable mineral entry). However, the unreclaimed disturbance associated with mining, such as from uranium mines or mine tailings, are counted in the disturbance when authorizing oil and gas development. In places in the planning area that have potential for oil and gas development, which is the greatest contributor to the local and state economies, and uranium potential, such as the area near Green Mountain, the Core Area disturbance calculations could preclude oil and gas development because the surface cap had been reached by new disturbances associated with uranium mining. The economic consequences of this management would depend on the extent to which oil and gas development were precluded.

4.8.3.3.1. Impacts Common to All Alternatives

Abandoned Mine Lands and Coalbed Fires

To reduce the threat of physical and environmental impacts from AML sites and coalbed fires, the BLM will remediate sites based on risk.

Abandoned mines, especially shafts, pose safety hazards to livestock and wildlife as well as people. Long-term beneficial impacts to health and safety would result from the Wyoming DEQ

AML Division continuing to work with the BLM to mitigate hazards associated with AML sites and coalbed fires.

Implementation of any of the alternatives would not be anticipated to result in additional AML sites or increase the risks at AML sites or coalbed fires that could adversely impact health and safety.

Physical Hazards

The BLM will manage physical hazards to reduce risks to the public by providing warnings and, where appropriate, developing mitigation measures to avoid and minimize impacts associated with physical hazards.

Implementation of any of the alternatives would not result in any increase in the potential for physical hazards; however, management could decrease the risks and potential impacts to health and safety resulting from physical hazards.

Hazardous Substances

Increases in human presence and activity associated with recreation, mineral activity, and ROW development increase risks associated with generation, use, transportation, and disposal of hazardous substances. Mineral activities are the most likely activities to increase the risk of hazardous substances to health and safety.

Impacts to health and safety from the management of hazardous substances would be the same under all alternatives because there are no separate management actions by alternative.

Implementing hazardous materials management activities will address human health and environmental risks from hazardous substances and hydrogen sulfide gas. Due to the increase in activity in oil and gas extraction, hydrogen sulfide poses an increasing threat to human health and safety. To reduce the risks to human health, all hydrogen sulfide plans will comply with Onshore Order #6, which identifies “uniform national requirements and minimum standards of performance expected from operators when conducting operations involving oil or gas that is known or could reasonably be expected to contain hydrogen sulfide.” In addition, the BLM will mitigate safety concerns associated with hydrogen sulfide through signs, warning sirens, and public education. All of these management actions would reduce the potential for human health and safety risks from hydrogen sulfide. Any potential impacts to health and safety from hydrogen sulfide would increase in relation to the level of mineral activity that releases hydrogen sulfide.

The BLM manages hazardous materials to reduce risks to visitors, employees, and the environment; to restore contaminated land; and to perform emergency-response activities in accordance with appropriate laws, policies, and regulations. Management to reduce risk and contamination would reduce potential impacts to health and safety from hazardous substances. There could be substantive indirect impacts related to risks from hazardous substances during remediation.

Reporting spills and releases of chemicals, petroleum products, and produced water to the Wyoming DEQ would reduce the potential for short-term and long-term impacts to health and safety by controlling spills and facilitating an appropriate response to hazardous substance spills.

4.8.4. Environmental Justice

This section addresses the potential for the alternatives to result in disproportionate adverse impacts to minority and low-income populations, including direct, indirect, short-term, and long-term impacts. Appendix A (p. 1427) identifies the laws, regulations, policies, and guidance considered in the analysis of disproportionate adverse impacts.

Because the analysis of disproportionate adverse impacts depends on identified impacts related to resources and resource uses, definitions of adverse impacts as they apply to environmental justice issues are closely related to the definitions of adverse impacts for other resource areas (e.g., social resources). For example, the displacement of a mobile home park that houses a low-income population to build a new road could be a disproportionate direct impact. An example of a disproportionate indirect impact would be a reduction in social services to low-income individuals that could result from decreased tax revenues as a result of decreased mineral production.

4.8.4.1. Summary of Impacts

The alternatives would be identical regarding potential impacts to minority and low income populations. No particular BLM actions proposed under any of the alternatives would cause disproportionate adverse impacts to minority or low-income populations. The BLM has considered all input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.4.2. Methods and Assumptions

Because the analysis of disproportionate adverse impacts is based on impacts to resources and resource uses, the assumptions for this analysis implicitly include the assumptions of other resource areas as they relate to the identification and analysis of impacts. In addition, this analysis assumes that the latest available demographic data from the U.S. Census Bureau and other sources accurately represent the population in the planning area.

In accordance with BLM and Council on Environmental Quality (CEQ) guidance for assessing environmental justice in the planning process, an area is considered to contain a minority population if either the minority population of the impacted area exceeds 50 percent or the percentage of minority population in the affected area is meaningfully greater than the percentage in the general population. The “general population” is defined as a relevant comparison area, such as the state.

In 2008, the minority population in the socioeconomic analysis area counties ranged from 5 percent (Hot Springs County) to 27 percent (Fremont County); the state average is 13 percent. On the WRIR, 33 percent of the population was minority. The vast majority of the population in the planning area reside in Fremont County. Within Fremont County, 18 percent of the population was in poverty in 2000 compared to 21 percent on the WRIR. In 2008, the Fremont County poverty level was 13 percent; no comparable data are available for the WRIR for 2008. The state poverty average is approximately 10 percent. Both in terms of minority populations and poverty, Fremont County and the WRIR are considered to have a relatively high concentration of minority population and low-income population, as defined in BLM and CEQ guidance, compared to the state.

4.8.4.3. Detailed Analysis of Alternatives

4.8.4.3.1. Impacts Common to All Alternatives

While there are minority and low-income populations in the planning area, no particular BLM actions under any of the alternatives have been identified as causing disproportionate adverse impacts to these populations. Although Fremont County has a high concentration of low-income and minority populations, there are no direct or indirect impacts under the alternatives that would affect these populations in a different way than the general population in the planning area. For example, the lower economic activity associated with Alternative B would cut across all sectors of the economy – from higher-skill managerial jobs to lower-skill service jobs. Therefore, there would be no identifiable environmental justice issues or direct or indirect impacts associated with any of the alternatives specific to any minority or low-income community or population as defined in Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994) or BLM IM 2002-164 (*Guidance on Environmental Justice in Planning*).

Environmental justice principles also require that the BLM provide opportunities for people of all backgrounds to have a meaningful voice in the planning process. The BLM has provided numerous opportunities in a variety of formats, and has considered all input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.5. Tribal Treaty Rights

The BLM has not identified any tribal treaty rights such as access to tribal hunting, fishing, or resource-collection areas that were reserved by treaties that could be impacted by RMP management decisions. Impacts to tribes are analyzed on a project-specific basis in consultation with the appropriate tribes. Any alternative that would impact wildlife, fish, or native plant communities in the planning area would have the potential to impact the treaty rights of a tribe. BLM guidance and statutory authorities protect sacred sites and other areas of importance to the tribes and are considered on a site-specific basis.

4.9. Climate Change

4.9.1. Summary of Impacts

GHG emissions from oil and gas development and production, vehicular traffic and authorized livestock grazing will be the greatest under alternatives A and C. Alternative B, followed by Alternative D, has the fewest adverse impacts because they authorize less of these activities that adversely impact the climate.

Alternative B, followed by Alternative D, has the most beneficial impacts because vegetation resources are more protected and wildlife protections are stronger to limit minerals development and long-term surface disturbance. Alternative D authorizes more livestock grazing AUMs (as well as more surface disturbance associated with range infrastructure) so it is less beneficial than Alternative B. Over time, the difference in AUMs as a measure of livestock emissions of CH₄ may be substantially less beneficial. Alternatives A and C will have fewer beneficial impacts as a result of limitations on surface disturbance to protect wildlife. AUM levels are likely to be the

highest under these two alternatives, although only moderately higher than under Alternative D with correspondingly higher CH₄ emissions associated with livestock grazing.

4.9.2. Methods and Assumptions

A growing body of evidence indicates that Earth's atmosphere is warming. Records show that surface temperatures in the Wyoming region have risen approximately 1.5° Fahrenheit since the 1960 to 1979 baseline years (GCRP 2009b). The largest increase in average temperature has occurred in the winter months in the northern portions of the region. Relatively cold days in the region are becoming less frequent and relatively hot days are becoming more frequent (GCRP 2009b). Observed changes in oceans, ecosystems, and ice cover are consistent with this warming trend (National Academy of Sciences 2006).

Ongoing scientific research has identified the potential impacts of GHG emissions – including CO₂, CH₄, N₂O), water vapor and several trace gases – on global climate change. Through complex interactions at regional and global scales, these GHG emissions cause a net warming of the atmosphere (which makes surface temperatures suitable for life on Earth), primarily by decreasing the amount of heat energy Earth radiates back into space. Although GHG concentrations in the atmosphere and climatic conditions have varied throughout Earth's history, recent industrialization and burning of fossil fuels has caused global atmospheric CO₂ concentration to increase dramatically; this most recent CO₂ increase is likely to contribute to overall climatic changes (National Academy of Sciences 2006). Global atmospheric concentrations of CO₂, CH₄, and N₂O have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values (as determined from ice cores spanning many thousands of years).

The global increase in CO₂ concentrations is due primarily to fossil fuel use and land use change, while those of CH₄ and N₂O are due to agricultural soil management, animal manure management, sewage treatment, and mobile and stationary combustion of fossil fuels (IPCC 2007a, EPA 2009b). According to climate change researchers, the impacts of climate change are expected to vary by region, season, and time of day (National Academy of Sciences 2006, GCRP 2009b). Computer model forecasts indicate that increases in temperature will not be evenly or equally distributed, but are likely to be accentuated at higher latitudes. Warming during winter is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures (National Academy of Sciences 2006).

Within North America, the report specifically forecasts that: warming in western mountains is projected to cause decreased snowpack, more winter flooding and reduced summer flows, exacerbating competition for over-allocated water resources; in the early decades of the century, moderate climate change is projected to increase aggregate yields of rain-fed agriculture by 5 to 20 percent, but with important variability among regions; major challenges are projected for crops that are near the warm end of their suitable range or which depend on highly utilized water resources; cities that currently experience heat waves are expected to be further challenged by an increased number, intensity and duration of heat waves during the course of the century, with potential for adverse health impacts; and coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution. Specific modeling and/or assessments of the potential impacts for the planning area and for the State of Wyoming currently do not exist.

The lack of scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change even at regional scales limits the ability to quantify current and future impacts of climate change in the planning area. The following paragraphs describe potential future impacts of climate change that can be reasonably anticipated for the planning area; however, some of these impacts are known to already be occurring in the area. However, over the next 20 years, tools will become available that will allow for a better site-specific analysis of the impacts of a proposed activity on GHG and the site-specific impact from climate change. The U.S. Geological Survey (USGS), for example, is developing GIS based tools to determine the carbon storage of specific soils. Ongoing research is analyzing the response of different vegetation types to increasing CO₂, longer growing seasons, higher heat and more unpredictable rain patterns.

Increasing temperatures in the planning area are likely to contribute to increased evaporation, drought frequencies, and declining water quantity. The warming of lakes and rivers will adversely affect the thermal structure and water quality of hydrological systems, which will add additional stress to water resources in the region (IPCC 2007b). The planning area depends on temperature-sensitive springtime snowpack to meet demand for water from municipal, industrial, agricultural, recreational uses and BLM-authorized activities. The USGS notes that mountain ecosystems in the western United States are particularly sensitive to climate change, especially in the higher elevations, where much of the snowpack occurs, which have experienced three times the global average temperature increase over the past century (USGS 2010). Higher temperatures are causing more winter precipitation to fall as rain rather than snow, which contributes to earlier snowmelt. Additional declines in snowmelt associated with climate change are projected, which would reduce the amount of water available during summer (GCRP 2009b). Rapid spring snowmelt due to sudden and unseasonal temperature increases can also lead to greater erosive events and unstable soil conditions.

Within a given region, increasing temperatures could affect the amount of water vapor in the atmosphere, the timing and amount of precipitation, the intensity of storm systems, snow melt, and soil moisture. All of these factors can affect climate, day-to-day weather conditions, and air quality in the planning area. There is evidence that recent warming is impacting terrestrial and aquatic biological systems (IPCC 2007b). Warming temperatures are leading to earlier timing of spring events such as leaf-unfolding, bird migration, and egg-laying (IPCC 2007b). The range of many plant and animal species has shifted poleward and to higher elevation, as the climate of these species' traditional habitat changes. As future changes in climate are projected to be even greater than those in the recent past, there will likely be even larger range shifts in the coming decades (Lawler et al. 2009). Warming temperatures are also linked to earlier "greening" of vegetation in the spring and longer thermal growing seasons (IPCC 2007b). In aquatic habitats, increases in algal abundance in high-altitude lakes have been linked to warmer temperatures, while range changes and earlier fish migrations in rivers have also been observed (IPCC 2007b). Climate change is likely to combine with other human-induced stress to further increase the vulnerability of ecosystems to other pests, invasive species, and loss of native species. Climate change is likely to affect breeding patterns, water and food supply, and habitat availability to some degree. Sensitive species in the planning area, such as the greater sage-grouse, which are already stressed by declining habitat, increased development and other factors, could experience additional pressures as a result of climate change.

The observed change in glaciers in the Wind River Mountains identified in Chapter 3, indicates that these changes will influence land-management decisions in the planning area. These factors may change migration patterns of wildlife, appropriate seasons of use for livestock grazing, increase fire intensity and return interval and INNS spread. The susceptibility to cheatgrass in the

southwest United States and the circular reinforcing relationship between cheatgrass infestation and landscape-level fires that has substantially contributed to greater sage-grouse reduction in numbers, was triggered in part by historic levels of high heat and drought. With climate fluctuations expected to see hotter and drier summers in the northern Rocky Mountains including the planning area with an increase in WNV (which responds positively to that type of climate condition) this climate change could have very serious impacts to wildlife, particularly greater sage-grouse, forage availability, vegetation resources, and air quality.

Climate change also poses challenges for many resource uses on BLM-administered land. Increased temperatures, drought and evaporation may reduce seasonal water supplies for livestock and could impact forage availability. However, in non-drought years, longer growing seasons resulting from thermal increases may increase forage availability throughout the year. Shifts in wildlife habitat due to climate change may influence hunting and fishing activities, and early snowmelt may impact winter and water-based recreational activities. Drought and resulting stress on vegetation is likely to increase the frequency and intensity of mountain bark beetle and other insect infestations, which reduces the potential for sale of forest products on BLM-administered lands.

Increases in average summer temperatures and earlier spring snowmelt in the planning area are expected to increase the risk of wildfires by increasing summer moisture deficits (GCRP 2009b). Studies have shown that earlier snowmelts can lead to a longer dry season, which increases the incidence of landscape-level fire (Westerling et al. 2006). Together with historic changes in land use, climate change is anticipated to affect the variability in the occurrence of wildfire throughout the western United States. Although the impact of climatic factors varies by ecosystem type and from year to year, drought, low winter precipitation, wind conditions, and high summer temperatures are positively associated with wildfire occurrence (NPS 2010). During the last 20 years, research has shown that these factors have led to an increase in the frequency of very large wildfires and total acres burned throughout the Rocky Mountain region (NPS 2010). In response to drought and higher temperatures, the number of wildfires and total acres burned has generally increased within the planning area; see Figure 3.18, “Acres Burned and Number of Wildfires per Year within the Lander Field Office, 1974-2008” (p. 360) in Chapter 3.

Climate change science and projections of climate change is a continually growing and emerging science. Additional and recent information on climate change and regional projections of climate change for the planning area can be found through the U.S. Global Change Research Program (<http://www.globalchange.gov/>) and the Intergovernmental Panel on Climate Change (<http://www.ipcc.ch/>).

Several federal initiatives have been launched to improve the ability to understand, predict, and adapt to the challenges of climate change. The Secretary of the Interior signed Secretarial Order 3289 on February 22, 2010, establishing a Department-wide, scientific-based approach to increase understanding of climate change and to coordinate an effective response to impacts on managed resources. The order reiterated the importance of analyzing potential climate change impacts when undertaking long-range planning issues, and also established several initiatives including the development of eight Regional Climate Science Centers. Regional Climate Science Centers would provide scientific information and tools that land and resource managers can apply to monitor and adapt to climate changes at regional and local scales (DOI 2010). The North Central Climate Science Center, which will incorporate the planning area, has a target establishment date of 2011.

Given the broad spatial influence of climate change which requires response at the landscape-level, the DOI also established Landscape Conservation Cooperatives which are management-science partnerships that help to inform management actions addressing climate change across landscapes. These Cooperatives are formed and directed by land, water, wildlife and cultural resource managers and interested public and private organizations, designed to increase the scope of climate change response beyond federal lands.

In addition to efforts being undertaken to better respond and adapt to climate change, other federal initiatives are being implemented to mitigate climate change. The Carbon Storage Project was implemented to develop carbon sequestration methodologies for geological (i.e., underground) and biological (e.g., forests and rangelands) carbon storage. The project is a collaboration of federal agency and external stakeholders to enhance carbon storage in geologic formations and in plants and soils in an environmentally responsible manner. The Carbon Footprint Project is a project to develop a unified GHG emission reduction program for the DOI, including setting a baseline and reduction goal for the Department's GHG emissions and energy use. More information about DOI's efforts to respond to climate change is available at: www.doi.gov/archive/climatechange/.

A variety of activities in the planning area currently generate GHGs. Fuels combustion, industrial processes and any number of other activities on public lands result in direct emissions of GHGs. Direct emissions in the planning area include those related to current and ongoing oil and gas and other minerals development, fire events, motorized vehicle use (e.g., OHVs), livestock grazing, facilities development, and other fugitive emissions. Indirect GHG emissions in the planning area include the demand for electricity generated outside the area. Contributions to climate change also result from land use changes (conversion of land to less reflective surfaces that absorb heat, such as concrete or pavement), and soil erosion (which can reduce snow's solar reflectivity and contribute to faster snowmelt). The emission of GHG by some BLM authorized activities are provided in the *Air Quality* section of this chapter.

4.9.3. Detailed Analysis of Alternatives

4.9.3.1. Impacts Common to All Alternatives

Soil resources and the vegetation it supports are major carbon sinks. See the *Soil* section. Removal of vegetation releases the soil organic carbon and the carbon stored in the vegetation, particularly the roots. Accordingly, the more surface disturbance and loss of vegetation, the more the activity contributes to GHG. This carbon is in addition to the emissions identified in the *Air Quality* section. The amount of carbon released varies depending upon the type of soil and vegetation and the vegetation that replaces it (growing trees, for example, are a greater carbon sink than grasses). The amount of surface disturbance varies by alternative (see the *Soil* section).

Vegetation resources are carbon sinks. The impacts to the type and health of the vegetation will directly impact the amount of carbon that is released into the atmosphere. The management of vegetation resources on BLM-administered lands varies by alternative. The more beneficial the impacts to vegetation resources, the more reduced the release of carbon, particularly where management focuses vegetation treatment on degraded areas with reforestation or revegetation of degraded areas.

Forests are important carbon sinks but as trees move from early to late seral stages, the overall carbon being removed from the atmosphere decreases and mature trees become a potential carbon

liability if the carbon is released to the atmosphere by decay or fire. Analyzing this impact is extremely complex and depends in no small part on the use of harvested trees. Since timber harvesting does not vary meaningfully by alternative (although forest management does), the impacts of forest management on climate change is not further analyzed. The impacts of climate change to forest resources in the planning area are identified in Chapter 3.

All alternatives authorize livestock grazing on almost all of the planning area (there is less than 1 percent difference in areas closed to livestock grazing). However, livestock grazing management varies by alternative both in terms of the type of management systems to be utilized and, over time, the number of AUMs (Appendix L (p. 1583)). Improper livestock grazing management has the potential to adversely impacts soils and vegetation and lead to increased INNS, all of which would increase the release of carbon from soil and vegetation. See the *Soil* section. Cattle themselves are emitters of GHG in the form of CH₄ (which is more powerful at warming the atmosphere than CO₂) and there would be more than a moderate difference in the CH₄ emitted by alternative, as the AUM reductions from the baseline (280,813 AUMs) were implemented. However, an analysis of the CH₄ emitted by livestock grazing can be done, if at all, on an allotment specific basis. The amount of CH₄ emitted depends on diet, supplementation, and other factors not part of BLM management. Livestock grazing strategies can improve forage so as to reduce CH₄ production as well as reduce adverse impacts to soils and vegetation. Over time, technological changes may occur that change the amount of uncaptured CH₄ from livestock. The United States government is working with operators of confined animal field lots to provide anaerobic digestors that will capture the CH₄ and use it for energy production. The limits on technical modeling and the need for site-specific information result in climate change analysis of livestock grazing being limited to the impacts to soil and vegetation from the management.

ROWs such as wind-energy development have the potential to impact climate change, either beneficially, by reducing the burning of carbon based fuels to generate electricity, or adversely, by increasing surface disturbance in locations far removed from the ultimate users of the electricity. The alternatives vary in the amount of industrial wind energy that is likely to be authorized. However, the impacts on climate change of these actions cannot be determined without more site and project specific information. For example, if the generated electricity is utilized locally and replaces coal generated electricity, the beneficial impacts are far greater than if the power is generated and transported across hundreds of miles of new transmission lines and replaces electricity generated through the burning of CH₄ in a cogenerated facility that captures the heat from the burning of the CH₄. Recognizing that the end use of the energy is too speculative for analysis, the BLM did not analyze the downstream impacts of wind-generated energy, and did not attempt to measure the net benefits of using a lower carbon fuel to generate electricity.

4.9.3.2. Alternative A

4.9.3.2.1. Program Management

Management under Alternative A protects soils and vegetation to a moderate degree and is anticipated to have the highest AUMs with the most livestock on BLM-administered lands.

4.9.3.2.2. Resources

The management described in the respective section (see the *Air Quality*, *Soil*, and *Vegetation* sections) addresses the management actions that adversely or beneficially impacts air, soils, and

vegetation. That analysis reflects the extent to which Alternative A beneficially or adversely impacts climate change by contributing to a release of carbon from the soil and vegetation or atmospheric carbon sequestration.

4.9.3.2.3. Resource Uses

The emissions associated with BLM authorized activities are analyzed in the *Air Quality* section, including the increase in fugitive dust which adversely impacts vegetation, and reduces albedo, or reflectivity, of snow and glaciers. These impacts are all contributors to climate change. Reclamation of initial disturbance will stop carbon loss associated with vegetation removal but not recapture any of the carbon released to the atmosphere. Livestock grazing under Alternative A will have the most surface disturbance associated with range improvement projects with adverse impacts to soils and vegetation. By authorizing AUMs up to the total permitted use, Alternative A will result in the most CH₄ gas emitted by livestock as well as all GHG emissions by vehicular use associated with large numbers of AUMs.

4.9.3.2.4. Special Designations

The impacts to air quality, soils, and vegetation by special designation management will have the same adverse or beneficial impacts to climate change. Management that protects vegetation in ACECs and that limits surface disturbance in the ACECs where setting is important will have a reduced adverse impact by reducing surface disturbance. However, GHG emissions may incrementally increase, if tourism and recreation increase, from travel-related emissions. The impacts of Alternative A in that regard are thought to be moderate.

4.9.3.3. Alternative B

4.9.3.3.1. Program Management

Alternative B manages with an emphasis on resource protections and a limit on surface disturbance. Alternative B management will likely limit wind-energy development. Alternative B over time will authorize the fewest AUMs and the most vegetation treatments to improve vegetation condition.

4.9.3.3.2. Resources

The management described in the respective section (see the *Air Quality*, *Soil*, and *Vegetation* sections) addresses the management actions that adversely or beneficially impacts air, soils, and vegetation. That analysis reflects that Alternative B has more beneficial impacts on air, soils and vegetation in relation to Alternative A. Accordingly, Alternative B would have more beneficial impacts to climate change than Alternative A and fewer adverse impacts. This is particularly true because of limits on surface disturbance for the benefit of biological resources.

4.9.3.3.3. Resource Uses

Alternative B has fewer adverse impacts to climate change by having lower GHG emissions than Alternative A and less mineral related surface disturbance. Livestock grazing management under Alternative B would have both fewer adverse impacts from livestock grazing emission of CH₄ but

would also most beneficially impact climate change by emphasizing vegetation improvement projects instead of infrastructure-type projects. Emphasis on improving degraded rangeland yields beneficial impacts to climate change by increasing vegetation to improve carbon capture and stopping the loss of organic carbon from soil. Over time, AUM use would be reduced as livestock grazing management would need to reduce numbers and seasons of use to meet rangeland objectives without the use of infrastructure. Vegetation utilization under Alternative B is likely to have more beneficial impacts to the climate because the use is “light” with substantially less risk of removing past the point at which production is adversely impacted. Over time, these beneficial impacts could be substantial.

4.9.3.3.4. Special Designations

The beneficial impacts described in the Special Designations sections of soil, water, vegetation, and wildlife from will beneficially impact climate change in the same manner, which is at least substantially more beneficial than Alternative A. Limits on surface disturbance, roads, and mineral development for the protection of values of concern will beneficially impact the climate. Conversely, increase in recreation and heritage tourism because of special designation management will adversely impact climate change by increasing transportation related emissions. It is likely that tourism will increase under Alternative B; see the *Economic Conditions* section for a comparison of the anticipated increase in recreation among all of the alternatives.

4.9.3.4. Alternative C

4.9.3.4.1. Program Management

Alternative C is very similar to Alternative A in its management of air, soils, vegetation, minerals, and livestock grazing. Alternative C has an emphasis on resource use with a much reduced level of protection for biological resources.

4.9.3.4.2. Resources

Impacts to air, soil, and vegetation under Alternative C are found in the *Air Quality*, *Soil*, and *Vegetation* sections. The impacts are very similar to Alternative A and substantially more adverse than Alternative B. Accordingly, Alternative C would have similar adverse impacts to climate change as Alternative A and substantially more adverse than Alternative B.

4.9.3.4.3. Resource Uses

Alternative C resource use management is similar to Alternative A although somewhat less restrictive. Impacts on the climate from this management are very similar to those under Alternative A and substantially more adverse than under Alternative B. Impacts from livestock grazing to climate change would be more adverse than under Alternative B but less than under Alternative A because, over time, fewer AUMs would be authorized. Alternative C has fewer limits on ROWs and more surface disturbance associated with mineral and realty development. Alternative C, like Alternative A, would emphasize infrastructure rather than the vegetation treatments that result in beneficial impacts under Alternative B.

4.9.3.4.4. Special Designations

Special designation management under Alternative C (no ACECs and minimal protections of the NHT) would result in adverse impacts described in the *Special Designations* sections of each resource. These impacts would be somewhat more adverse than Alternative A and substantially more adverse than Alternative B. The same adverse impacts to air, soil, and vegetation caused by allowing surface disturbance would adversely impact the climate. It is likely that there will be little additional recreation-related emissions under Alternative C because the BLM will not improve existing recreational opportunities and affords historic settings less protections, particularly in comparison to Alternative B.

4.9.3.5. Alternative D

4.9.3.5.1. Program Management

Alternative D is similar in its protections of air, soil, and vegetation as Alternative B, but over a smaller area. Greater sage-grouse protections are very similar, although slightly less restrictive. Alternative D manages livestock grazing in a way that is more similar to Alternative C than to Alternative A or B but with more limits on livestock grazing.

4.9.3.5.2. Resources

Impacts from management of air, soil, and vegetation under Alternative D are analyzed in the *Air Quality*, *Soil*, and *Vegetation* sections. Impacts are less adverse than alternatives A and C but more adverse than Alternative B. The comparative impacts to climate would be the same.

4.9.3.5.3. Resource Uses

Alternative D's impacts from resource uses to air soil and vegetation are described in those sections with corresponding impacts to climate. Alternative D authorizes less surface disturbance than Alternative C and more than Alternative B. The impacts of oil and gas and other mineral developments are analyzed in the *Air Quality* section; Alternative D has fewer adverse impacts to the climate than alternatives A and C, but more than Alternative B.

Adverse impacts to the climate from livestock grazing under Alternative D are less than under Alternative C, particularly over time, but more than under Alternative B because more AUMs will be authorized with more range infrastructure. Like alternatives A and C, Alternative D has a higher utilization level with a greater risk of impairing the vegetation's ability to sequester carbon, an adverse impact to the climate. Alternative D management emphasizes infrastructure when tied to a Comprehensive Grazing Strategy. This is likely to lead to less infrastructure because of resource conflicts but probably not enough vegetation treatment to meaningfully increase carbon capture in degraded rangelands. Over time, Alternative D will have fewer AUMs than Alternative C, so less CH₄ will be emitted by the livestock and in livestock related transportation.

4.9.3.5.4. Special Designations

Special designation management under Alternative D is similar to, but less beneficial than under Alternative B in terms of impacts to the climate. The difference is analyzed in more detail in the

Air Quality, Soil, and Vegetation sections. While fewer limits on surface disturbance will occur than under Alternative B, the difference will be only moderate or less because of VRM associated with the special designations. Alternative D has substantially fewer adverse impacts to climate than Alternative A, and much fewer than Alternative C.

4.10. Cumulative Impacts

CEQ defines cumulative effects as:

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7).

For the Lander RMP revision, each of the three components of this definition of cumulative effects is addressed as follows:

- *Incremental impacts of the RMP revision.* The incremental impacts of the action (i.e., the revision of the existing plan), are described for each resource in the preceding sections.
- *Impacts from all past and present actions.* The impacts from all past and present actions are captured in the baseline conditions presented in Chapter 3, Affected Environment. As discussed in that chapter, the description of the current affected environment reflects past and present actions.
- *Reasonably foreseeable future actions.* Other reasonably foreseeable future actions are identified in Appendix T (p. 1641).

The analysis of cumulative impacts serves to place the projected incremental impacts from the management alternatives in the context of past, present, and future impacts. This combination necessarily involves projections and limited analyses. Public documents prepared by federal, state, and local agencies are the primary sources of information regarding past, present, and future actions. Speculative projects are not included in the projections, but areas of high potential for development or resource use that are unconstrained by management actions are identified and potential impacts are assessed. Necessarily, some of these analyses results will be qualitative, while others can be quantified. Certain developments might be identified as too speculative for analysis, such as oil shale-tar sands development in an area that is not actively leasing oil shale.

Analyses are limited because there is incomplete documentation of all past and present impacts on private and public lands, and limited knowledge of future development because of changing economic and technical conditions. Illustrative of this process is the expansion of oil and gas activities associated with CBNG development, or the impact to management considerations with the USFWS decision that listing the greater sage-grouse under the ESA is warranted but precluded.

Methods and Assumptions

It is neither practical nor required to exhaustively analyze all possible cumulative impacts to all resources and uses. Instead, the CEQ indicates the cumulative impact analysis should focus on meaningful impacts. Therefore, the analysis in this document focuses on past, present, and future actions anticipated to result in substantial impacts to historically important resources. This analysis is likely predictive of cumulative impacts to other resources not analyzed here. The resources to be analyzed were developed based on issues identified during public scoping and through the professional judgment of BLM specialists and Cooperating Agencies.

Particular attention was given to controversial issues or those with a substantial public interest and the uniqueness of resources affected. However, some issues that might be considered controversial or with a substantial public interest were not addressed because there are no environmentally meaningful differences among the alternatives.

Assumptions used in the calculation of impacts from non-BLM actions in the planning area include:

- Oil and gas activities are based on the Wyoming Reservoir Management Group's Oil and Gas RFD for the Wyoming BLM field offices.
- For cumulative impacts associated with non-BLM activities other than oil and gas, there is no "standard" assumption that can be made by extrapolating impacts associated with BLM management. The land and mineral ownership patterns in the planning area do not support attributing the same trends observed or identified for federal lands on state and privately owned lands.
- Generally, the context and intensity of non-BLM activities are not anticipated to vary by alternative because these activities do not directly depend on BLM management actions and allowable uses set forth in the RMP alternatives. However, oil and gas and wind-energy development will likely depend upon BLM management.
- Cumulative impacts such as soil erosion, INNS spread, and habitat fragmentation are anticipated to be commensurate with the amount of surface disturbance projected in the planning area (Table 4.50, "Cumulative Surface Disturbance from BLM and Non-BLM Reasonable Foreseeable Actions" (p. 1278)).
- Actions by private persons and entities are captured in public documents prepared by federal, state, and local agencies.
- The assumptions for reclamation are that short-term disturbance will be reclaimed within 2 years. This level of reclamation is based on soil stability and does not suggest a return to predisturbance conditions. Habitat fragmentation will not be restored in this timeframe; indeed predisturbance vegetation and habitat condition might not return for decades past the end of the planning period.
- Additional assumptions are identified under each issue.

Table 4.50. Cumulative Surface Disturbance from BLM and Non-BLM Reasonable Foreseeable Actions

Action	Alternative A	Alternative B	Alternative C	Alternative D
Total acres short-term disturbance from BLM actions	52,591	74,689	160,065	53,894
Total acres reclaimed from BLM actions	40,152	67,186	99,433	42,441
Total acres long-term disturbance from BLM actions	12,439	7,503	60,632	11,453
Total acres short-term disturbance from non-BLM actions	Unknown	Unknown	Unknown	Unknown
Total acres reclaimed from non-BLM actions	Unknown	Unknown	Unknown	Unknown
Total acres long-term disturbance from non-BLM actions	Unknown	Unknown	Unknown	Unknown
Cumulative long-term acres from disturbance	Unknown	Unknown	Unknown	Unknown
Source: Appendix T (p. 1641)				
BLM Bureau of Land Management				

Site-specific actions that have already occurred (past) or are ongoing (present) are not considered in this cumulative impacts analysis because they are already captured in Chapter 3, Affected Environment. Only those reasonably foreseeable future actions are considered in this cumulative impacts analysis.

Quantifiable aspects of the analysis, including impacts to air quality and surface disturbance have been identified. It is important to note however, that the specificity of the numbers in the table suggests a degree of accuracy that the data do not support, particularly because historical trends are used to predict future activity. With the immediate impacts of fluctuation of commodity prices on development, historical trends might not be representative of the future. For example, historical trends in locatable mineral development include a 15-year period in which 8 years had prices of uranium averaging under \$15.00 per pound and 1 year with prices close to \$100 per pound. In addition, much of the BLM data were created before modern equipment made exact measurement possible. Historic surface disturbance is based on permitted activities rather than the as-built environment. Acknowledging the limitations of the data is not to undermine its utility for comparative analysis of alternatives, either for assessing cumulative impacts or for direct and indirect impacts. This is especially true for the RMP, which includes site-specific analysis.

The analysis consists of an examination of the cumulative impacts to certain resources that are representative of resources in general, in the planning area. Of these issues, the most detailed analysis is for greater sage-grouse because of the 2010 USFWS finding that listing under the ESA was warranted but precluded (USFWS 2010). Because the Cumulative Impact Assessment Area (CIAA) for the greater sage-grouse was determined to be the State of Wyoming, development across the state is identified. This impacts analysis applies to the other resources, but is not repeated unless it is uniquely relevant on a site-specific basis. For example, the Core Area protection for greater sage-grouse will also protect riparian-wetland and vegetative

resources in the Core Area. The reduced protections for non-Core Area will result in reduced benefits to riparian-wetland and vegetative resources. Consequently, although only the greater sage-grouse analysis discusses the different types of development in-depth, the adverse or beneficial cumulative impacts apply to the other resources. Mule deer are an example of a resource that would have justified an assessment of cumulative impacts had it not been for the statewide assessment of greater sage-grouse. While mule deer habitat and herd areas do not precisely overlap Core Area, they are very similar. There is, of course, a connection between the two, and indeed among all current wildlife habitat. Crucial habitat for all species exists where modern development has not happened or had only a minimal impact. Otherwise, the area would not have been included in Core Area and would have little utility as habitat for big game, particularly important seasonal habitat. An assessment that identified existing or future development would adversely impact greater sage-grouse serves to identify adverse impacts to other wildlife, not just sagebrush obligates.

Table 4.51, “Summary of Reasonably Foreseeable Future Actions” (p. 1280) identifies reasonably foreseeable future projects that are considered in this cumulative impacts analysis. The majority of the projects identified are programmatic and/or strategic in nature; therefore, the exact intensity or location of anticipated impacts cannot be quantified. Most projects identified in Table 4.51, “Summary of Reasonably Foreseeable Future Actions” (p. 1280) are ongoing and provide a management framework for site-specific actions implemented during the life of the various projects. Though they are considered in this cumulative impacts analysis, refer to Chapter 3 for a detailed description of site-specific past and present (i.e., ongoing) actions.

Table 4.51. Summary of Reasonably Foreseeable Future Actions

	Physical Resources	Air Quality	Geologic Resources	Soil	Water	Cave and Karst Resources	Non-WSA Lands	Mineral Resources	Fire and Fuels Management	Biological Resources	Heritage and Visual Resources	Cultural Resources	Paleontological Resources	Visual Resources	Land Resources	Lands and Realty	Renewable Energy	Rights-of-Way and Corridors	Trails and Travel Management	Livestock Grazing Management	Recreation	Special Designations	Congressionally Designated Trails	Wilderness Study Areas	Wild and Scenic Rivers	ACECs	Socioeconomic Resources	Social Conditions	Economic Conditions	Health and Safety	Environmental Justice	Tribal Treaty Rights
Resource Plans																																
BLM RESOURCE MANAGEMENTS PLANS AND OTHER FEDERAL PLANS AND ANALYSES																																
Draft Resource Management Plan and EIS for the Bighorn Basin Planning Area (2011)		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X	X	X
Approved Resource Management Plan and Final EIS for the Casper Field Office Planning Area (2007)		X	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X	X	X
Green River Resource Management Plan and Final EIS for the Rock Springs Field Office (1997)		X	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X		X	X	X	X		X	X	X	X	
Approved Resource Management Plan and Final EIS for the Rawlins Field Office (2008)		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X	X	
Approved Resource Management Plan and Final EIS for the Pinedale Field Office (2008)		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X		X	X	X	X	
Final Programmatic EIS, Wind Energy Development on BLM-Administered Lands in the Western United States (2005)					X												X	X												X		
Final Programmatic EIS, Designation of Energy Corridors on Federal Land in the 11 Western States (2008)					X											X	X	X											X			
Final Programmatic EIS, Geothermal Leasing in the Western United States (2008)					X			X								X	X												X			
COUNTY PLANS																																
Carbon County Land Use Plan		X	X	X	X			X		X				X		X		X										X	X			
Fremont County Land Use Plan		X			X			X		X		X	X	X						X			X			X				X		
Hot Springs County Land Use Plan		X			X			X		X		X	X	X						X			X			X			X	X		
Natrona County Land Use Plan				X	X			X	X	X		X		X		X		X		X	X								X			
Sweetwater County Land Use Plan		X			X			X		X						X			X	X	X								X			
CONSERVATION DISTRICTS																																
Popo Agie CD Long Range Plan (2008-2012)				X	X					X						X					X								X	X		
Dubois–Crowheart CD Land Use and Resource Management Plan (2006-2010)		X	X	X	X				X		X							X		X	X				X				X			
Lower Wind River CD Long Range Plan (2011-2015)			X	X	X			X		X						X				X									X	X		
WATERSHED PLANS																																
Popo Agie CD Watershed Plan					X				X	X									X	X					X					X	X	

Resource Plans	Physical Resources	Air Quality	Geologic Resources	Soil	Water	Cave and Karst Resources	Non-WSA Lands	Mineral Resources	Fire and Fuels Management	Biological Resources	Heritage and Visual Resources	Cultural Resources	Paleontological Resources	Visual Resources	Land Resources	Lands and Realty	Renewable Energy	Rights-of-Way and Corridors	Trails and Travel Management	Livestock Grazing Management	Recreation	Special Designations	Congressionally Designated Trails	Wilderness Study Areas	Wild and Scenic Rivers	ACECs	Socioeconomic Resources	Social Conditions	Economic Conditions	Health and Safety	Environmental Justice	Tribal Treaty Rights
WATERSHED PLANS																																
Popo Agie CD Watershed Plan					X				X	X									X	X										X		
Ocean Lake Watershed Water Quality Management Plan (Lower Wind River CD)					X			X		X										X										X		
Belle Fourche River Watershed Plan (Sweetwater CD)					X																											
Watershed Strategic Plan (Wyoming Assoc. of Conservation Districts)				X	X					X									X	X								X	X	X		
STATE AGENCY PLANS																																
Wyoming Dept of Agriculture Strategic Plan (2005)																																
Wyoming Game and Fish Strategic Habitat Plan										X										X												
Wyoming Game and Fish Greater Sage-Grouse Conservation Plan				X	X			X		X										X												
Wyoming Game and Fish Final Wyoming Gray Wolf Management Plan (2007)										X																						
Wyoming State Water Plan Wind/Bighorn River Basin (2003)					X							X					X			X											X	
Wyoming Statewide Comprehensive Outdoor Recreation Plan (2003)																			X	X												
Wyoming Statewide Trails Plan (2004)																			X	X					X							
Wyoming SHPO Comprehensive Statewide Historic Preservation Plan (2007-2015)												X		X																		
FEDERAL AGENCY PLANS																																
Shoshone National Forest Land and Resource Management Plan		X		X	X			X	X	X										X	X					X		X	X			
United States Fish and Wildlife Pathfinder Interim Management Plan					X					X																						
United States EPA Region 8 Wyoming State Implementation Plans		X											X																			
FIRE MANAGEMENT PLANS																																
Yellowstone National Park Fire Management Plan		X							X	X		X																				
Southern Zone Fire Management Plan									X	X																						
Wyoming Fire Management Plan				X					X	X																						
Federal Wildland Fire Management Policy				X					X	X																						

4.10.1. Cumulative Impacts to Greater Sage-Grouse from Management Actions

Cumulative Impact Assessment Area

State of Wyoming

Background

Greater sage-grouse habitat is found throughout most of Wyoming. Approximately 69 percent of the state has been mapped as historic range for the species, with most of the range still identified as having suitable habitat. As part of the 2005 12-month finding in response to petitions to list the greater sage-grouse under ESA, the USFWS identified a list and ranking order of threats to greater sage-grouse populations and habitat across the species' range. The top five threats identified for the 2005 12-month finding for the eastern part of the range, which encompasses Wyoming, were oil and gas development, infrastructure, INNS, wildfire, and grazing (Diebert 2010). The result of the 2005 finding was that greater sage-grouse was not warranted for listing. The 2005 finding was remanded in 2007 and the USFWS completed another 12-month finding in 2010. The 2010 finding determined that greater sage-grouse is warranted for listing, but precluded by higher priority listing actions. During the 2010 finding, the USFWS determined that habitat loss and fragmentation resulting from wildfire, energy development, urbanization, agricultural conversion, and infrastructure development are the primary threats to the species. All of these primary threats occur on lands throughout the state regardless of ownership. As a federal agency, the BLM is obligated to develop and implement a strategy to avoid having its management activities contribute to the need to list greater sage-grouse under the ESA (BLM 2008e, BLM 2004a).

In 2008, the Governor of Wyoming issued an Executive Order establishing greater sage-grouse Core Area throughout the state. Since that time, other Wyoming state agencies have issued similar Executive Orders detailing management of greater sage-grouse and their habitats. The most recent Executive Order (2011-5) for greater sage-grouse Core Area protection was issued in June 2011 (Map 63). The Executive Order resulted from work completed by the Governor's SGIT, which was formed to find ways to conserve greater sage-grouse in Wyoming in response to listing petitions. The SGIT developed a list of stipulations intended to maintain existing suitable greater sage-grouse habitat by allowing development activities to occur in Core Area in a way that will not cause a decline in the greater sage-grouse population. The Core Area strategy, which the BLM has adopted, is designed to protect approximately 83 percent of the statewide population within approximately 25 percent of the state's land mass. Greater sage-grouse conservation strategies also are being implemented outside Core Area, but to a lesser degree. In response to the Governor's request for review of the Core Area strategy, the USFWS stated that the strategy the SGIT outlined would be "a sound framework for a policy by which to conserve greater sage-grouse in Wyoming."

Through the issuance of IM WY-2010-012 (BLM 2009j), the Wyoming BLM committed to the management outlined in the 2008 Executive Order and will utilize energy location densities and cumulative surface disturbance thresholds in Core Area to protect greater sage-grouse habitat over the long term (BLM 2009j). Because the Core Area strategy has recently been developed, there are no BLM land use plans in Wyoming that have formally adopted the Core Area strategy. Accordingly, greater sage-grouse conservation is implemented on a case-by-case basis in individual, site-specific NEPA analyses. BLM field offices are in the process of revising

or amending RMPs to incorporate the Core Area strategy, which is reflected in Alternative D of this RMP and EIS.

Analysis of Cumulative Impacts

The State of Wyoming was selected for analysis because the approach identified for conservation of the species is a statewide plan. Greater sage-grouse numbers will be evaluated by the USFWS for the state as a whole. Consequently, BLM management of public lands in the planning area will be evaluated not in terms of the number of greater sage-grouse thought to occur locally, but as a component of the statewide numbers. The BLM is revising or amending RMPs in states that support greater sage-grouse habitat to incorporate protection measures similar to those developed in Wyoming. BLM Field Offices are grouped into two geographic regions that are experiencing similar threats to greater sage-grouse habitat, the Rocky Mountain and Great Basin areas. As part of the Rocky Mountain area, the cumulative impacts facing greater sage-grouse in Wyoming are similar to the rest of the region. Analyzing cumulative impacts in Wyoming is representative of what is occurring throughout the region.

The USFWS emphasized that greater sage-grouse conservation needed to be looked at regionally and recommended the WAFWA zones. However, the BLM does not have reliable data on that broad scale for existing and future development for all of Zone 2. A planning effort is currently underway to collect those data in a systematic way with uniform data standards, definitions, and analyses tools. At present and for the foreseeable future, the information is incomplete or unavailable for WAFWA Zone 2. However, this information, while important on a landscape scale is not directly relevant to the Lander analysis because the conservation measures adopted in Wyoming are based on a statewide strategy. By addressing impacts to greater sage-grouse by development across the state, Lander, which is centrally located and not adjoining any other state, captures a broad-scale area of analysis for which the data are relatively well known and understood.

Assumptions

This analysis examines current and future actions occurring on non-BLM-administered lands in the planning area and actions occurring on all lands outside the planning area (including BLM-administered lands in other field office planning areas) that can affect greater sage-grouse and their habitats. The following assumptions are made:

- The Core Area strategy and management stipulations will be successful at protecting approximately 83 percent of the greater sage-grouse population in Wyoming, which will be sufficient to prevent listing the greater sage-grouse under the ESA.
- Statewide, the BLM will implement the Core Area-based management through new RMPs or amendments to existing RMPs. While NEPA analysis has not been completed for Core Area prescriptions, the work of the SGIT strongly supports the likelihood that Core Area management will be identified as the best method of protecting greater sage-grouse with the fewest adverse impacts to other uses and resources. While it is possible that in certain areas a different strategy will be found appropriate or selected through NEPA analysis (including more stringent prescriptions on development), analysis here assumes that the Core Area strategy will be implemented including management for the non-Core Area.
- Future Governors of Wyoming will comply with Executive Order 2011-5 and State of Wyoming lands will continue to be managed in accordance with the Executive Order.

*Chapter 4 Environmental Consequences
Cumulative Impacts to Greater Sage-Grouse
from Management Actions*

- Locatable mineral mining, primarily for uranium and bentonite, will not be subject to disturbance densities outlined in the Executive Order or the IM; however, disturbance from these activities will be used in disturbance calculations for other projects.
- WRIR and the USFS have committed to the Core Area strategy, and lands in and out of the Core Area will be managed in compliance with the management stipulations applicable for each area.
- Non-Core Area greater sage-grouse populations will likely decline due to loss and fragmentation of habitats.
- Private lands with high potential for oil and gas and wind-energy development are likely to be developed with no specific emphasis on protecting greater sage-grouse habitat.
- Development in non-Core Area that pushes activities near the edge of the Core Area is likely to adversely impact the functionality of the adjacent Core Area habitat. Surface disturbance and human activity near this edge could cause degradation of adjacent Core Area habitat and result in Core Area boundaries to erode over time.

Cumulative impacts to greater sage-grouse will occur primarily from surface-disturbing and other disruptive activities across Wyoming that result in the loss, degradation, or fragmentation of habitat or key habitat components, the disturbance/displacement of birds during sensitive periods, and direct mortality. Impacts to greater sage-grouse from non-BLM actions in the planning area and from all actions in the remainder of the state are primarily anticipated from the same threats the USFWS identified for the eastern part of greater sage-grouse range. These threats occurring in the CIAA are discussed below. Management that results in beneficial and adverse impacts will vary by land ownership and whether the project is in Core Area or non-Core Area. Table 4.52, “Percent Composition by Land Ownership of Greater Sage-Grouse Core Area and Non-Core Area” (p. 1285) lists the percentage of land ownership in the planning area and the CIAA.

Table 4.52. Percent Composition by Land Ownership of Greater Sage-Grouse Core Area and Non-Core Area

	Total	Bureau of Land Management	State of Wyoming	Private	U.S. Forest Service	Wind River Indian Reservation	Other
Planning Area	100	36.9	4.3	18.9	13.5	23.8	2.6
Core Area in Planning Area	40.2	64.3	6.5	17.6	0.02	11.2	0.4
Non-Core Area in Planning Area	59.8	18.5	2.8	19.7	22.6	32.3	4.1
State of Wyoming Overall Ownership	100	27.9	5.8	44	13.8	2.5	5.9
Ownership of the 24.4 Percent of Wyoming Lands in Core Area	-	50.8	7.2	36.6	0.2	1.9	3.2
Ownership of the 75.6 percent of Wyoming Lands that are Non-Core Area	-	20.6	5.3	46.5	18.1	2.6	6.8
Source: BLM 2012a							

“Other” lands are primarily under the jurisdiction of the Bureau of Reclamation, U.S. Department of Defense, and the USFWS and support very limited amounts of habitat for greater sage-grouse. Because of the small percentage of the state comprising other lands, they are not further discussed.

Private lands are not subject to Core Area or non-Core Area stipulations and it is likely that protective measures for greater sage-grouse would not be implemented on private lands unless the private landowner voluntarily agrees to protective measures or enters into a Candidate Conservation Agreement with Assurances. It is likely that private lands within Core Area undergoing oil and gas development will be subject to Core Area stipulations, because the Wyoming Oil and Gas Conservation Commission and Wyoming DEQ are state agencies that must comply with the Core Area stipulations outlined in the Wyoming Governor's Core Area Executive Order. Most contiguous private land is in the eastern third of the state, and some of these lands do not contain sagebrush habitats or have been converted through agricultural practices; therefore, they do not support greater sage-grouse. On a statewide basis, more acres are in private ownership than the total acres of lands, outside the national parks, managed by federal agencies including BLM and USFS. Accordingly, management of private lands has a very real potential to impact greater sage-grouse. Although only 17.6 percent of the Core Area is privately owned, activities on private lands surrounding the Core Area could result in adverse impacts to the private land in the Core Area, particularly from energy development, infrastructure, livestock grazing, and subdivisions not covered by the State of Wyoming or federal Core Area strategies.

The western two-thirds of the state has more BLM-administered, WRIR, and USFS lands. As indicated in the assumptions for analysis, BLM, USFS, WRIR, and state lands will be managed in accordance with the stipulations identified for both the Core Area and non-Core Area. Greater sage-grouse are not known to occupy USFS lands except in a portion of the Thunder Basin National Grasslands, which is why, although 13.8 percent of Wyoming lands are USFS lands, the USFS manages only 0.2 percent of the Core Area. Nevertheless, USFS management is consistent with the Core Area strategy.

In the Core Area, stipulations on BLM, State of Wyoming, WRIR, and USFS lands will limit the number of projects and amount of surface disturbance allowed per square mile for discretionary actions. Although the details of management are likely to vary under each jurisdictional boundary, in general, the plans will not authorize surface disturbance within a 0.6-mile buffer around active greater sage-grouse leks. In addition, a seasonal protection stipulation will be applied to surface-disturbing and disruptive activities in suitable greater sage-grouse habitat during the breeding/nesting period, generally mid March through the end of June. These limitations should provide adequate protection to maintain habitat to support the current number of greater sage-grouse found within the Core Area boundaries. However, see below for a discussion of the issues associated with locatable minerals.

Approximately 75 percent of the state is identified as non-Core Area, which supports just 17 percent of the known greater sage-grouse population. Non-Core Area is comprised of lands that historically did not support greater sage-grouse, have isolated or very small scattered leks, or are undergoing or are planned to undergo intensive development and/or urbanization.

Non-Core Area protections are much less restrictive (i.e., a 1/4-mile buffer around leks versus the 0.6-mile buffer in Core Area). Therefore, it is likely that additional greater sage-grouse habitat loss and fragmentation will occur on BLM, State of Wyoming, WRIR, and USFS lands in areas undergoing development activities. In addition to the smaller lek and nesting buffers, there are no limits on the number of projects or the amount of surface disturbance that can occur in non-Core Area. It is expected that habitat losses in non-Core Area will accrue regardless of land ownership and will increase as disturbance caps are reached in the Core Area. It is not possible to quantify this effect as the Core Area strategy provides an incentive for successful reclamation of disturbance so as to reduce the area considered disturbed.

In summary, the most beneficial impacts to greater sage-grouse are in Core Area, which have most of the land managed by agencies using Core Area stipulations (i.e., the BLM, the State of Wyoming, the WRIR, and the USFS). The most adverse situation for greater sage-grouse is to be in the non-Core Area or in the Core Area with substantial private land not subject to the stipulations. Not coincidentally, the most concentrated areas of Core Area are in the parts of Wyoming with the most concentrated federal lands. Map 136 shows land ownership across the state and identifies the greater sage-grouse Core Area.

Stipulations for Core Area and non-Core Area will apply primarily to oil and gas and energy-related realty actions, but could pertain to range improvement projects (e.g., vegetation treatments, water developments, fences) depending on the size and scope of the project. Surface disturbance related to locatable mineral mining, primarily for uranium and bentonite, and non oil and gas mineral leasables will not be subject to the same stipulations; however, disturbance from all activities will be used in calculations when assessing whether disturbance caps have been reached.

Excluding high development or high mineral potential areas from the Core Area is a recognition that highly disturbed areas are generally not suitable as greater sage-grouse habitat. However, many of these areas were suitable habitat before disturbance, and therefore can be found directly adjacent to the Core Area. Because most of the heavily developed areas are non-Core Area, less restrictive stipulations apply. Therefore, it is likely that the intense development could have a spill-over effect to the Core Area, with potential erosion of habitat adjacent to development. This potential is discussed below for each type of development.

The BLM applies Core Area surface disturbance limitations only to federal surface, not to federal minerals for split-estate. While this has little impact in the planning area because of the limited amount of split-estate in Core Area (417,287 acres, generally in the eastern portion of the planning area), on a statewide basis there are extensive private surface lands with federal minerals in the Core Area; see Map 137. In the Buffalo and Newcastle planning areas for example, almost all mineral ownership in the Core Area is either private or split-estate where the Core Area stipulations will not be applied. Similarly, in the Pinedale planning area, some of the Core Area is bisected by private surface. As discussed below, the Core Area is vulnerable to impacts from adjacent oil or gas development.

The greatest contributor to the decline in greater sage-grouse populations is habitat fragmentation. Small decreases in lek connectivity result in large increases in probability of lek abandonment (Connelly et al. 2000) The greater the extent to which habitat is fragmented and connectivity lost, the greater the adverse impacts to greater sage-grouse.

Oil and Gas

Currently, oil and gas exploration and development is taking place throughout much of the state, with the most intensive development in the Powder River Basin, Pinedale, and Red Desert areas. The Powder River Basin area has less Core Area and a higher percentage of private land, whereas the Pinedale and Red Desert areas have more Core Area and a higher percentage of BLM-administered lands. In the case of the Powder River Basin, most greater sage-grouse habitat occurs in non-Core Area and therefore will likely receive relatively limited protection due to the large amount of private land and the high value of oil and gas production. On the limited amount of federal lands where stipulations apply, greater sage-grouse will receive the lower level of protection applied to non-Core Area, which will likely lead to substantial adverse impacts to greater sage-grouse because only ¼ mile around leks will be closed to surface disturbance.

Oil and gas development across the state is expected to remain stable or increase over the next 20 years with the majority of activity currently occurring, or predicted to occur, in areas open to leasing having very high, high, and moderate potential for future development of oil or gas reserves. As technology increases and new reserves are discovered, development will occur both inside and outside the Core Area. For example, the BLM recently authorized increased development in the Salt Creek Field in Casper utilizing CO₂ enhanced recovery (BLM 2007e) which is a technology being used in old oil fields.

As surface disturbance caps are reached in the Core Area, it is expected that development in non-Core Area will increase, at least until reclamation levels are achieved in Core Area and new surface disturbance is possible. While reclamation and mitigation measures will reduce short-term impacts from surface disturbance, permanent facilities will result in long-term disturbance. Development on BLM, State of Wyoming, WRIR, and USFS lands in Core Area (approximately 50 percent of the total acres of statewide Core Area) will be subject to the management stipulations outlined in the Core Area strategy; therefore limits will be placed on the amount of habitat loss and

fragmentation that can occur. The Core Area strategy should prevent large losses of habitat except in areas currently leased and unitized that are undergoing substantial development, such as in the Rawlins and Pinedale planning areas. In this situation, it will be difficult to keep the total surface disturbance under the 5 percent threshold identified in the Executive Order and IM. Development on private lands (approximately 37 percent of total statewide Core Area) will not be subject to the same stipulations, and habitat loss and fragmentation will likely increase as opportunities for development on BLM and State of Wyoming lands become more limited. An unintended consequence of federal limitations could be to push more development onto private lands.

Oil and gas exploration and development on BLM, State of Wyoming, WRIR, and USFS lands in non-Core Area will not be subject to the location density and total disturbance caps. Areas currently undergoing intensive development in the state are primarily outside the Core Area, and it is anticipated that the high level of development will continue in existing fields. Increased levels of noise and human activity, combined with smaller lek buffers and increased habitat fragmentation from surface disturbance, will likely render these areas avoided or unusable by greater sage-grouse.

Erosion of the Core Area edges could occur where Core Area adjoins or includes existing or anticipated oil and gas operations, such as south of Highland in the Casper planning area, the Wamsutter/Creston Junction area of the Rawlins planning area, the Hiawatha area, and the Wyoming Range. At particular risk is the Core Area separated by the Pinedale Anticline, which will experience intensive oil and gas development and associated infrastructure during the next 15 years (approximately 4,400 new wells) with a 40-year productive life (BLM 2008f). The Core Area in the northern portion of the Wyoming Range could be subject to pressure from oil and gas reserves with high potential for development northwest of Cora. There also is high potential for development south of Pinedale and east of Big Piney that is adjacent to Core Area. The Jonah Field is partially in the Core Area, as is the Hiawatha and Wamsutter/Creston Junction developments. The BLM is completing an EIS for an additional 1,600 wells in the Moxa Arch project, which will be an addition to the approximately 1,450 wells already developed. A small portion of the project area lies within the Core Area and the rest of the project area falls in non-Core Area adjacent to the Core Area.

In addition to the disturbance associated with actual oil and gas operations, infrastructure requirements increase substantially. For example, the Pinedale Field Office recently approved an ROW for 55 miles of 230-kilovolt transmission line and two substations to support oil and gas activities in the Pinedale Anticline (BLM 2009k). While some of the surface disturbance associated with oil and gas development are included in the oil and gas RFDs, additional disturbances such as new transmission lines could be necessary to fully develop and transport these resources.

Non-Oil and Gas Leasable Minerals

Coal resources tend to be present in localized regions in Wyoming. Major coal resources are present outside the planning area near Gillette/Wright, Hanna, and east of Rock Springs. As with high-potential oil and gas areas, places with high potential for coal have primarily been omitted from the Core Area. However, coal leases are currently in place close to the Core Area in the Buffalo and Newcastle planning areas and south of the Core Area to the northwest of Rock Springs. The coal leases near Hanna in the Rawlins planning area are in the Core Area but the IM regarding caps on surface disturbance do not apply to coal leasing. (It is not known at this time how the Rawlins RMP will be amended regarding greater sage-grouse management, and whether

the IM will be followed or a more restrictive management applied that includes limitations associated with surface disturbance from coal mining.) Coal development areas must be fully reclaimed following mining extraction, but the intensive nature of the development activity over a considerable period results in a long-term impact and would likely result in adverse impacts to adjacent and nearby Core Area habitats.

Phosphate is a leasable mineral that could adversely impact greater sage-grouse habitats in Wyoming. While phosphate resources occur throughout the State of Wyoming, generally, they are not present in commercially viable quantities. Currently, there is no phosphate leasing or production from federal surface or mineral estate in the CIAA (BLM 2010f). In the case of the planning area, phosphate potential has been identified, but leases have not been reviewed pending the revised RMP decisions. Future demand for phosphate minerals will likely increase over time in other parts of Wyoming; however, this development is too speculative to consider as a cumulative impact. Under the Executive Order and IM, phosphate leasing, a BLM discretionary activity, is subject to the surface disturbance limitations in the Core Area discussed above for oil and gas.

Trona is another leasable mineral present in the CIAA. While not present in the planning area, it is present in the southwest part of the state, principally overlapping the Kemmerer and Rock Springs planning areas, with an additional small location inside Core Area near Rock Springs. Historic mining activity and infrastructure has affected the availability of suitable greater sage-grouse habitat, so extensive resources are in non-Core Area. An additional area of trona is identified as occurring in “islands” of disconnected Core Area. The IM does not apply to trona development, so it is possible that additional mining could adversely impact or erode the surrounding Core Area. The sections of Core Area with trona resources comprises a small part of the state’s overall Core Area; because trona resources are so concentrated within a portion of the southwest part of the state, mining is not likely to impact the remaining Core Area.

Locatable Minerals

The BLM grants locatable mineral authorizations under the 1872 General Mining Law unless unnecessary or undue degradation would result. So long as the greater sage-grouse is a candidate species and not listed under the ESA, locatable mineral development such as uranium and bentonite mines, will be authorized where they would not cause unnecessary or undue degradation to the greater sage-grouse or their habitat. As a consequence, the Core Area strategy has little application except to the extent that the strategy is designed to avoid listing greater sage-grouse, which would trigger more stringent management of locatable minerals. Locatable mineral activity is subject to regulation by the Land Quality Division of the Wyoming DEQ. Wyoming has added stipulations for mining activities that could limit locatable mineral mining in Core Area, but the impact of these stipulations is not clear because there is no history to suggest how stipulations would be applied when the State of Wyoming processes an application in Core Area. If the State of Wyoming limits surface disturbance, it is likely that mines would be precluded because surface disturbance created from mining activities would meet or exceed the disturbance threshold of 5 percent.

Major uranium resources in the planning area are found in the Gas Hills and Green Mountain areas, and outside the planning area near Midwest and directly south of the planning area boundary in the Great Divide Basin. Generally, these areas are in non-Core Area, reflecting the decades of mining and AML reclamation that has resulted in habitats unsuitable for greater sage-grouse. The Green Mountain area and the uranium deposits near the southern boundary of the planning area are in Core Area. Just as in the case of oil and gas, there is extensive uranium

potential close to Core Area, which presents the potential of eroding the outer boundaries of the Core Area. This is particularly true in the Casper, Buffalo, and Rawlins, planning areas where existing claims and identified projects are in or adjacent to the Core Area. The Lander Field Office is processing an EIS for a uranium mine adjacent to the Core Area that overlaps the Casper planning area, and the Rawlins Field Office is processing a uranium mine application along its boundary with the Lander planning area. In addition to the three uranium recovery facilities in the planning area, the U.S. Nuclear Regulatory Commission is processing 11 active license applications and two inactive applications in Wyoming (Nuclear Regulatory Commission 2010). If these proposed mines are in or near the Core Area, they would adversely impact to greater sage-grouse habitat and could cause erosion of Core Area boundaries.

Wyoming has extensive bentonite resources, some of which overlap or are adjacent to the Core Area. The loss of sagebrush habitat associated with bentonite in the Bighorn Basin has been intensive on a local scale and contributed to altering 12 percent of the sagebrush habitat in the Bighorn Basin (BLM 2009b). Restoration efforts to return the mine site to predisturbance vegetative conditions have been mostly unsuccessful. The BLM anticipates an additional 34 square miles to be disturbed by bentonite mining through 2024 in addition to other oil and gas and energy transmission disturbances (BLM 2009b).

Bentonite resources in the planning area are located in the Core Area, except for an operating bentonite mine in the Gas Hills area that is just outside the Core Area. Active bentonite mines do not support suitable greater sage-grouse habitat; therefore, mines in the CIAA, specifically in the Worland and Cody planning areas, are in non-Core Area. However, in those two planning areas, almost all of the bentonite claims are adjacent to Core Area, which could increase the potential to impact Core Area habitat and erode the Core Area edges to the east of these mines. In the Casper and Buffalo planning areas, most of the bentonite claims are adjacent to or within the Core Area. Just as with uranium, it is not clear the extent to which the State of Wyoming greater sage-grouse protections will limit mines in Core Area, but the 1872 General Mining Law and subsequent BLM management will not limit the development of bentonite resources unless unnecessary or undue degradation would result.

Mineral Material Disposals

Mineral material disposals, often referred to as “salable minerals,” are a BLM discretionary action. Mineral material sources are available throughout the state and can occur on all ownership lands. It is expected that mineral material disposals in suitable habitat on lands managed by the BLM, State of Wyoming, the WRIR, and the USFS would likely not be allowed in new areas within or adjacent to suitable greater sage-grouse habitat in Core Area even if not specifically closed by the agency's management plan. On privately owned mineral estate, disposals could occur in the Core Area and demand for private sites could increase if federal and state lands are closed to disposals. While some mineral material disposals are subject to the State of Wyoming Land Quality Department permitting process, smaller disposals from community pits and common use areas are not, and the demand for disposals could increase to meet the anticipated increase for materials for oil and gas or other mineral developments, road construction, and urban development.

Infrastructure

Various forms of infrastructure, including powerlines, communications towers, wind turbines, fences, and roads, occur across the CIAA landscape regardless of land ownership. These types of facilities can cause direct habitat loss from surface disturbance and functional habitat loss from behavioral avoidance by greater sage-grouse. As stated in the USFWS 12-month finding,

fragmentation of habitats is cited as a primary cause of greater sage-grouse population declines because the species requires large expanses of contiguous sagebrush. Greater sage-grouse tend to avoid areas with tall structures (e.g., powerlines, communications towers, and wind turbines) due to the increased opportunity for predation by raptors. Therefore, aboveground facilities can make some habitat unsuitable for greater sage-grouse. There has been a national push to develop more wind energy and the associated transmission lines to move the energy outside the State of Wyoming. The Energy Policy Act of 2005 directs the Secretaries of Agriculture, Commerce, Defense, Energy, and the Interior to designate energy corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities. The Westwide Corridor identifies approximately 438 miles of corridor through Wyoming (DOE and BLM 2008), of which approximately 205 miles cross the Core Area. The BLM is also evaluating the route for the Gateway West Transmission Line Project from Glenrock south to the Interstate 80 corridor east of Hanna and then west along the Interstate 80 corridor out of the State of Wyoming. The proposed route would cross approximately 160 miles of the Core Area. These large projects could adversely impact greater sage-grouse up to 1 mile on either side of the transmission lines.

It is anticipated that areas having Categories 5, 6, and 7 wind potential outside USFS wilderness and BLM WSA areas have the greatest likelihood of being developed. Most of these areas are primarily in the eastern part of the state and along the Interstate 80 corridor. Approximately 18 percent of the lands identified as having high potential for wind energy in the state occur in the Core Area.

The Executive Order states that wind-energy development should be avoided in greater sage-grouse Core Area; therefore, it is unlikely that much development will occur in the Core Area because state approval would be required for most projects. Wind-energy developments with 30 or more turbines require approval from the Wyoming DEQ Industrial Siting Council, and smaller projects are not typically commercially viable. It is possible that wind-energy projects of fewer than 30 turbines could occur in the Core Area if the project is located only on private lands. It is not possible to predict how much wind-energy development will occur in the CIAA because there is currently a lack of available transmission lines needed to move the power. Lands with high potential for wind energy outside Core Area are the most likely to be developed, providing transmission lines needed to carry the energy are in place or can be built. Development on BLM, State of Wyoming, USFS, and WRIR lands will be subject to lek avoidance and seasonal protections for nesting habitat, but these same protections are not likely to be implemented on private lands unless specifically required by the landowner. Even with these protections, large-scale wind-energy development would adversely impact the suitability of adjacent and connectivity lands for greater sage-grouse unless they are developed on lands far away from the Core Area.

Wind-energy development in the southern and eastern parts of Wyoming are the most likely to be developed, primarily on private surface. Less development is expected on public lands. As of the beginning of fiscal year 2010, BLM Wyoming had approved only one industrial wind project (in 1997) and has applications for eight others, the largest of which is 8,767 acres (BLM 2010g). Since 2010, the BLM has completed the Final EIS for the Choke Cherry/Sierra Madre wind-energy development in the southern part of Wyoming. None of these projects are in the Core Area, although all are close.

Underground pipelines used to gather and transport oil or gas will increase in areas experiencing intensive development, and are expected to cause only short-term habitat loss provided the disturbance is successfully reclaimed. Pipeline disturbances can be difficult to reclaim,

particularly in the very arid parts of the state, and habitat loss could be long-term if suitable vegetation for greater sage-grouse is not reestablished. Powerlines will likely increase in areas undergoing energy development and in areas near cities and towns experiencing rural subdivision. Powerlines constructed in utility corridors will minimize the impact of overhead structures being placed in undisturbed greater sage-grouse habitat. Corridors are more likely to be used in the western two-thirds of the state because the BLM and the USFS generally designate corridors on their lands, whereas the establishment and use of corridors is less likely in the eastern third of the state where there is more private land. This policy of locating corridors on public lands facilitates the granting of ROWs, but results in inherent conflicts with the Core Area because of the linear nature of the facilities and the costs associated with routing the infrastructure around leks. The Interstate 80 corridor across the southern end of the state is the preferred location for major infrastructure, but north-south facilities must cross the Core Area at some point.

Extensive transmission line development is likely, and several projects have been proposed, including the Gateway West and Gateway South projects. Increases in demand for renewable energy from outside Wyoming is likely to result in an increase in demand for cross-state transmission corridors. Much of the transmission network is likely to follow existing disturbances, such as Interstate 80. While the likely location of transmission lines are not in Core Area because that habitat has already been lost, Core Area is very near it, especially near Rawlins.

Pipelines and powerlines and other types of infrastructure that go through the Core Area and non-Core Area can facilitate the transport of INNS across the landscape, which can adversely impact greater sage-grouse habitat. Pipelines and powerlines can originate, pass through, and terminate on lands having one ownership, but due to the state's scattered land pattern, it is much more likely these projects will cross through lands having different ownership. Activities on private lands could receive the same greater sage-grouse protections as BLM, state, WRIR, and USFS lands because landowners often ask for the same mitigation measures as used on adjoining lands.

Pipeline capacity will likely increase as oil and gas development continues. All RFDs for land use plans currently under revision in Wyoming (Buffalo, Bighorn Basin, and Lander) and recently completed revisions (Pinedale, Casper, Kemmerer, and Rawlins Field Offices) project additional demand for pipelines. The BLM has recently approved a pipeline originating in Opal and heading west for 678 miles (BLM 2010h) and the Overland Pass Pipeline from Opal and heading east through Lincoln, Sweetwater, Albany, and Laramie counties into Colorado (BLM 2007f). Parts of both of these lines cross the Core Area and will affect greater sage-grouse habitat adjacent to the lines. Additional pipelines are expected throughout the CIAA to gather and transport product, including moving CO₂ to facilitate enhanced oil recovery in existing oil fields.

New roads and trails are developed or established in greater sage-grouse habitats across the state, both inside and outside the Core Area, from authorized activities and recreational OHV use. Roads and trails contribute to the overall habitat loss and fragmentation occurring in the CIAA and they can result in greater sage-grouse mortality from vehicle collisions, create barriers to movement, facilitate the spread of INNS, and provide opportunities for predation. High-density road development is occurring in intensively developed oil and gas fields, which are primarily located in non-Core Area. Development of new roads will be associated with new energy development areas, mining activities, and ROWs and will occur across the state regardless of land ownership. Developed roads in the Core Area on BLM, State of Wyoming, WRIR, and USFS lands will be subject to the 5-percent disturbance cap. Unauthorized roads and trails established by recreational OHV use are expected to increase in greater sage-grouse habitat during the

planning period, particularly on BLM-administered lands near communities. Due to the limited availability of BLM Rangers, enforcement of travel management decisions on BLM-administered lands is difficult and the proliferation of new road and trails that can fragment greater sage-grouse habitat is expected to continue. Private and State of Wyoming lands are expected to have less unauthorized road and trail establishment due to more controlled access.

Fences are present on most ownership lands across the State of Wyoming and are used primarily to delineate property boundaries and to manage livestock. Fences can cause greater sage-grouse to avoid adjacent habitats because raptors can use them as hunting perches and they can create predator corridors and contribute to overall habitat fragmentation. In addition, fences can cause direct greater sage-grouse mortality through bird collision with fence wires. Not all fences present the same mortality risk to greater sage-grouse because the risk depends on the style of fence, landscape topography, and spatial proximity to seasonal habitats. It is expected that the level of fencing will increase on private land and in areas near communities as more lands become subdivided. Fencing on BLM, State of Wyoming, WRIR, and USFS lands is likely to remain steady or increase in response to energy development and grazing management concerns.

Invasive Species

INNS spread as areas are disturbed and would adversely impact greater sage-grouse habitat by reducing or eliminating native vegetation required for food and cover. INNS in the CIAA consist of annual grasses (primarily cheatgrass) or other invasive plants, but also could be native conifers that encroach sagebrush communities. The potential for the establishment or spread of INNS increases with each surface-disturbing activity, regardless of land ownership. Because development on private lands is not required to implement INNS prevention strategies, the potential for adverse impacts from development is greater on private lands. In areas experiencing intensive development or large-scale disturbance, the potential is even greater. The limitations on the amount of surface disturbance allowed per square mile on BLM, state, WRIR, and USFS lands in the Core Area will reduce the risk of INNS getting established in new areas over the risk in non-Core Area. Because most of the state is in non-Core Area, the risk of INNS getting established and adversely affecting non-Core Area habitat will increase on all lands as there will be no surface disturbance limits. INNS that spread from non-Core Area to Core Area will result in adverse impacts to Core Area habitat quality. Similar as described for energy development and infrastructure, surface disturbance on private lands inside or outside the Core Area will not be limited unless required by the land owner.

In many parts of the State of Wyoming, juniper is expanding within its current range and moving into sagebrush habitats regardless of land ownership. Pinyon-juniper woodlands have expanded almost tenfold in the intermountain west since European settlement in greater sage-grouse range due to the reduced role of fire, the introduction of livestock grazing, increases in global CO₂ concentrations, climate change, and natural recovery from past disturbances (USFWS 2010). Juniper can eventually replace sagebrush and reduce the availability of greater sage-grouse habitat; female greater sage-grouse are known to avoid conifers in winter (Doherty et al. 2008). Conservation actions to control or eradicate juniper, including mechanical, herbicide, cutting, and burning treatments, are occurring in the CIAA; however, treatments are not keeping pace with the rate of juniper encroachment in most areas. In most areas of the Wyoming, treatments by Firewise Communities, the WGFD, and other groups or individuals are conducted on fewer acres of private, WRIR, and state lands primarily due to the costs of the treatments. Including the projects completed on BLM and USFS lands, juniper encroachment outpaces treatment, and treatments have not been determined to reestablish greater sage-grouse habitat (USFWS 2010).

Vegetation mapping is not sufficiently complete to identify how much the Core Area is threatened with juniper encroachment. Fire suppression in the Core Area is emphasized in the Executive Order, which makes it unlikely that fire will be heavily utilized for vegetative treatments, making mechanical treatments the most likely method to address juniper encroachment.

Wildfire

Wildfire that burns sagebrush ecosystems in the CIAA will result in the long-term loss of sagebrush, affect the availability of insects, and increase the risk of INNS establishing in greater sage-grouse habitats. Wildfire will likely occur across Wyoming, regardless of land ownership. Large wildfires in Wyoming historically have occurred in forests or on lands with a substantial amount of timber that do not provide habitat for greater sage-grouse (see Map 18 of the Summary of the Analysis of the Management Situation [BLM 2009a] showing fire locations over the last 20 years); however, small wildfires are common in sagebrush communities. Small wildfires will result in localized impacts to greater sage-grouse habitat, whereas large wildfires could result in impacts to greater sage-grouse populations (USFWS 2010). It is impossible to predict the level of impacts that wildfire will contribute to overall habitat loss in the future, but efforts to suppress fire in greater sage-grouse habitat can result in beneficial impacts. The BLM has issued a policy to make greater sage-grouse habitats, particularly in the Core Area, a priority for fire suppression, regardless of land ownership. It is anticipated that suppression of wildfires on all lands in the Core Area in the CIAA, regardless of ownership, will be a priority. Outside the Core Area, priority will likely be given to areas with energy-development infrastructure and near homesites, which typically provide little suitable habitat for greater sage-grouse.

Climate change and the spread of INNS are increasing the likelihood of adverse impacts to greater sage-grouse populations from wildfire. In the Great Divide Basin, 27 percent of greater sage-grouse habitat has burned since 1980. Fire within 33.6 miles of a lek is one of two primary factors in predicting loss of a lek (USFWS 2010). Sagebrush recovery can take decades, while INNS can take over a site almost immediately following fire. Fire return intervals for areas infested with INNS are far more frequent, sometimes as short as 2 or 3 years, which would prevent burned areas from returning to suitable greater sage-grouse habitat.

Livestock Grazing

Domestic livestock grazing occurs on most lands in the Wyoming that support greater sage-grouse habitat, including federally managed lands. Heavy grazing use that reduces vegetative cover needed for nest concealment, alters composition of the plant community, and increases opportunities for predators can occur on all ownership lands in the Core Area and non-Core Area. High utilization levels typically occur in riparian-wetland habitats and near water development and mineral supplement areas, which can degrade brood-rearing and nesting habitats.

Livestock management typically involves the use of fencing and water developments (wells, pipelines, reservoirs, and spring developments) that can result in the loss, degradation, and fragmentation of greater sage-grouse habitat. Fences and water developments are utilized on all ownership lands in the CIAA. The number of future projects constructed in the Core Area could be reduced based on habitat-disturbance calculations. If projects are denied on BLM, State of Wyoming, WRIR, and USFS lands due to disturbance caps, it is assumed that the number of projects will increase on private lands and outside the Core Area to compensate. One of the historic contributors to the loss of habitat is the conversion of sagebrush habitat to agricultural lands. Overall, the contribution of impacts from livestock grazing by alternative would not vary

substantially because there is little difference in the amount of land open and closed to grazing among the alternatives.

Summary

Central Wyoming has the densest concentration of greater sage-grouse in the United States and has been identified by the USFWS as of the highest priority for persistence of the species (USFWS 2010). A substantial part of the Core Area outside the planning area is pressured by continued energy and ROW development, urbanization, fire, and livestock grazing. The level of cumulative impacts from the threats described above is predicated on the fact that management of the Core Area is protective enough to maintain habitat to support 83 percent of the current greater sage-grouse population in the state. Reducing the level of adverse impacts in areas supporting the largest number of greater sage-grouse also depends on lands continuing to be managed using the Core Area strategy. The contribution of cumulative impacts to greater sage-grouse in the CIAA is anticipated to be least under Alternative B, which provides the most measures to minimize habitat loss and fragmentation and closes the most habitat to surface disturbance related to oil and gas development and infrastructure in the planning area, followed by alternatives D, A, and C. The greatest contribution of cumulative adverse impacts to greater sage-grouse in the CIAA is expected under Alternative C, which allows the greatest level of surface disturbance and most development and resource uses in the planning area with the least amount of restrictions. Alternative D incorporates the Core Area strategy, and therefore will be consistent with management of BLM-administered, State of Wyoming, WRIR, and USFS lands across the CIAA.

4.10.2. Cumulative Impacts to Air Quality with regard to Public Health and Welfare from Management Actions

Cumulative Impact Assessment Area

The planning area and designated CAA Class I areas within 100 kilometers (approximately 60 miles) of the planning area.

Analysis of Cumulative Impacts

Cumulative impacts to air quality were analyzed for each alternative by assessing cumulative emissions in the planning area over the life of the plan. Cumulative emissions were assessed in two ways – by comparing to statewide emissions from 2008 and by “growing” estimated BLM emissions for future years. The Wyoming DEQ compiles a statewide emissions inventory of air pollutants every 3 years as required by the EPA. The most recent statewide emissions inventory available was compiled for 42 different source categories for 2008 actual emissions. The 2008 statewide emissions data were obtained from the EPA National Emissions Inventory (EPA 2008). Table 4.53, “BLM Contribution to Cumulative Annual Statewide Emissions” (p. 1296) shows the estimated emissions for BLM actions and activities in the planning area compared to Wyoming statewide emissions. The estimated emissions for BLM actions and activities were then scaled up to reflect potential increases in non-BLM actions in the planning area. Table 4.54, “Cumulative Annual Emissions Summary for BLM and Non-BLM Activities in the Lander Planning Area” (p. 1298) shows estimated emissions under each alternative for projected BLM actions, projected non-BLM actions, and the cumulative total of these actions. Emissions estimates from non-BLM oil and gas activities were calculated using data on existing and projected oil and gas wells in the planning area from the Lander Field Office RFD scenario for oil and gas (BLM 2009c). The projected numbers of wells and gas production rates estimated for private and fee

land (i.e., non-federal) in the planning area for 2018 and 2027 were used to calculate cumulative emissions from oil and gas activities. For cumulative impacts associated with non-oil and gas mineral development (i.e., bentonite, uranium, and gold), it was assumed that 100 percent of these actions would occur on federal mineral estate (i.e., no additional emissions from non-BLM actions) and the cumulative emissions have been included in the projected emissions estimates for 2018 and 2027. The analysis of non-BLM mineral materials disposal activities is based on the proportional mineral estate ownership in the planning area (41 percent federal and 59 percent non-federal). The calculation of cumulative impacts for air quality from non-mineral, non-BLM activities is based on the proportion of surface ownership in the planning area (38 percent BLM-administered and 62 percent non BLM-administered).

Table 4.53. BLM Contribution to Cumulative Annual Statewide Emissions

Pollutant	BLM Estimated Emissions in the Lander Planning Area (tons per year)	2008 Wyoming Statewide Emissions (tons per year)	Total (tons per year)	Percent Contribution of BLM Lander Planning Area Emissions to Statewide Emissions
Base Year - 2008				
PM ₁₀	761	393,864	394,625	0.19
PM _{2.5}	135	57,622	57,757	0.23
NO _x	678	190,914	191,592	0.35
SO ₂	11	109,304	109,315	0.01
CO	1,138	274,997	276,135	0.41
VOCs	1,726	155,864	157,590	1.10
Alternative A - 2018				
PM ₁₀	2,195	393,864	369,059	0.55
PM _{2.5}	371	57,622	57,993	0.64
NO _x	1,829	190,914	192,743	0.95
SO ₂	23	109,304	109,327	0.02
CO	1,734	274,997	276,731	0.63
VOCs	4,737	155,864	160,601	2.95
Alternative B - 2018				
PM ₁₀	1,760	393,864	395,624	0.44
PM _{2.5}	359	57,622	57,981	0.62
NO _x	1,420	190,914	192,334	0.74
SO ₂	24	109,304	109,328	0.02
CO	2,077	274,997	277,074	0.75
VOCs	4,019	155,864	159,883	2.51
Alternative C - 2018				
PM ₁₀	2,887	393,864	396,751	0.73
PM _{2.5}	443	57,622	58,065	0.76
NO _x	1,873	190,914	192,787	0.97
SO ₂	25	109,304	109,329	0.02
CO	1,758	274,997	276,755	0.64
VOCs	4,754	155,864	160,618	2.96
Alternative D - 2018				
PM ₁₀	2,122	393,864	395,986	0.54
PM _{2.5}	373	57,622	57,995	0.64
NO _x	1,747	190,914	192,661	0.91
SO ₂	24	109,304	109,328	0.02
CO	1,872	274,997	276,869	0.68

Pollutant	BLM Estimated Emissions in the Lander Planning Area (tons per year)	2008 Wyoming Statewide Emissions (tons per year)	Total (tons per year)	Percent Contribution of BLM Lander Planning Area Emissions to Statewide Emissions
VOCs	4,592	155,864	160,456	2.86
Source: EPA 2008 BLM Bureau of Land Management CO carbon monoxide NO _x nitrogen oxides PM _{2.5} particulate matter less than 2.5 microns in diameter PM ₁₀ particulate matter less than 10 microns in diameter SO ₂ sulfur dioxide VOC volatile organic compound				

Table 4.54. Cumulative Annual Emissions Summary for BLM and Non-BLM Activities in the Lander Planning Area

Scenario	PM ₁₀ (Tons per Year)			PM _{2.5} (Tons per Year)			NO _x (Tons per Year)			SO ₂ (Tons per Year)			CO (Tons per Year)			VOCs (Tons per Year)			HAPs (Tons per Year)		
	BLM	Non-BLM	Total	BLM	Non-BLM	Total	BLM	Non-BLM	Total	BLM	Non-BLM	Total	BLM	Non-BLM	Total	BLM	Non-BLM	Total	BLM	Non-BLM	Total
Base Year – 2008																					
Base Year	761	810	1,572	135	151	286	678	496	1,174	11	12	23	1,138	1,583	2,720	1,726	1,062	2,788	270	152	422
Forecast Year – 2018																					
Alternative A	2,195	1,210	3,405	371	202	573	1,829	887	2,716	23	16	39	1,734	1,855	3,589	4,737	2,373	7,110	786	383	1,168
Alternative B	1,760	1,345	3,106	359	284	642	1,420	711	2,132	24	22	47	2,077	2,657	4,733	4,019	2,071	6,091	654	325	979
Alternative C	2,887	2,329	5,217	443	320	763	1,873	953	2,826	25	19	44	1,758	1,891	3,649	4,754	2,386	7,140	788	384	1,173
Alternative D	2,122	1,369	3,491	373	238	611	1,747	857	2,604	24	18	42	1,872	2,134	4,005	4,592	2,316	6,908	759	371	1,130
Forecast Year – 2027																					
Alternative A	2,047	1,160	3,208	344	189	533	1,528	702	2,230	22	15	37	1,583	1,760	3,343	3,722	1,863	5,585	616	300	915
Alternative B	1,621	1,290	2,911	335	271	606	1,173	552	1,725	23	22	45	1,953	2,574	4,527	3,145	1,627	4,772	509	253	762
Alternative C	2,737	2,278	5,015	416	304	720	1,546	725	2,271	24	18	41	1,596	1,778	3,374	3,734	1,874	5,608	617	301	919
Alternative D	1,976	1,318	3,294	347	225	572	1,458	675	2,133	23	17	40	1,727	2,040	3,767	3,606	1,820	5,426	594	291	885
Source: Appendix U (p. 1651)																					
BLM Bureau of Land Management CO carbon monoxide HAPs hazardous air pollutants NO _x nitrogen oxides PM _{2.5} particulate matter less than 2.5 microns in diameter PM ₁₀ particulate matter less than 10 microns in diameter SO ₂ sulfur dioxide VOC volatile organic compound																					

BLM and non-BLM reasonably foreseeable actions are anticipated to increase emissions in the planning area over the planning period. For the planning area, cumulative air quality impacts (as measured against national and state ambient air quality standards) are anticipated to be roughly the same on BLM and non-BLM-administered lands because it is assumed that the density of activities are the same in both areas. Because of proposed development restrictions on BLM-administered lands, adverse cumulative impacts to air quality are anticipated to be the least under Alternative B. Cumulative projected emissions under alternatives A, C, and D are similar; all are projected to be greater than under Alternative B. Cumulative emissions in the planning area are not anticipated to result in air quality impacts that exceed national or state ambient air quality standards because the emissions sources will likely be widely dispersed.

Potential cumulative concentrations of CO, NO_x, and SO₂ could increase slightly, but would be unlikely to exceed air quality standards. Existing concentrations of O₃ in the planning area are approximately 94 percent of the 8-hour ambient air quality standard. Existing PM₁₀ concentrations in the planning area are approximately 40 percent of the annual ambient air quality standard. O₃ and particulate matter concentrations could be an issue of concern during the planning period. The BLM will perform quantitative analyses of potential concentrations, as appropriate, when specific projects are proposed. The BLM will continue to work with the Wyoming DEQ and the EPA to ensure that emissions from BLM activities do not contribute to any violations of the NAAQS or Wyoming Ambient Air Quality Standards.

Potential cumulative emissions are likely to result in minor impacts to atmospheric deposition, and precipitation pH would likely stay about the same. Potential total nitrogen deposition and total sulfur deposition would likely stay about the same, and would be unlikely to exceed levels of concern. The BLM will perform quantitative analyses of potential atmospheric deposition, as appropriate, when specific projects are proposed. The BLM will continue to work with the Wyoming DEQ, the EPA, the NPS, the USFS, and the USFWS to ensure that emissions from BLM activities do not contribute to any exceedances of the deposition levels of concern.

Potential visibility would likely stay about the same or degrade slightly, and could be an issue of concern during the life of the plan. The BLM will perform quantitative analyses of potential visibility, as appropriate, when specific projects are proposed. The BLM will continue to work with the Wyoming DEQ, the EPA, the NPS, and the USFS to ensure that emissions from BLM activities do not contribute to adverse impacts to visibility.

4.10.3. Cumulative Impacts to Water from Management Actions

Cumulative Impact Assessment Area

The CIAAs are the significant watersheds of the Wind River and Sweetwater River/North Platte River, both inside and upstream portions outside the planning area, and portions of the Great Divide Basin watersheds in the planning area. Fourth-order watersheds were used as the base unit of analysis because impacts from management actions proposed under the RMP and other existing plans are not expected to have cumulative hydrologic influence beyond this scale. Given that the hydrologic influence is primarily focused in the stream channels and that delineation of the CIAA was based on watershed boundaries, the area of analysis is sufficient. More specific information for the fourth-order Hydrologic Unit Code (HUC) watersheds is provided below in the discussion of riparian-wetland areas.

Analysis of Cumulative Impacts

The assumptions used in this cumulative impact assessment for water and riparian-wetlands include:

Impacts of Invasive Species

- INNS replace the native riparian-wetland-obligate species, which reduces soil stability, water infiltration rates, and water holding capacity, all adversely affecting riparian-wetland health.
- Water quality has thresholds that are established by their classification and designated beneficial uses. For example, Class 1 waters allow for no degradation of their water quality, whereas the other categories allow for varying degrees of water quality degradation so long as the designated beneficial uses are supported.
- Surface-disturbing activities on all land tenures are all subject to the WYPDES Storm Water Discharge control provisions, which are administered by the Wyoming DEQ. Water quality should not be adversely affected by surface-disturbing activities of 1 or more acres because the WYPDES program is specifically designed to keep sediment and any stored fuels and lubricants from construction/industrial activities onsite and out of drainages

Abandoned Mine Lands

- AML projects will increase disturbance initially, but over the long term will bring stability to historic abandoned mines and result in beneficial impacts to riparian-wetland resources.
- Except for on a short-term basis, AML work reduces erosion and improves water infiltration, which result in net beneficial impacts to water quality.
- The presence of unnaturally occurring bare ground will lead to increases of runoff and sedimentation. The severity of the runoff and sedimentation will vary by the design and management of the bare ground.
- The discharge of produced water into a riparian-wetland system will adversely impact the system. The severity of the impacts will vary.

Accelerated runoff and agricultural return flow

- Accelerated runoff can contribute to excessive energy in the stream systems and accelerate downcutting, reduce bank stability, increase movement of sediments downstream, and introduce fertilizers and pesticide agents.

Agricultural commodity production

- Most agricultural commodities require irrigation from local stream systems, which can adversely impact riparian-wetland resources through the loss of available water to support riparian-wetland-obligate species, and through return flow of irrigation water carrying sediment, soil amendments (fertilizers), and pesticides.
- Surface-disturbing activities such as mineral development and road construction impact localized areas, removing vegetation, compacting hydric soils, and creating a vector for runoff and INNS establishment

Cumulative Impacts Common Among Watersheds

Adverse impacts to water quality are products of surface-disturbing activities associated with mineral resource development, motorized vehicle use, road construction, agricultural land uses, and improper livestock grazing management. These activities lead to increases in runoff and sedimentation and have the potential to degrade water quality. Increased development leads to increased INNS infestations. Land management decisions on BLM and other federal, state, and private lands would likely result in changes in water quality beyond designated uses in some locations within the CIAA.

The above discussion under greater sage-grouse describes impacts to greater sage-grouse from various types of activities. To the extent that those activities result in the removal or degradation of habitat, it is equally likely that water resources would be adversely affected. Water quality can be thought of as the sum measure of the outputs for a given watershed.

BLM-authorized activities, along with other federal, state, and private land use decisions, could degrade water quality beyond the designated use of receiving waterbodies in some locations of the CIAA, thereby changing water quality beyond designated uses in some locations. Mitigation and BMPs applied as a result of state (CWA administration) and federal regulation is expected to prevent or moderate water-quality degradation. If an authorized surface-disturbing activity such as storm water control at industrial or construction sites violates Wyoming state law and the CWA water-quality regulations, the Wyoming DEQ and the EPA would impose substantial daily fines for the period of violation.

Because development from all sources is likely to continue, cumulative actions would magnify adverse impacts associated with BLM-authorized activities. Even with proper BLM and Wyoming Oil and Gas Conservation Commission oversight, improper casing and cementing of wells, undetected spills, or leachate from produced-water pits could introduce contaminants into groundwater. Existing development, combined with the RFD, will increase the potential for such adverse impacts.

Cumulative impacts would likely be the greatest in the Wind River Basin outside the Dubois area, the Gas Hills portion of the Sweetwater River drainage, and the Great Divide Basin as a result of mineral development and surface discharge of produced water, combined with other surface-disturbing activities. In addition, cumulative impacts would likely increase in the Dubois and Lander Slope areas of the western Wind River Basin as a result of the land under private ownership and potential population in these areas, primarily through rural subdivision development. Although existing and future activities on these lands is not well known, it is assumed that surface-disturbing activities (e.g., mineral development and general construction) will occur. Private landowners and, in some cases, State of Wyoming lands are also subject to the storm water discharge control provisions of the CWA, and they are required to control sediment on construction and industrial sites. Therefore, the BLM does not anticipate that impacts would be greater on private or state lands. However, discharging produced waters into ephemeral drainages from private or State of Wyoming leases or not adequately considering water treatment options for produced water disposal could result in major impacts.

Cumulative impacts of aquifer depletion during the production of CBNG and uranium from federal, state, and private wells would result in a permanent loss of these water resources. Although this would result in an irreversible and irretrievable commitment of these resources, the depths of many of these formations (1,000 to 10,000 feet) make the practicality of the use of these resources in the future unlikely. However, lowering the water table and pressure in these CBNG formations could impact associated artesian water resources. Typically, these formations are non-tributary to surface waters, but connected to surface waters through springs along faults or where they outcrop. During site-specific project planning, water quality sampling, isotopic analysis, and groundwater modeling would be used to evaluate this potential, and decisions would be made to protect surface waters as appropriate.

Cumulative impacts from surface-disturbing activities, water developments, and surface discharges from CBNG and conventional oil and gas operations could degrade water quality beyond the designated use of receiving waterbodies in the Wind River Basin.

In conjunction with the direct and indirect impacts of the alternatives, adverse impacts to water resources would be greatest under Alternative C because of the anticipated increases in development. Under Alternative B, increased restrictions on development, recreation, and range improvement projects would reduce the potential for surface disturbance and subsequent increases in erosion, runoff, and sediment delivery to surface waters. Alternative D would result in the second fewest impacts, and would result in more adverse impacts than Alternative B but fewer than alternatives A and C.

Wind River

The total acres of cumulative impact analysis in the Wind River drainage considered is 4,970,802, of which 23 percent are BLM-administered public lands.

The Upper Wind River watershed is primarily in the Dubois area, but extends through the WRIR, ending in the vicinity of the Riverton Dome East oil field. This watershed is comprised of approximately 1,630,991 acres of land and is entirely encompassed within the planning area boundaries. Only 4 percent of these acres are BLM-administered lands. The largest landowners in this watershed are the Shoshone National Forest and WRIR (38 percent each followed by private landowners (18 percent).

Past and present impacts to water resources in the upper reaches of this watershed are primarily a result of timber harvest, wildfire, rural and agricultural development, and livestock grazing. Actions such as timber harvest and wildfire often can lead to movement of large amounts of sediments into riparian-wetland systems. Historically, the Shoshone National Forest has performed approximately 12,000 acres of vegetative treatments including mechanical treatments, timber sales, and prescribed burning.

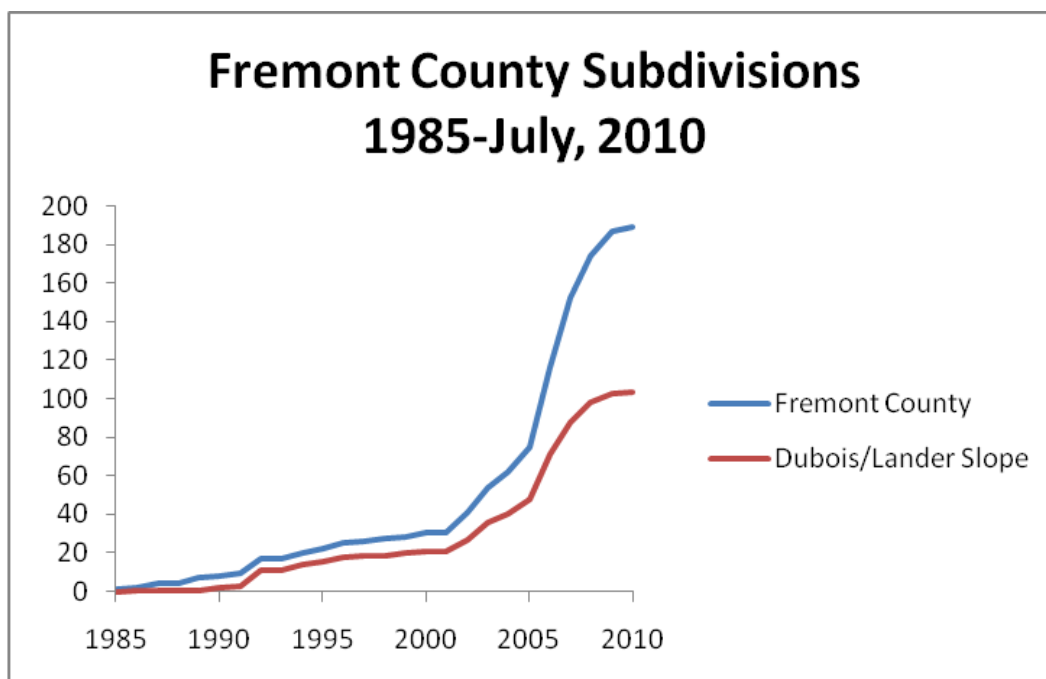
Dubois, Wyoming, occupies a small portion of this watershed and a large portion of this watershed is rural private land used for agricultural commodity production. Most of these commodities require irrigation from local stream systems, which can adversely impact water resources through the loss of available water to support riparian-wetland-obligate species, and through return flow of irrigation and accelerated runoff. According to the Wyoming DEQ and the Dubois-Crowheart Conservation District, waterborne pathogens (*E. coli*) in the Wind River are a concern between the Dubois and the WRIR boundary and in the lower portions of Horse Creek (Wyoming DEQ 2010a). There is currently a watershed plan, developed by the Popo Agie Conservation District, to remediate this problem. Twin Creek has been identified by the Wyoming DEQ as being of concern for habitat degradation. There is also a portion of Poison Creek, for an undetermined distance above Boysen Reservoir, that is impaired for contact recreation use.

Over time, as the monitoring and assessment of the state's waters by the Wyoming DEQ progresses, more waterbodies can be expected to be found to have use impairments that will require remediation. The BLM will, as has been done for the Sweetwater watershed, attempt to mitigate impacts to water quality by reviewing existing data, such as PFC and rangeland health assessments, and nominate streams for monitoring by the Wyoming DEQ that have concerns indicated by data.

The major surface-disturbing activity, subject to WYPDES Storm Water permitting requirements, on adjacent private lands is subdivision development. The upper Wind River, in the Dubois area north of the WRIR boundary, has seen subdivision development only paralleled in the planning area by parts of the Lander Slope. Subdivision development occurs solely on private lands and is a major surface-disturbing activity affecting the Upper Wind River. From 1985 to present,

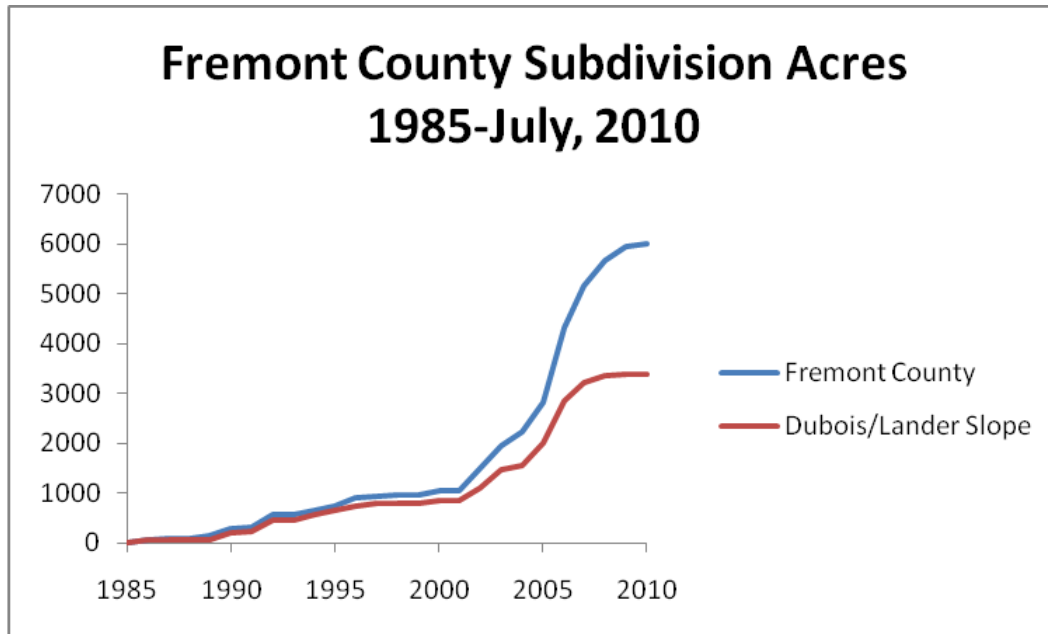
the amount of subdivision activity is an indication of both demand and constraints on such development. The recent history of subdivision development in Fremont County is reflected in the two graphs below. Lot size in the county is also influenced by state law, that before 2008, precluded county regulation of subdivisions with lots smaller than 35 acres; the 2008 law allows counties, should they so choose, to require large-tract developers to file plats, record contracts for deeds, and disclose plans for providing utilities, road maintenance, and fire protection. As of March 2010, Natrona County has taken on these new powers and Fremont County has not.

In the 1980s, there was a low demand for subdivision housing. The early 1990s saw a slight upturn in rural subdivisions. The period from 2002 through 2008 saw the largest growth in subdivisions. The growth of subdivisions in Fremont County shown in Figure 4.13, “Fremont County Subdivisions, 1985-2010” (p. 1303) closely mirrors the associated acres under subdivision development shown in Figure 4.14, “Acres under Subdivision Development in Fremont County, 1985-2010” (p. 1303). In both figures the Dubois area and the Lander Slope account for slightly more than half of the number of subdivisions (54 percent) and the total acreage under subdivisions (57 percent), even though they comprise less than 15 percent of the private land in the county. History suggests that future subdivision growth will be linked to how robust the local economy is. The present economic situation in the county, and the country at large, suggests that there will be no rapid upturn in subdivision development for the next several years. Much of the demand for subdivisions comes from present and former residents of the county and the state who desire to live outside towns (Mealor 2007).



Source: Fremont County 2010

Figure 4.13. Fremont County Subdivisions, 1985-2010



Source: Fremont County 2010

Figure 4.14. Acres under Subdivision Development in Fremont County, 1985-2010

Impacts from subdivision development include increases in traffic, noise, and human activity that can change the native plant community in forested areas and on rangelands; farmland subdivision can decrease the farmland acreage base in the county. More physical impacts come from associated roads and yards that can increase and concentrate water in small areas, which can lead to soil loss and increased sediment loads in streams.

The Lower Wind River watershed is shown on Map 138. The Lower Wind River watershed is just over 1 million acres, of which 89 percent is within the boundaries of the planning area. The majority landowner in this watershed is the WRIR (39 percent), followed by private landowners (27 percent), the BLM (approximately 18 percent), and the Bureau of Reclamation (10 percent). Cumulative impacts to water resources throughout this watershed result primarily from agricultural land use, livestock grazing, and oil and gas development.

As discussed for the Upper Wind River watershed, most of the WRIR was historically open, and will remain open, to livestock grazing, and water resources will remain vulnerable to adverse changes in hydrology and vegetative communities. Livestock stocking rates are generally low on the WRIR and livestock-related impacts would be expected to be minor.

A large portion of this watershed is private land used for agricultural commodity production and Bureau of Reclamation lands supporting irrigation systems on private lands. The impacts from these commodities are discussed under the assumptions for analysis. Additional impacts historically observed from the presence of private land, in particular irrigated fields, in this watershed are the high potential source of INNS seed, which adversely impacts water resources.

Oil and gas development occurs in localized areas in the Maverick Springs, Little Dome, Pavillion, Muddy Ridge, and part the Gun Barrel oil and gas fields. These fields, in particular the Pavillion, Muddy Ridge, and Gun Barrel fields have been very active in recent years, leading to

a high level of surface-disturbing activities. These activities contribute to the sedimentation of riparian-wetland systems adjacent to these fields and increases in overland flow.

This watershed encompasses Boysen Reservoir and Ocean Lake. Both of these waterbodies are managed by the State of Wyoming and are protected from surface-disturbing activities such as oil and gas development; these protection benefit local riparian-wetland resources. However, these waterbodies are highly utilized for recreation activities such as OHV use, camping, fishing, and hunting activities, which results in potential adverse impacts to riparian-wetland areas. The cumulative impacts to water resources in the Lower Wind River watershed will be influenced largely by management on WRIR and Bureau of Reclamation lands in the upstream portions of the watershed. However, the additional riparian-wetland buffers and limitations on livestock utilization in riparian-wetland areas provided under Alternative B would beneficially impact riparian-wetland resources cumulatively. The limitations on livestock utilization in riparian-wetland habitats provided under Alternative D would likewise result in cumulative beneficial impacts to riparian-wetland resources in this watershed.

Most of the oil and gas production in the planning area occurs in this watershed, primarily in the Badwater, Lysite, Bridger, Alkali, and Poison creeks drainages; Twin Creek and Little Popo Agie River, Big and Little Sand draws, and Alkali Butte; and lower Beaver Creek. There are a few wells in the rest of the basin, including several in Dubois, along the Popo Agie River northeast of Lander, Muskrat Creek, and other locations. The projected acres of surface disturbance associated with oil and gas development from non-BLM actions are identified in Appendix T (p. 1641). Future production is expected to occur primarily in and around the existing oil fields. The amount of surface disturbance associated with this development is expected to increase in and adjacent to these existing fields, rather than development of new fields.

The Wyoming DEQ AML Division is completing safety and rehabilitation work on abandoned mines in the Copper Mountain (Bridger Mountain Range) area. There could be a few new projects in this area. Near the Hudson, AML program work will occur in conjunction with old coal mines primarily on patented mine land where mining activity ended by the late 1920s. The Gas Hills area has seen much AML work in the past, but it is not expected to continue at its present rate. There are limited areas with surface and groundwater quality problems from past mining and milling activities in the Gas Hills uranium district.

Sweetwater River and North Platte River Drainage

The total acres of cumulative impact analysis area in the Sweetwater River and North Platte River drainage is 1,894,398, of which 59 percent is BLM-administered public land. The CWA Class 1 water-quality portion of the Sweetwater River has a watershed area of 545,425 acres, of which 395,874 acres (73 percent) are BLM-administered public lands. This Class 1 water-quality portion of the Sweetwater River is located from the confluence with Alkali Creek and upstream to its origin in the Bridger National Forest at Sweetwater Gap on the Continental Divide. This section has the highest water-quality protections and allows for no degradation of water quality. Threats to these systems include mining, oil development, AML work, and water depletion.

The watershed of the Sweetwater River includes much the area of past gold mining on South Pass. Abandoned placer gold dredging operations have disturbed long stretches of Rock Creek as well as parts of Willow Creek and other creeks in the South Pass area. Land tenure is a patchwork of patented mining land, State of Wyoming land, and claims on BLM-administered public lands. The BLM believes that approximately half the annual gold mining activity on South Pass occurs on land tenures other than BLM. Currently, there are a few seasonally active placer mining

operations that work small (less than ¼ acre) portions of draws and creeks, but there are no large mining operations. There is no expectation that this will change in the future.

There is no expectation of substantial change to the existing level of oil development in this watershed. Only a portion of this activity occurs on private and state lands. The Bison Basin oilfield, which consists of a few wells, is along an ephemeral drainage that is a tributary to the Sweetwater River, approximately 12 miles south of the river. There is some oil production in the Sheep Creek, Happy Spring, and Crooks Gap oilfields. There are a few scattered wells in other locations such as Cedar Ridge, Long Creek, and the top of Crooks Mountain.

This watershed also includes Wyoming DEQ AML projects to mitigate safety concerns and stabilize old mines. The Wyoming DEQ AML Division has completed safety and rehabilitation work on approximately 100 abandoned mines and sites in the South Pass area. Mercury in streambed sediment of the local streams, especially Rock Creek and Willow Creek, does not appear to affect water quality, but this pollutant could be suspended if these sediments are disturbed by dredging. WGFD fish tissue sampling showed that mercury levels in Willow Creek were below the U.S. Food and Drug Administration guideline for action limit in muscle, but higher in gut tissues. This trend does not suggest a human health concern, but could be a concern for fish-eating wildlife. The Wyoming DEQ assessment of Willow Creek shows full support of aquatic life uses.

Extensive AML work has occurred in the Gas Hills and the Green Mountain-Crooks Gap area, much of it on private land. There are some projects nearing completion in these areas, and one project is scheduled for an abandoned coal mine in the Muddy Gap area. After 2013, new projects on South Pass and in the Gas Hills are expected to commence. AML work in the Green Mountain-Crooks Gap area will be largely completed in the next couple of years. As indicated above, AML work results in a long-term beneficial impact to water resources.

Some adverse impacts to water quality from uranium mining are anticipated in the vicinity of Jeffrey City, both in situ and open pit or subsurface mining as well as discharges from tailings piles. As indicated above, requirements of the WYPDES program should alleviate some of the adverse impacts historically observed.

In 2002, the USFWS issued a revised intra-service biological opinion and conference opinion regarding federal actions that individually deplete 25 acre-feet or less to the Platte River System (USFWS 1996). Individual projects that deplete less than 25 acre-feet are considered minor depletions. Individual projects that deplete more than 25 acre-feet are considered major depletions and require consultation. Cumulatively, all BLM and non-BLM actions over the planning period are anticipated to deplete more than 25 acre-feet of water in the Platte River System, but none of the proposed actions individually would exceed 25 acre-feet. The USFWS (USFWS 2002b) indicates that most of the proposed federal and non-federal actions within the Platte River System are anticipated to involve water depletions. The USFWS and Bureau of Reclamation are currently addressing the issue of water depletion in the Platte River System through preparation of the Platte River Recovery Implementation Program EIS (USFWS 2002b). The cumulative impact of water depletions within the Platte River System to special status species downstream in the Platte River is well documented (BOR and USFWS 2005) and expected to continue during the planning period.

The *Fish and Wildlife Resources* and the *Special Status Species – Fish* sections of this chapter described project water depletions from and potential adverse impacts to special status species in the Sweetwater River watershed, which is a part of the Platte River System, from BLM actions described in this RMP. Water depletions from non-BLM actions are anticipated from development

of oil and gas wells, fish and wildlife water sources, and livestock water sources. Development of fish and wildlife water sources on private lands in the planning area not administered by the BLM are not anticipated.

Human population and related development in the Sweetwater River watershed has historically been tied to boom and bust cycles of the mineral industries; these cycles resulted in almost 5,000 people living at Jeffrey City in the late 1970s but only a few residents today. The same is true for Atlantic City and South Pass City. Miners Delight and Lewiston are now ghost towns. Population-driven subdivision development in this area will occur only in relation to favorable market conditions for local minerals. Water depletion due to such development is not anticipated in the near future, even with moderate interest in uranium.

Because projected water depletions from BLM actions are highest under Alternative C and because water depletions from non-BLM actions are not expected to vary by alternative, the greatest cumulative adverse water depletions are anticipated under Alternative C and the least cumulative adverse water depletions are anticipated under Alternative B. Alternative D would result in impacts between alternatives A and B concerning depletions in the Sweetwater River watershed and those minor portions of the Platte River System in the planning area.

Crooks Creek is an impaired waterbody due to oil and grease contamination of unknown origin. The BLM compiled a list of streams in the Sweetwater River watershed with identified concerns from PFC inventory data, and submitted the list to the Wyoming DEQ in 2004 for inclusion on their monitoring program.

Great Divide Basin

There are 161,324 total acres of the Great Divide Basin in the planning area, 92 percent of which are BLM-administered public lands. The Great Divide Basin is influenced by oil and gas development, including CBNG, and exploration, and most recently by increased uranium exploration and potential mining; this activity occurs in the adjoining Rawlins and Rock Springs planning areas and on private and State of Wyoming lands. Both in situ mining projects and traditional shaft and open-pit mines would adversely impact surface water and groundwater. There is some oil production in the Red Creek area and there is CBNG exploratory drilling along the Fremont/Sweetwater county line; any substantial new oil and gas development would likely occur along the county line.

Wind-energy development is likely to occur in the Great Divide Basin, 99,685 acres of which have high wind-energy potential. Industrial wind-energy development (as opposed to the smaller structures utilized in the livestock grazing program), involve extensive surface disturbance, including roads, pads, and transmission lines. As with any type of surface disturbance, wind-energy development has the potential to adversely impact water quality if not properly mitigated by the application of storm water discharge management.

4.10.4. Cumulative Impacts to Riparian-Wetland Areas from Management Actions

Cumulative Impact Assessment Area

The CIAA used to analyze cumulative impacts to riparian-wetland resources extends outside the planning area, following the fourth-order watershed or HUC) boundaries. The CIAA is comprised

*Chapter 4 Environmental Consequences
Cumulative Impacts to Riparian-Wetland Areas
from Management Actions*

of fourth-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because the scope of cumulative influence from the final RMP and land use plans for planning areas adjacent to the planning area is not expected to have a hydrologic influence beyond this scale.

Analysis of Cumulative Impacts

As with water resources in general, adverse impacts to riparian-wetland systems are a product of surface-disturbing activities associated with mineral resource development, motorized vehicle use, road construction, and agricultural land uses. These activities lead to increases in runoff and sedimentation into riparian-wetland areas. Surface-disturbing activities such as mineral development and road construction impact localized areas of riparian-wetland systems, removing vegetation, compacting hydric soils, and creating a vector for runoff and INNS establishment.

Private agricultural lands that are grazed or irrigated with water from adjacent stream systems can adversely impact riparian-wetland health. A large portion of the local riparian-wetland areas are on private lands. Livestock grazing can result in a direct adverse impact to riparian-wetland areas through the removal of vegetation, compaction of riparian-wetland soils, and reduction of bank stability. If prolonged, this activity can lead to a change in plant community that will not support riparian-wetland health and will create a non-functioning system as riparian-wetland-obligate species are replaced by upland species and more salt-tolerant communities. The cumulative impacts to riparian-wetland systems from these activities would vary widely, not only by alternative, but by the individual watershed in which these activities occur. The following paragraphs describe cumulative impacts for each fourth-order watershed.

The Upper Wind River watershed is primarily in the Dubois area, but extends through the WRIR, ending in the vicinity of the Riverton Dome East oilfield. This watershed is comprised of approximately 1,630,991 acres and is entirely encompassed within the planning area boundaries. Only 4 percent of these acres are BLM-administered lands. As mentioned in the cumulative impacts to water section above, the Shoshone National Forest and WRIR own most of the land in this watershed. Cumulative impacts to riparian-wetland resources in the upper reaches of this watershed would result primarily from timber harvest, wildfire, and livestock grazing on these lands. Activities such as timber harvesting and wildfire can often result in adverse impacts due to movement of sediments into riparian-wetland systems.

Historically, the Shoshone National Forest has performed approximately 12,000 acres of vegetative treatments, including mechanical treatments, timber sales, and prescribed fire; however, the level of sediment movement associated with these activities cannot be quantified at this time. The adverse impacts from Dubois and the surrounding agricultural areas discussed in the water section also apply to the riparian-wetland systems in the area. Impacts include loss of available water to support riparian-wetland-obligate species, sediment, soil amendments (fertilizers), and pesticides. Introduction of INNS can impact water infiltration rates and water holding capacity, which adversely impacts riparian-wetland health.

Impacts to riparian-wetland systems on the WRIR would be the same as discussed above in the water section.

Oil and gas development occurs in localized areas in the Sheldon Dome, Northwest Sheldon Dome, Steamboat Butte, Riverton Dome East, Indian Butte, and Alkali Butte oil and gas fields. The surface disturbance associated with the development of these fields contributes cumulatively to the total amount of bare ground, increasing soil compaction, runoff, and sedimentation into

riparian-wetland systems. However, these fields are older, highly developed, and do not generate a large amount of new disturbance. A number of these fields have permits to discharge produced water to the surface, contributing to increased salinity and water volumes in this watershed. The cumulative impacts to riparian-wetland resources in the Upper Wind River watershed could be reduced to some degree under Alternative B due to the closure of this area to mineral development; however, given the small percentage of land influenced by the management actions in the Lander RMP, variability between alternatives is not expected to affect the watershed.

The Badwater watershed is east of Boysen Reservoir from Highway 20 extending east toward Arminto, Wyoming. The watershed is 548,466 acres, and 59 percent is within the boundaries of the planning area. The largest landowners in this watershed are the BLM (56 percent) (18 percent outside the planning area) and private landowners (32 percent) (17 percent outside of the planning area). Cumulative impacts to riparian-wetland resources in this watershed are heavily influenced by oil and gas development.

The Badwater watershed is an area with high potential for oil and gas and has historically been an area of intense development in the planning area. Oil and gas development occurs primarily in the Madden Deep, Iron Horse, and Gun Barrel units. The Gun Barrel unit splits the boundary between the Badwater and Lower Wind River watersheds; however, most of the unit is in the Badwater watershed.

The total level of development, including BLM, is expected to continue. There are approximately 1,400 wells proposed in the area over the next 10 years. See Appendix T (p. 1641) for information on surface disturbance associated with private and state lands. The existing development plays a role in the high level of bare ground and soil compaction, contributing to adverse impacts to riparian-wetland areas in the form of increased overland flow and sedimentation. All three units have permits to discharge produced water to surface; most of the water discharged is produced in the Gun Barrel unit. This produced water contributes to sediment movement into riparian-wetland resources in this watershed. Furthermore, it introduces hydrocarbons, heavy metals, VOCs, and high levels of sodium, all of which can change the existing plant communities and soil chemistry, adversely impacting riparian-wetland health.

Private land ownership also has a heavy influence on riparian-wetland impacts due to the close correlation and proximity of private land and riparian-wetlands. In particular, the lands around the Lost Cabin area in this watershed are a high potential source of INNS seed that can be introduced into riparian-wetland systems.

This watershed has had few active mining claims in recent years; however, the AML program has been active in cleaning up historical mines in the northern reaches of this watershed.

Livestock grazing occurs on most of the lands in this watershed, including state and private lands, adversely impacting riparian-wetland resources in localized areas. However, the impacts from livestock grazing are not as noteworthy in this watershed as those from oil and gas development.

Cumulative impacts to riparian-wetland resources in the Badwater watershed would be substantially less under Alternative B than under the other alternatives as a result of greater restrictions on slope disturbances, restrictions on surface water discharges, livestock utilization levels, wildlife and special status species restrictions, and increases in riparian-wetland buffers. Cumulative impacts to riparian-wetland resources would not vary in the Badwater watershed from management actions under alternatives A and C. Alternative D would provide more protections to riparian-wetland resources through greater restrictions on livestock utilization in riparian-wetland

areas, than alternatives A and C, which would result in fewer livestock-related cumulative adverse impacts. Most of the Badwater watershed is considered a DDA, which results in the potential for fewer restrictions on oil and gas development and management of riparian-wetland areas more similar to Alternative C. Alternative D places greater restrictions on surface discharge of produced water than alternatives A and C, but would not protect riparian-wetland resources as well as Alternative B. There is a potential under Alternative D for riparian-wetland buffers to be reduced below 500 feet if it can be shown that impacts could be properly mitigated. It is expected that with reduced buffers and restrictions on surface-disturbing activities that Alternative D would result in higher levels of sedimentation in riparian-wetland areas than alternatives A and B. Cumulative impacts to riparian-wetland resources in the Badwater watershed would be lowest under Alternative B, followed by alternatives A, D, and C.

The Little Wind River watershed is in the southern end of the WRIR, running from the base of the Wind River Range east to the Beaver Creek oilfield and south along Beaver Creek up to the South Pass area, and is comprised of approximately 713,900 acres, all of which are within the boundaries of the planning area. The majority landowners in this watershed are the WRIR (42 percent), private landowners (27 percent), and the BLM (25 percent). Cumulative impacts to riparian-wetland resources in this watershed are primarily influenced by agricultural land use and oil and gas development.

The upper reaches of this watershed along the Little Wind River on the WRIR and Beaver Creek are primarily private lands used for agricultural production. These irrigated lands contribute to reductions in in-stream flow, adversely impacting riparian-wetland resources. As described above, agricultural lands contribute to the return flow of irrigation water into riparian-wetland areas, carrying sediments, soil amendments, pesticides, and INNS seed and contributing to riparian-wetland degradation. In addition, the development of housing in these areas contributes to increases in runoff and sedimentation into riparian-wetland systems, although these developments are much smaller than the subdivisions in Dubois and Lander described above.

Oil and gas development primarily occurs in the Riverton Dome and Beaver Creek oilfields. Historically, these fields have produced oil, but now are being developed to produce CBNG. The RFD for both fields is expected to be approximately 550 wells over the next 10 years. Both fields contribute to a high degree of bare ground and contribute produced water discharge into Beaver Creek.

The South Pass area of this watershed has historically been mined for gold. The mining activities have lead to disturbed ground and introduction of chemicals, including mercury, into the riparian-wetland systems. These impacts were discussed above under water quality. The level of current development is lower than it has been historically; however, recreational gold prospecting still occurs.

Cumulative impacts to riparian-wetland resources in the Little Wind River watershed would be largely driven by management actions on the WRIR and actions on private lands. Surface-disturbing activities and livestock grazing would be restricted on BLM-administered lands to a much greater degree under Alternative B, benefitting riparian-wetland resources along the Beaver Creek drainage system. Alternative D is expected to provide additional protections to riparian-wetland resources from livestock grazing over alternatives A and C. However the Beaver Creek oilfield is in a DDA, which could result in fewer restrictions on surface-disturbing activities related to oil and gas development. Because the Beaver Creek oilfield is an area that represents some of the highest levels of surface-disturbing activities in the Little Wind River watershed,

the continued development of this field is expected to continue to contribute to the cumulative adverse impacts to this watershed. Cumulative impacts to this watershed related to mineral development are not expected to vary by alternative.

The Popo Agie watershed is primarily in the Lander Slope and South Pass areas. This watershed is comprised of approximately 514,184 acres, 99 percent of which is within the planning area boundaries. The majority landowners in this watershed are the Shoshone National Forest (38 percent, 1 percent outside of the planning area boundaries), private landowners (26 percent), and the BLM (25 percent). Cumulative impacts to riparian-wetland resources in this watershed are primarily the result of rural development on the Lander Slope and agricultural land use around the town of Lander. Most of the lands in the Shoshone National Forest in this watershed are wilderness, which prohibits much of the surface-disturbing activities encountered throughout the planning area, such as timber harvesting and mineral development. Surface disturbance occurs as a result of recreational activities in the form of primitive campsites and hiking and pack trails.

Rural development of private lands on the Lander Slope contributes to the level of bare ground. The town of Lander and the surrounding agricultural areas contribute to a high degree of accelerated runoff and irrigation return flow, much of which flows directly into the riparian-wetland systems in the area. A large portion of this watershed is private land used for agricultural commodity production. Private land, in particular irrigated fields, in this watershed are a high potential source of INNS seed that can be introduced into riparian-wetland systems.

Oil and gas development is minimal in this watershed, but occurs in localized areas in the Lander, Dallas Dome, and Derby Dome oilfields. The surface disturbance associated with the development of these fields contributes cumulatively to the total amount of bare ground. These fields are older, highly developed, and do not generate a large amount of new disturbance. A number of these fields have permits to discharge produced water to the surface, contributing to increased salinity and water volumes in this watershed. The cumulative impacts to riparian-wetland resources in the Popo Agie watershed are not expected to vary substantially by alternative.

The Muskrat watershed is in the area south of Shoshone, Wyoming, to Beaver Rim and east almost to the Natrona County border. This watershed is comprised of approximately 471,031 acres, all of which is within the planning area boundaries. The majority landowner in this watershed is the BLM (82 percent), followed by private landowners (10 percent), and the State of Wyoming (7 percent). Cumulative impacts to riparian-wetland resources in this watershed are influenced primarily by livestock grazing and mining activities in the Gas Hills area.

Unlike most of the other watersheds in the planning area, most riparian-wetland areas in this watershed are on BLM-administered lands and are affected by historic and current livestock grazing. Improper livestock grazing management adversely impacts riparian-wetlands through the removal of vegetation, soil compaction, and destruction of bank stability. Soil compaction and the removal of vegetation can change the plant community to a more grazing-resistant community or upland plant community, adversely impacting riparian-wetland health.

Historical uranium production has resulted in very large areas of soil disturbance. There is very little active mining in the Gas Hills, and most of the ground disturbance has been reclaimed or is making progress toward successful reclamation.

Oil and gas development primarily occurs in the Fuller oilfield, and is primarily older development contributing to a localized increase in bare ground and produced-water discharge. This produced water contributes substantially to sediment movement into riparian-wetland

resources in this watershed. There is some new natural gas, but there are currently no plans for expanded development in this field.

Cumulative impacts to riparian-wetland resources in the Muskrat watershed would be substantially less under Alternative B than under the other alternatives as a result of greater restrictions on livestock grazing in riparian-wetland areas, slope disturbances, surface water discharge restrictions, wildlife and special status species restrictions, and increases in riparian-wetland buffers. Cumulative impacts to riparian-wetland resources would not vary in the Muskrat watershed from the management actions under alternatives A and C. Alternative D provides better protections to riparian-wetland resources resulting from greater restrictions on livestock utilization in riparian-wetland areas than alternatives A and C, which would result in fewer livestock-related cumulative adverse impacts. However, the eastern portions of the watershed historically mined are considered a DDA, which results in the potential for fewer restrictions on oil and gas development and management of riparian-wetland areas more similar to Alternative C. Alternative D places greater restrictions on surface discharge of produced water than alternatives A and C, but would not protect riparian-wetland resources as well as Alternative B. There is the potential under Alternative D for riparian-wetland buffers to be reduced to less than 500 feet in the DDAs if it can be shown that impacts could be properly mitigated. However, the BLM does not expect substantial mineral development in this watershed; therefore, the riparian-wetland buffers would be sufficient to mitigate adverse impacts resulting from such activities. Cumulative impacts to riparian-wetland resources in the Muskrat watershed would be lowest under Alternative B, followed by alternatives D, A, and C.

The Sweetwater River watershed is one of the largest watersheds in the planning area; it spans the southern boundary of the planning area from South Pass east to Pathfinder Reservoir and from Beaver Rim south to Green Mountain. This watershed is comprised of approximately 1,858,374 acres, of which approximately 76 percent is within the boundaries of the planning area. The majority landowner in this watershed is the BLM (75 percent, 16 percent outside the planning area boundaries), followed by private landowners (13 percent, 3 percent outside the planning area boundaries), and the State of Wyoming (8 percent, 2 percent outside the planning area boundaries). Much like the Muskrat watershed, cumulative impacts to riparian-wetland resources in the Sweetwater River watershed are influenced primarily by livestock grazing and mining activities around Jeffrey City, Wyoming. Most of the riparian-wetland areas in this watershed are on BLM-administered lands; however, the riparian-wetland areas around the Sweetwater River are primarily owned by private landowners.

Riparian-wetland areas in this watershed are affected primarily by historic and current livestock grazing. Improper livestock grazing management adversely impacts riparian-wetlands through the removal of vegetation, soil compaction, and destruction of bank stability. Soil compaction and the removal of vegetation can change the plant community to a more grazing-resistant community or upland plant community, adversely impacting riparian-wetland health.

Historic uranium production has resulted in large areas of soil disturbance. There have also been a number of new uranium prospects with the potential to adversely impact riparian-wetland resources. Most new uranium prospects are for in situ leach production, which reduces surface disturbance compared to open-pit mining. These development are similar to an oil and gas field, and would result in similar impacts to riparian-wetland resources.

Oil and gas development primarily occurs in the Bison Basin, Happy Springs, and Crooks Gap oilfields, and is primarily older development contributing to a localized increase in bare ground.

There has been some new oil development in the Bison Basin oilfield, and there is the potential for expanded development of this field.

Cumulative impacts to riparian-wetland resources from surface-disturbing activities such as mineral development in the Sweetwater River watershed would not vary substantially by alternative. Under alternatives A, B, and D, this watershed is largely protected by a series of ACECs, WSAs, wildlife and special status species restrictions, and VRM restrictions for trail protections. The overlapping restrictions would result in cumulative beneficial impacts to riparian-wetland resources. Alternative B would best moderate adverse impacts to riparian-wetlands from non-BLM activities as a result of greater restrictions on livestock utilization in riparian-wetland areas, slope disturbances, surface water discharge restrictions, wildlife and special status species restrictions, and increases in riparian-wetland buffers. Cumulative impacts to riparian-wetland resources would not vary in the Sweetwater River watershed from the management actions under alternatives A and C. Alternative D better protects riparian-wetland resources due to greater restrictions on livestock utilization in riparian-wetland areas than alternatives A and C, which would result in fewer cumulative adverse impacts. Cumulative impacts to riparian-wetland resources in the Sweetwater River watershed would be lowest under Alternative B, followed by alternatives D, A, and C.

The Upper Bighorn, Nowood, Middle North Platte, and Great Divide Basin watersheds are all on the edges of the planning area. These four watersheds are comprised of approximately 8.2 million acres combined; however, only approximately 5 percent of this acreage is in the planning area. Cumulative impacts in these watersheds are influenced very little by the management actions of the planning area. However, in the Great Divide Closed Basin, uranium development south of Green Mountain will contribute to cumulative adverse impacts to riparian-wetland resources. The ongoing exploration for uranium in this area, combined with the future prospects and the development activities in the Rawlins planning area will contribute to increases in ground disturbance in this area. The increases in ground-disturbing activities will increase overland flow and sedimentation into riparian-wetland areas in this watershed. Cumulative impacts to riparian-wetland resources in these watersheds could be reduced to some degree under Alternative B due to the increased restrictions on livestock utilization in and mineral development in riparian-wetland areas; however, given the small percentage of land influenced by the management actions in the Lander RMP, the variability among alternatives is not expected to be substantial. Cumulative impacts to riparian-wetland resources in these watersheds will primarily be driven by the management actions identified in the Bighorn Basin RMP, Casper RMP, and Rawlins RMP.

4.10.5. Cumulative Impacts to Vegetative Communities from Surface-Disturbing Activities and Other Management Actions

Cumulative Impact Assessment Area

Upland Vegetation

The CIAA for upland vegetation is the planning area. Upland vegetation includes grasslands, sagebrush, desert shrubs, and saltbush-greasewood flats, and mountain shrubs, as described in Chapter 3. This area was used as the area of analysis because impacts from management actions proposed under the RMP and other existing plans are not expected to have a cumulative influence beyond this scale.

Forests and Woodlands

The CIAA used to analyze cumulative impacts to forests and woodlands extends throughout the planning area, inclusive of the South Zone of the Shoshone National Forest because these correspond to the fourth-order HUC watershed level discussed for riparian-wetlands. Cumulative impacts at this level mirror and are indicative of impacts at the much larger Central Rocky Mountain region scale in terms of contemporary impacts from forests and woodlands management.

Analysis of Cumulative Impacts

Assumptions used in this cumulative impact analysis for vegetation include:

- Surface disturbance resulting in removal of vegetation has a net adverse impact on upland vegetation.

Upland Vegetation

Past and present actions that affect and have affected vegetative resources include livestock grazing, recreational uses (primarily OHVs), mineral and energy exploration and development, woodland harvest, and vegetative treatments (including those for fire management) on adjacent WRIR, private, State of Wyoming lands, and non-BLM federal lands (Bureau of Reclamation) immediately adjacent to and within the planning area. These actions, described above and in Chapter 3, include disturbances associated with drilling, building access roads, and placement of pipelines.

The projected acres of surface disturbance associated with reasonably foreseeable actions on non-BLM-administered lands in the planning area are provided in Appendix T (p. 1641). This projection understates adverse impacts because the BLM cannot forecast private activities. As indicated above for water resources cumulative impacts, subdivision of private lands and mineral development fluctuates with economic and other factors. As non-BLM development occurs, it magnifies trends resulting from BLM actions.

The spatial layout of oil and gas and energy facilities disturbs a large proportion of vegetation when considered across the planning area. Each disturbed area for a well pad increases the opportunity for INNS invasions and disrupts the spatial continuity of vegetative communities. Past, present, and future surface disturbance from oil and gas development is expected to be highest in the Gunbarrel-Madden-Ironhorse, Beaver Creek, and Bison Basin units.

Past vegetative treatments and wildfire have resulted in beneficial impacts to upland vegetation. Vegetative treatments result in short-term impacts to vegetation by decreasing vegetation production and increasing establishment of early successional species. In the long term, vegetative treatments increase available forage and water for livestock and wildlife populations (for use by private operators) in these areas.

Past fire suppression has contributed to increasing juniper encroachment in the planning area and to a concurrent decrease in aspen communities. Juniper encroachment adversely impacts upland vegetation communities by transitioning the ecosystem structure and decreasing the overall acreage of upland vegetation.

Lands with well-maintained range improvements adjacent to the planning area increase available forage and water for livestock and wildlife populations (for use by private operators) in these areas. This improves distribution of livestock and wildlife, improving vegetation condition on BLM-administered lands. These incremental beneficial impacts result in healthier vegetative

communities that are more capable of retaining moisture and nutrients and resisting disease, INNS invasion, drought, and other natural disturbances and stressors.

Lands with seasonal or yearlong grazing and unmaintained or nonexistent range improvements experience decreased health of vegetative communities. Unhealthy vegetation is incapable of retaining moisture and nutrients and resisting disease, INNS invasion, drought, and other natural disturbances and stressors.

Motorized recreation adversely impacts vegetation. Cross-country OHV use destroys vegetation as tires travel over the ground surface. Repeated passes by motorized vehicles removes vegetation in vehicle tracks. Unwashed tires can transport INNS seeds, and roads historically have been source locations for INNS populations. Localized impacts can be quite severe, but across the CIAA, impacts from motorized recreation are negligible.

Subdivision and agricultural development adversely impact upland vegetative communities. Not only do these activities often remove native vegetation, there is an increased need for water to support this development. It also continues to impact the continuity of vegetation on a landscape basis. Special status plant species, under the ESA and Wyoming BLM sensitive species guidance, are protected on federal lands by exclusion or avoidance of all surface-disturbing activities. Protection of these species and other natural resources on private and state lands might not occur, resulting in adverse impacts to these species and resources.

The CIAA has historically experienced substantial proliferation of INNS into areas considered weed free, and a substantial increase would occur in INNS where they already exist. Integrated INNS management reduces the spread and potential for INNS establishment. Private lands are not subject to the same INNS control measures as public lands; therefore, infestations are generally not treated as rapidly and thoroughly as infestations on public land.

The alternatives vary in their protections for vegetative resources. Alternative B and then Alternative D have the most limitations on development and would result in the fewest adverse impacts to vegetation and the least contributions to cumulative adverse impacts. However, alternatives A and C do not adopt the Core Area strategy or implement it on a case-by-case basis, and would result in more adverse impacts than alternatives B and D. Therefore, alternatives A and C would contribute more to cumulative adverse impacts to vegetative resources.

Under Alternative D, protections for greater sage-grouse habitat under the Core Area strategy would also protect upland vegetation from permitted discretionary actions. To the extent that non-Core Area is managed with fewer greater sage-grouse protections, it is likely that vegetation in those areas will be more adversely affected. As discussed for cumulative impacts to greater sage-grouse, management under the Executive Order and the IM will likely result in more development of private lands not managed in accordance with the Core Area strategy. The cumulative impact of these actions will exacerbate the adverse impacts of BLM actions with a multiplier sort of effect.

The cumulative impacts to vegetation from activities for all resources is projected to be moderate in the short term. It is not anticipated that BLM management actions will cause measurable changes to the vegetation disturbance occurring on non-BLM-administered lands. Therefore, Alternative B would protect the most vegetative resources and Alternative C would result in the greatest cumulative adverse impacts to vegetation.

Over the long term, BLM activities would improve vegetation composition through vegetative fire and fuels treatments and comprehensive grazing strategies. Over the short term, these activities would adversely impact vegetation by reducing the forage base, thereby increasing wildlife and livestock grazing on existing vegetative resources. Furthermore, the displacement of wildlife and livestock associated with surface-disturbing and other disruptive activities would serve to increase grazing on undisturbed vegetative resources. Surface disturbance would increase the proliferation of INNS, which would increase the need for weed-control activities.

Long-term impacts would include increased production and diversity of vegetative communities.

The degree of impacts to vegetative communities would depend on the timing of activities and whether the amount of activity in the CIAA outpaces successful reclamation and revegetation efforts in disturbed areas. The implementation of BLM reclamation and mitigation guidelines, best comprehensive grazing strategies, and restrictions on surface use would help reduce overall impacts. However, given the level of anticipated mineral development and the fact that most of the native shrub communities (e.g., sagebrush) require more than 20 years to reestablish to predisturbance conditions, surface disturbance impacts are expected under all alternatives, with alternatives A and C resulting in the greatest adverse impacts to plant communities. Impacts under alternatives B and D would be similar, but less adverse. Development activities under all the alternatives would result in the removal of unique attributes of vegetative communities and would reduce the ability of vegetative resources to support other resource values.

Forests and Woodlands

Chapter 3 describes the impacts to forest and woodland resources from past actions in the planning area. Notable past actions include an active commercial logging program from the early 20th Century through the early 1990s on Green Mountain, in the South Pass area, and on USFS and private lands in the Dubois area. In these areas, the mixture of age-class structure is still noticeable, specifically in the Green Mountain area. This landscape-level age-class mixture is less noticeable in the South Pass and Dubois areas. Acres of historically logged forestlands in the CIAA are minor compared to acres that have had some type of silviculture treatment in the past.

The prominence of even-aged stands 100 to 200 years old across the CIAA that are nearing the historic fire return interval in this area, combined with continued fire suppression throughout most of the 20th Century to the present, has resulted in forested areas dominated by lodgepole pine that are fully mature and more susceptible to insect and disease outbreaks. This is evident with the bark beetle outbreak that has heavily affected the northern portion of the CIAA and is anticipated to substantially affect the southern portion of the CIAA over the coming years. Of the 1.3 million forested acres in the Shoshone National Forest, approximately 823,000 acres, or 63 percent, of the forest are affected by bark beetles. Likewise, acreage of mountain pine beetle, Douglas-fir beetle, and other bark beetles on the WRIR are similar in their extent. Of the 170,000 forested cover types acres on the WRIR, 120,000 acres (70 percent) are affected by bark beetles.

Fire in woodland areas over the past 15 years has altered specific portions of the CIAA, but alteration has not been widespread due to active fire suppression and changes in many portions of the historic landscape, and contemporary resource uses and public infrastructure that have altered the natural landscape. Conifer woodlands have also increased in acreage due to fire suppression strategies and contemporary resource uses. Deciduous woodlands have decreased for the same reasons.

Development in the WUI has not been substantial in terms of acreage in forest and woodland areas throughout the CIAA. However, development in the past on private lands adjacent to BLM-administered lands has made management of BLM forests and woodlands both more critical and challenging to implement.

The significance of widespread bark beetle outbreaks in forest and woodland areas has led to extensive die-off of trees and removal of dead and dying trees in the WUI. This is specific to the Wind River Range, specifically the Dubois area, and increasingly in the Lander Slope and South Pass areas. Green Mountain has not experienced the same landscape-level insect and disease outbreaks. The removal of trees is concentrated on treating priority areas, and is minor in relation to the entire forested landscape. The priority of tree removal is for protecting WUI communities and infrastructure from increased fire danger associated with stands of dead trees.

Mechanical treatments of woodland communities is ongoing throughout the CIAA and results in a net loss of woodland acreage, but that loss is minor compared to existing woodland communities. Similarly, the harvesting of over-the-counter and commercial wood products is ongoing, but the harvest is sustainable and minor compared to the maintenance of areas that are not harvested.

It is anticipated that management of forest and woodland stands will continue the pattern of the last 15 years. Increased loss of forested stands will lead to stand management that could include more extensive use of wildland fire in areas where it is allowed to burn without threatening human health and safety. Increased mechanical treatments of forest stands are also anticipated and will serve to restore forested communities where fire is not a viable option. The primary impacts to forested areas in the planning area will come from actions of the USFS on the Shoshone National Forest, the Bureau of Indian Affairs (BIA) on the WRIR, and private landowners in the Dubois and South Pass areas. Limits on the use of prescribed fire and the use of wildland fire in woodland and forested areas due to increased public and private infrastructure and WUI will restrict management options in many areas. Increased infrastructure and disturbance due to mineral development in woodland areas will be minimal across the CIAA, but will likewise limit the use of fire in certain forested areas due to prohibitive complexity and liability associated with the use of natural processes such as fire.

Woodland health treatments will continue so as to restore juniper and limber pine woodlands and aspen communities. Mechanical treatments and prescribed fire will be used across the CIAA to achieve multiple resource benefits. Although prescribed fire will continue in these areas, annual livestock use of areas will continue to limit the use of fire in many woodland areas.

Protections for threatened and endangered and sensitive species will limit management options across the CIAA and potentially restrict certain forest and woodland treatments so as to maintain habitat conditions suitable for wildlife species and protect habitat qualities associated with vegetation species such as five-needle pines. While private landowners do not have the same requirements with regard to sensitive species as federal agencies, the threatened and endangered status of grizzly bears and the lynx populations in the Dubois area will apply to all landowners including in the Shoshone National Forest.

Over-the-counter and commercial wood product sales and removal is expected to continue in the CIAA, but it will be minor in relation to forest and woodland stands that do not have any product removal. The cumulative impacts in forested and woodland communities will be an increase in early seral vegetative conditions that will be minor compared to the continued dominance of late seral forest and woodland conditions.

The actions of the USFS and the BIA will drive most impacts to forest and woodlands in the CIAA. BLM management has little impact on forests in the CIAA. Pine beetle and other pests are adversely impacting forest resources to the point that certain pine species have become BLM sensitive species (limber pine) and have resulted in the re-listing of the grizzly bear under the ESA. There would be virtually no difference in impacts among the alternatives regarding forest management. Consequently, the cumulative impacts of non-BLM actions, while potentially overwhelmingly adverse to forest resources, similarly would not vary by alternative.

Alternatives C and D provide the most potential benefit, cumulatively, to forest resources because both allow active silviculture techniques. Alternative D provides management that could most easily work cooperatively with the USFS and could maximize synergistic management. However, funding is expected to decrease, and with no commercial market likely to develop, the alternatives would result in similar cumulative impacts.

4.10.6. Cumulative Impacts to the Continental Divide National Scenic Trail from Development Activities

Cumulative Impact Assessment Area

The cumulative impact area of analysis for the CDNST includes the foreground/middleground zone (0 to 5 miles either side) of the trail within the Wyoming Basin ecoregion (Map 139).

The Wyoming Basin Ecoregion is a broad arid intermontane basin interrupted by hills and low mountains and dominated by grasslands and shrublands. Nearly surrounded by forest-covered mountains, the region is drier than the Northwestern Great Plains (43) to the northeast and does not have the extensive cover of pinyon-juniper woodland found in the Colorado Plateaus (20) to the south. Much of the region is used for livestock grazing, although many areas lack sufficient forage to support this activity. The region contains major natural gas and petroleum producing fields. The Wyoming Basin also has extensive coal deposits along with areas of trona, bentonite, clay, and uranium mining (EPA 2009e).

The CIAA was chosen because it represents a distinct visual and recreational opportunity along the CDNST; therefore, this area marks a unique contribution to the trail system as a whole. Such areas are vitally important to the trail purpose as emphasized in the Bureau of Outdoor Recreation study commissioned by the enabling legislation of the CDNST (Bureau of Outdoor Recreation 1976):

The primary purpose of this trail would be to provide a continuous, appealing trail route, designed for the hiker and horseman, but compatible with other land uses...[and] to provide hiking and horseback access to those lands where man's impact on the environment has not been adverse to a substantial degree and where the environment remains relatively unaltered. Therefore, the protection of the land resource must remain a paramount consideration in establishing and managing the trail. There must be sufficient environmental controls to assure that the values for which the trail is established are not jeopardized.... The basic goal of the trail is to provide the hiker and rider an entrée to the diverse country along the Continental Divide in a manner which will assure a high quality recreation experience while maintaining a constant respect for the natural environment.

Typical stressors contributing to potential cumulative impacts to the CDNST include man-made intrusions into the viewshed and changes to the recreation environment. Man-made intrusions into the viewshed, occurring primarily on BLM public land, occur as a result of actions to support resource uses such as oil and gas development, wind-energy development, and ROW corridors. Changes to the recreation environment that cause the area to move toward a more urban environment include increases in motorized access and use, decreased naturalness, increased facilities, and increased contacts with people and groups. Typically these changes result from the same activities documented above, but can also result from actions in the recreation program (i.e., a new facility is developed to support a motorized vehicle play area in the trail corridor).

For analysis purposes, the CDNST in the Wyoming Basin has three distinct parts. These analysis units were developed based on homogeneity in land ownership pattern, level of development (existing and projected), and landscape characteristics (the form, line, color, and texture of land, vegetation, water, and structures). The three distinct parts of the CDNST through the Wyoming Basin are the Checkerboard Region, the Bairoil Region, and the Antelope Hills Region.

The Checkerboard Region encompasses the area from the point where the CDNST intersects the Wyoming Basin/Southern Rockies ecoregion division north to the point where the CDNST meets Mineral Exploration Road. This section of trail (approximately 54 miles) is in the Rawlins planning area and intersects a region known as the checkerboard. This region has mixed public and private lands that resemble the pattern on the board game. In this region, BLM management is limited due to the large amount of private lands within the trail viewshed and the lack of blocked areas of public land. Protections on this section of trail include a 1/8 mile CSU on either side of the trail to maintain human health and safety; this prescription is applied only on BLM-administered lands. Impacts to the Checkerboard Region are not expected to vary under the alternatives because the entire segment is located outside of the planning area.

The Checkerboard Region of the CDNST is under intense pressure from resource uses, including energy development associated with wind and natural gas. Projects underway that will be within view and influence the character of the CDNST in this area include the Atlantic Rim Gas Development and the Choke Cherry/Sierra Madre wind-energy development. It is also reasonable to assume that the area's high wind-energy potential will continue to attract new wind-energy developments in the CDNST corridor, and further justified by the fact that the entire trail in this region is currently within a project area with an approved meteorological tower (wind testing tower) ROW. As a result, it has been projected that within the next 20 years, users of this portion of the CDNST will be constantly viewing man-made visual intrusions associated with energy development and transmission (Smith 2010).

The Bairoil Region encompasses the area of the CDNST from Mineral Exploration Road to the Happy Springs oilfield. This section of trail (approximately 42 miles, 16 of which are in the planning area) is heavily developed and affected by transmission corridors, oil and gas development, and uranium mining. The Rawlins RMP applies a 1/8-mile buffer on both sides of the trail to protect human health and safety.

It has been projected that over the next 20 years this portion of the CDNST will continue to experience additional industrial development. Uranium mining in the area has experienced an upward trend, and the area also contains moderate potential for oil and gas. The area also has high wind-energy potential. New impacts to this section of the trail would be less under Alternative B because some of this portion of the trail is closed to leasing because of its overlap with greater sage-grouse Core Area. In addition, alternatives B, C, and D proposes a 1/4-mile protective

corridor on either side of the planning area portion of this trail. Such a corridor would ensure user safety, but would not provide long-term protections for the visual resources and setting associated with the trail. It is projected that the additive impact of the Rawlins RMP and Lander RMP alternatives A, C, and D would result in the CDNST users intermittently encountering human intrusions along this entire section of the trail.

The Antelope Hills Region encompasses the area of the CDNST from just out of view of the Happy Springs oilfield to the Wyoming Basin/Middle Rocky Mountains ecoregion division. This section of trail (approximately 60 miles, 56 of which are in the planning area) is pristine, with little to no influences from man-made visual intrusions. This portion of trail provides the CDNST visitors with a feeling of solitude while also traveling through a historic area with few modern intrusions. The trail travels along a section of the Seminole Cutoff of the Oregon/California NHTs. The modifications that do exist along this trail are viewed for only a short period, do not strongly contrast from the surrounding landscape, and, in the case of the South Pass Historic site, contribute to the visitors experience.

Existing management of the CDNST in this area is not integrated or targeted to specifically benefit the CDNST. Portions of the trail intersect the Lander Field Office NHT ACEC (¼ mile either side of the NHT) and South Pass Historic Mining Area ACEC, as well as the Rock Springs Field Office Wind River Slope SRMA and South Pass ACEC. As a result, the CDNST in the Rock Springs planning area is not projected to have new visual intrusions into the viewshed. Alternative A will allow for new visual intrusions into the viewshed of the CDNST, especially in the regions east of the South Pass ACEC. These intrusions will primarily result from wind-energy development and can be anticipated across 49 miles of this section of the CDNST. New visual intrusions in this region of the Wyoming Basin CDNST would be highest under Alternative C due to increased development that this alternative facilitates. Alternative B provides the most protections for the CDNST in this area, and ensures no new visual intrusions into the trail viewshed. Alternative D is similar to Alternative B, except that under Alternative D, new visual intrusions in the background of the trail viewshed could may be infrequently seen by CDNST users. The background area is outside this CIAA; therefore, impacts to this zone do not factor into the comparison of alternatives.

Table 4.55, “Wyoming Basin CDNST Management Miles by BLM Field Office” (p. 1321) lists each segment and how much of that segment is managed by the various BLM field offices. While the impacts to trail miles from Lander RMP management actions would vary by alternative, potential impacts in the Rawlins and Rock Springs planning areas would not vary. Therefore, impacts from the management detailed in the Rawlins and Rock Springs RMPs will be considered an additive impact to all alternatives. That is, this management actions under this RMP could directly impact 72 miles of the CDNST in the Wyoming Basin. This cumulative impacts analysis also considers the additive impact of actions and decisions along the 77 miles of the Wyoming Basin CDNST in the Rawlins and Rock Springs planning areas.

Table 4.55. Wyoming Basin CDNST Management Miles by BLM Field Office

Segment (Length)	Lander Planning Area, Miles (Percent of Segment)	Rawlins Planning Area, Miles (Percent of Segment)	Rock Springs Planning Area, Miles (Percent of Segment)
Checkerboard (54 Miles)	0	54 (100%)	0
Bairoil (42 Miles)	17 (40%)	25 (60%)	0
Antelope Hills (60 Miles)	58 (97%)	0	2 (3%)
Total (156 Miles)	75 (48%)	79 (51%)	2 (1%)
Source: BLM 2012a			
BLM Bureau of Land Management CDNST Continental Divide National Scenic Trail			

Analysis of Cumulative Impacts

Actions in the Rawlins and Rock Springs planning areas will not change by alternatives in this document. Actions in the Rawlins planning area and the minimal protections on the CDNST prescribed through the Rawlins RMP will result in 74 miles of the Wyoming Basin CDNST being susceptible to human intrusions and disturbances. CDNST users will see these impacts as they move from the southern Rockies to the Wyoming Basin ecoregion (Map 139). This section of trail will provide users a rural recreation setting. Typically, a rural recreation setting is characterized as having heavy motorized vehicle traffic, reduced naturalness, structures and facilities frequently visible, and a high level of contacts with other people. It is projected that the visual resources along these 74 miles of trail will be dominated by wind turbines, transmission corridors, gas development facilities, and associated roads. Actions in the Rock Springs planning area and the protections for the CDNST delineated in the Rock Springs RMP will prevent visual intrusions on and recreation setting changes on 3 miles of Wyoming Basin CDNST.

Table 4.56, “Number of Miles of Wyoming Basin CDNST Projected to be Impacted by Human Intrusion and Resource Uses” (p. 1321) summarizes the findings.

Table 4.56. Number of Miles of Wyoming Basin CDNST Projected to be Impacted by Human Intrusion and Resource Uses

CDNST Area (Trail Miles)	Alternative A (miles)	Alternative B (miles)	Alternative C (miles)	Alternative D (miles)
Checkerboard (54)	54	54	54	54
Bairoil (42)	42	19	42	42
Antelope Hills (60)	49	0	60	0
Total (149)	139	74	146	90
Source: BLM 2012a				
CDNST Continental Divide National Scenic Trail				

Alternative A, coupled with management in the Rawlins RMP would result in almost the entire Wyoming Basin CDNST (93 percent of the trail) being converted to a rural recreation setting

with numerous visual intrusions. Under this alternative, the CDNST visitor would be within sight of energy developments and utility corridors over almost the entire Wyoming Basin. Users will be constantly on or near improved roads; within view of strongly dominant visual modifications and facilities; in contact with other people; and consistently encountering motorized users. This amount of impact will not allow the Wyoming Basin CDNST to meet the purpose of the trail (as established in the enabling legislation).

As a result of decisions in the Rock Springs RMP and Alternative A, 10 miles of the Wyoming Basin CDNST will be protected from visual intrusions and recreation setting change. This section (from the South Pass ACEC to the Wyoming Basin boundary) would continue to provide users with a middle-country recreation setting. Despite these protections, it is projected that management under Alternative A would cause CDNST users to strongly remember the Wyoming Basin and BLM Wyoming CDNST for the amount of energy development.

Alternative B would result in the least cumulative impact to the Wyoming Basin CDNST. This alternative protects almost 50 percent of the Wyoming Basin CDNST from new development by restricting energy impacts to the Rawlins portion of the CDNST. Under this alternative, the Wyoming Basin CDNST would provide a balanced display of multiple uses and recreation settings. The Rawlins portion would be developed for energy uses and provide a rural recreation setting; the other portions would display wide-open spaces and a middle-country (sometimes back country) recreation setting.

Cumulative impacts under Alternative C would be similar to impacts under Alternative A, except that only the 3 miles of Wyoming Basin CDNST (managed by the Rock Springs Field Office) would display an unchanged visual and recreation resource.

Cumulative impacts under Alternative D would result in 60 percent of the Wyoming Basin CDNST trail affected by human intrusions and development. Importantly, most of this impact would occur in the Checkerboard and Bairoil regions of the Wyoming Basin CDNST. These regions are primarily influenced by the Rawlins RMP or existing human intrusions, and therefore mark an ideal opportunity to provide the user with an opportunity to learn about these resource uses. Therefore, cumulative impacts to the Wyoming Basin CDNST under this alternative would be less than under alternatives A and C, but more than under Alternative B.

Alternative D provides for protections of the more pristine Antelope Hills Region of the CDNST, or almost 40 percent of the CDNST through the Wyoming Basin. This portion of the CDNST would remain unchanged and the recreation setting would continue to provide a middle-country and sometimes back country recreation setting. Cumulative impacts under Alternative D would result in a Wyoming Basin CDNST that is managed in a manner that meets the overall purposes, need, and goal for the CDNST while also allowing for resource uses.

Under all alternatives, this section of the CDNST would continue to experience impacts from similar activities.

4.10.7. Cumulative Impacts to National Historic Trails from Development Activities

Cumulative Impact Assessment Area

*Chapter 4 Environmental Consequences
Cumulative Impacts to National Historic Trails from
Development Activities*

February 2013

For the four Congressionally Designated NHTs (the Oregon, Mormon, California, and Pony Express NHTs), the CIAA is divided into a general assessment area and a specific assessment area (defined below).

General Assessment Area: The general assessment area is defined as the entire length of the four NHTs, which spans from Missouri and Iowa across the west to Oregon and California. This area is used as a general unit of analysis because impacts from actions throughout the United States are expected to have incremental impacts to the NHT system as a whole.

The data used for the analysis of the general assessment area came from the NPS 1999 *Comprehensive Management and Use Plan and Update for the Oregon, Mormon Pioneer, California, and Pony Express National Historic Trails* (NPS 1999). That plan identified the routes of the NHTs, generally described the present conditions of the trails, and identified what sections remained. The plan also designated particular remaining segments of the NHTs as “High Potential Segments”: those that possess “above average scenic values or affording an opportunity to vicariously share the experience of the original users of a historic route.” The entire NHT route in the planning area (more than 90 miles) is part of one of these High Potential Segments, so it can be reasonably compared to other High Potential Segments along the four NHTs. For the analysis of the general assessment area, all High Potential Segments more than 25 miles long were chosen to compare with the NHTs in the planning area.

Specific Assessment Area: The more specific assessment area is defined as the route of the NHTs through Wyoming from Fort Laramie to near the Utah and Idaho state lines. Fort Laramie, in southeastern Wyoming, was chosen because it lies near the beginning of the western high plains, where the land begins to lift toward the slopes of the Rocky Mountains. It was also the place where the pioneers left the easiest part of their westward journey. Once past Fort Laramie, the NHTs pass through the high plains for more 400 miles and cross the Continental Divide. Finally, as the pioneers neared the borders of present-day Utah or Idaho (depending on which trail they were on), they began to encounter the mountains and valleys of the eastern Great Basin and entered the next phase of their journey.

Again, the data used for the analysis of the specific assessment area again came from the NPS 1999 *Comprehensive Management and Use Plan and Update for the Oregon, Mormon Pioneer, California, and Pony Express National Historic Trails* (NPS 1999). For this more specific analysis, any High Potential Segment within the western high plains from Fort Laramie to near the Utah or Idaho state lines was chosen to compare with the NHTs in the planning area.

General Assessment Area

Background: The original Oregon, Mormon, California, and Pony Express Trails spanned thousands of miles over the central and western United States. During their heyday, these trails were the primary overland routes for some 500,000 American settlers and fortune seekers traveling west in the mid 1800s. The combined efforts of all of these emigrants helped secure the lands of the far and intermountain west for the United States, and enabled our nation to extend from the Atlantic Ocean to the Pacific Ocean.

The four trails covered more 11,000 miles on their way to Oregon, California, Utah, and points between. First established in the 1840s, these trails were heavily used by emigrants, entrepreneurs, and fortune seekers until around 1870. Afterward, the same trails were mostly used for commerce and more local traffic, and eventually many of these trails were improved, built upon, or even

paved. It was not until the 1960s that a widespread appreciation of these historic routes began to develop, and a movement to preserve what was left of them began to build momentum.

In 1968, the National Trails System Act was passed to establish and develop a National Scenic, Historic, and Recreational Trails System across the nation. The Oregon and Mormon Pioneer NHTs, both of which run through the planning area, were the first two NHTs designated through this act. Later, the California and Pony Express trails were designated as NHTs, and these trails also run through the planning area in the same vicinity as the Oregon and Mormon Pioneer trails.

The **NPS** was given the task of identifying the historic routes and remaining vestiges of these four emigrant trails. They found that approximately 25 percent of the original 11,400 miles of the Oregon, Mormon, California, and Pony Express Trails remained intact or somewhat intact. These intact portions range from short pieces of undamaged trail ruts surrounded by modern developments to long stretches of intact or somewhat intact trail. The **NPS** was then asked to identify segments of these NHTs the public could best visit and appreciate. These segments were called High Potential Segments, and the **NPS** put forward recommendations for their management and use.

Some of these High Potential Segments are of very high quality, with long stretches of largely undisturbed trail traces and surrounding landscapes that look much like they did in the mid 1800s. Others have more disturbances on them or are shorter, but still qualify as High Potential Segments because of their recreational potential or their high scenic quality. For this more general portion of the analysis, the BLM has chosen High Potential Segments 25 or more miles long because shorter segments tend to be surrounded by more impacts and have more impediments to useful management. Table 4.57, “High Potential Trail Segments in the General Assessment Area” (p. 1324) lists these High Potential Segments and their qualities.

Table 4.57. High Potential Trail Segments in the General Assessment Area

Segment Name	Segment Location	Length (Miles)	Trail(s)	Number of Associated High Potential Sites	Primary Land Owner/ Manager	Overall Quality		
						Ruts/ Swales	Historic Setting	Combined
South Pass	Central and Western Wyoming	145	Oregon, Mormon, California, Pony Express	8	BLM	Good to excellent	Excellent	Excellent
Big Sandy to Green River	Western Wyoming	50	Oregon, Mormon, California, Pony Express	1	BLM	Fair to good	Good to excellent	Good
Anderson Ridge to Buckskin Crossing	Western Wyoming	27	California	0	BLM	Good to excellent	Excellent	Good to excellent
North Piney Creek to Smiths Fork	Western Wyoming	42	California	0	USFS	Good	Excellent	Good to excellent

Segment Name	Segment Location	Length (Miles)	Trail(s)	Number of Associated High Potential Sites	Primary Land Owner/ Manager	Overall Quality		
						Ruts/ Swales	Historic Setting	Combined
Bear River Divide	Western Wyoming	31	Oregon, California	0	BLM	Good to excellent	Excellent	Excellent
Fort Bridger to Cache Cave	South-western Wyoming	44	Mormon, California, Pony Express	3	Private	Good	Fair to good	Good
Castle Rock to This is the Place	Northern Utah	51	Mormon, California, Pony Express	2	Private	Fair	Fair	Fair
Fairfield to Ruby Valley	Western Utah and Eastern Nevada	217	Pony Express	5	BLM	Fair to excellent	Excellent	Good to excellent
Grantsville to Franklin River	Western Utah and Eastern Nevada	177	California	18	BLM	Good	Good to excellent	Good to excellent
Curlew Valley to Salt Lake Cutoff Jct	Northern Utah and Southern Idaho	45	California	3	Private	Fair to good	Fair to good	Fair to good
Granite Pass to Humboldt River	Southern Idaho, Northwestern Utah, and North-eastern Nevada	98	California	6	BLM	Fair to excellent	Good to excellent	Good to excellent
Auburn to Wayan	Western Wyoming and Eastern Idaho	25	California	0	USFS	Good	Good	Good
Arbon Valley to Sublette Reservoir	Southern Idaho	25	California	2	BLM and USFS	Good to excellent	Good to excellent	Good to excellent
Cascade Mountain Crossing	Southern Oregon	30	California	4	BLM and USFS	Good to excellent	Good to excellent	Good to excellent
Overland Canyon to Simpson Park Station	Eastern Nevada	84	Pony Express	0	BLM	Good to excellent	Excellent	Good to excellent
Humboldt Sink to Dayton	Western Nevada	81	California	2	BLM and State of Nevada	Fair	Fair to good	Fair to good
Genoa to Union House	Western Nevada and Eastern California	72	California	15	USFS	Fair	Fair	Fair

Segment Name	Segment Location	Length (Miles)	Trail(s)	Number of Associated High Potential Sites	Primary Land Owner/ Manager	Overall Quality		
						Ruts/ Swales	Historic Setting	Combined
Humboldt Sink to Fernley	Western Nevada	37	California	1	BLM and private	Fair	Fair	Fair
Verdi to Steephollow Crossing	Eastern California	74	California	7	USFS	Fair to good	Fair	Fair
Bucks Summit to Lake Oroville	Eastern California	34	California	0	USFS and private	Fair to good	Fair	Fair
Lassen Meadows to Pothole Springs	Northwestern Nevada and Northeastern California	206	California	13	BLM and USFS	Excellent	Excellent	Excellent
1856 Nobles Trail Junction to Granite Creek	Western Nevada	30	California	1	BLM	Good	Fair to good	Good
Deep Hole Springs to Smoke Creek Canyon	Western Nevada	26 miles	California	1	BLM	Good	Fair to good	Good
Butte Creek to Manzanita Chute	Eastern California	25	California	1	USFS and National Park Service	Fair to good	Fair to excellent	Good to excellent
Pit River to Feather Lake	Eastern California	46	California	2	USFS	Fair to good	Fair to good	Fair to good
Deer Creek Meadows to Acorn Hollow	Eastern California	46	California	4	USFS and private	Fair to good	Fair to excellent	Fair to good
North Trail	Western Idaho	83	Oregon	8	BLM	Good to excellent	Good	Good
Barlow Road	Northern Oregon	42	Oregon	6	USFS	Good	Excellent	Good to excellent
Source: NPS 1999								
BLM Bureau of Land Management USFS United States Forest Service								

Analysis of Cumulative Impacts – General Assessment Area

As Table 4.57, “High Potential Trail Segments in the General Assessment Area” (p. 1324) shows, most of the best-quality High Potential Segments are on public lands managed by the BLM or the USFS. This is logical, because these agencies have been given the responsibility to manage

and protect these NHTs for several decades. Other land managing agencies, such as states or counties, might or might not have trail protection as a priority. Privately owned lands tend to be managed based on other factors, including agricultural, residential, and commercial uses, and long-preserved trails can quickly become threatened if these other uses become dominant. It is generally true that the NHTs are best protected by entities who have laws encouraging protection of trails, and it is also true that entities with other priorities do not tend to protect historic trails as well.

In addition, almost all of the miles of excellent- or good-to-excellent condition High Potential Segments (91 percent) are in just three areas of the west – the plains of central and western Wyoming, the deserts of western Utah and eastern Nevada, and the deserts of northwestern Nevada. Three of these segments (covering more than 245 miles) are in Wyoming; two segments (covering almost 580 miles) are in western Utah/eastern Nevada, and one segment (covering a little more than 200 miles) is in northwestern Nevada.

One of these excellent-condition segments is the South Pass High Potential Segment, and the complete NHT route in the planning area is in this High Potential Segment. The South Pass High Potential Segment begins in the Casper planning area, just east of the Lander planning area, and ends in the Rock Springs planning area near Farson; approximately 90 of the 145 miles of the South Pass High Potential Segment are in the Lander planning area. The South Pass High Potential Segment is equal to or better in quality than any of the other excellent segments in Wyoming, Utah, or Nevada, because it not only has excellent historic settings, it can also be traveled on two-track roads on or near original ruts or swales for most of its length.

Most types of development adversely impact the historical settings of the trails, and commercial wind-energy development is now considered the most adverse. This is due to the very large size of the turbines, the visual impact of which is exacerbated by lighting mandated for aircraft safety, and associated transmission lines that can contrast with the visual and historical setting of the trails, even at a great distance. Pressures to develop wind energy along High Potential Segments are present on the Fairfield-to-Ruby Valley and the Fort Bridger-to-Cache Cave segments (where wind farms have already been permitted), and the Anderson Ridge-to-Buckskin Crossing, North Piney Creek-to-Smiths Fork, Bear River Divide, Curlew Valley-to-Salt Lake Cutoff Junction, Granite Pass to Humboldt River and Barlow Road segments, where high wind-energy potential has been identified. High wind-energy potential has also been identified along the South Pass High Potential Segment; several wind-energy development companies have applied for leases on and around this segment, and several more companies have expressed interest in the area.

Development of transmission line and pipeline developments along the NHTs is also a concern. Segments in southwestern Wyoming, western Utah, Nevada, southern Idaho, and northeastern California have been impacted or are threatened by major utility corridors. The South Pass High Potential Segment is also threatened by transmission line and pipeline development. Since the 1980s, major transmission and/or pipelines have proposed to cross the segment, and these types of proposals are expected to increase in the future.

If development is allowed along a highly pristine NHT segment such as South Pass, then developers will be encouraged to press for development along other high quality segments. Conversely, if development is restricted in order to maintain South Pass Segment's historical settings, then other high quality segment managers could use the same rationales for protection of settings.

Specific Assessment Area

The specific assessment area for NHTs is the route of the NHTs from Fort Laramie to near the Utah and Idaho state lines. This area represents a section of the trails that the emigrants themselves identified; they had just left the easiest part of their journey and had now entered the almost 400-mile long trek across the high plains of Wyoming. The area's geology strongly influenced the path taken because it followed the availability of water and the gradual slopes up to and over the Continental Divide. Finally, as the pioneers neared the borders of present-day Utah or Idaho (depending on which trail they were on), they encountered the mountains and valleys of the eastern Great Basin and entered the next phase of their journey.

The specific assessment area encompasses High Potential Segments in the Casper, Lander, Rock Springs, Pinedale, and Kemmerer planning areas, and the USFS Bridger-Teton National Forest. The assessment area includes the High Potential Segments of Fort Laramie to Warm Springs, Prospect Hill, South Pass, Big Sandy to Green River, Anderson Ridge to Buckskin Crossing, North Piney Creek to Smith's Fork, Bear River Divide, and Fort Bridger to Cache Cave. It does not include the Auburn to Wayan High Potential Segment because this segment is considered to have left the western high plains and is instead on the extreme eastern edge of the Great Basin.

All High Potential Segments, not just those 25 miles and longer, were included in the analysis of the specific assessment area. Table 4.58, "High Potential Trail Segments in the Specific Assessment Area" (p. 1328) lists and describes these segments.

Table 4.58. High Potential Trail Segments in the Specific Assessment Area

Segment Name	Segment Location	Length (Miles)	Trail(s)	Number of Associated High Potential Sites	Primary Land Owner/ Manager	Overall Quality		
						Ruts/ Swales	Historic Setting	Combined
Fort Laramie to Warm Springs	South-eastern Wyoming	14	Oregon, Mormon, California, Pony Express	4	Private	Good to excellent	Fair to good	Good
Prospect Hill	Central Wyoming	3	Oregon, Mormon, California, Pony Express	2	BLM	Fair to good	Fair to good	Fair to good
South Pass	Central and Western Wyoming	145	Oregon, Mormon, California, Pony Express	8	BLM	Good to excellent	Excellent	Excellent
Big Sandy to Green River	Western Wyoming	50	Oregon, Mormon, California, Pony Express	1	BLM	Fair to good	Good to excellent	Good
Anderson Ridge to Buckskin Crossing	Western Wyoming	27	California	0	BLM	Good to excellent	Excellent	Good to excellent

Segment Name	Segment Location	Length (Miles)	Trail(s)	Number of Associated High Potential Sites	Primary Land Owner/ Manager	Overall Quality		
						Ruts/ Swales	Historic Setting	Combined
North Piney Creek to Smiths Fork	Western Wyoming	42	California	0	USFS	Good	Excellent	Good to excellent
Bear River Divide	Western Wyoming	31	Oregon, California	0	BLM	Good to excellent	Excellent	Excellent
Fort Bridger to Cache Cave	South-western Wyoming	44	Mormon, California, Pony Express	3	Private	Fair to good	Fair to good	Good
Source: NPS 1999								
BLM Bureau of Land Management USFS United States Forest Service								

Two High Potential Segments are rated as excellent in overall quality — the South Pass Segment and the Bear River Divide Segment. Both of these segments have outstanding historical settings, and the condition of their ruts and swales are mostly quite good. The rest of the High Potential Segments range from: good to excellent (two segments); good (three segments); and fair to good (one segment). Short narratives on each follow:

Fort Laramie to Warm Springs Segment: This 14-mile long segment is predominantly privately owned, with some National Guard- and NPS-managed lands. Currently in good condition, this segment is generally classified as range land. However, because it is mostly in private ownership, it is subject to changes in ownership and use, and its good-condition status could change at any time.

Prospect Hill Segment: This 3-mile long segment is predominantly BLM-administered land, but has some state and private lands around it. It is in fair to good condition, and has been affected by pipeline and transmission line development in the past. Recent BLM management decisions should help to reduce impacts to this site by requiring VRM limits out to 3 miles on each side of the segment.

South Pass Segment: This 145-mile long segment is predominantly BLM-administered land, and is in excellent condition. The NPS described the South Pass segment in these words: “The first cross-country segment of the Oregon Trail recommended in this report is also one of the very best stretches of the Oregon Trail left in any of the six states through which the trail passes. The South Pass segment, which extends from Independence Rock to just west of Parting of the Ways, contains 125 miles of the most unspoiled terrain over which the Oregon Trail passes” (NPS 1981).” And, “The quality of the resources and the visual experience make South Pass one of the most impressive segments on the entire trail...(NPS 1999).”

As described above, in the 1987 RMP, the planning area section of the South Pass Segment is only minimally protected by BLM management decisions that restrict development within ¼ mile on each side of the trail. On the Rock Springs section of the segment, part is protected by a 3 mile on each side ACEC, and part is protected by a ¼ mile on each side zone.

Big Sandy to Green River Segment: This 50-mile long segment is also mostly BLM-administered, and is in good condition. A paved highway runs along the segment, but the setting is mostly intact. A ¼ mile on each side protection corridor minimally protects this segment.

Anderson Ridge to Buckskin Crossing Segment: This 27-mile long segment is mostly BLM-administered land, and in good to excellent condition. A county road runs over or along approximately half the segment, but the setting is mostly intact. Management decisions include surface restrictions along the mountain flanks where the segment runs, and a 1 mile on each side restriction is in place.

North Piney Creek to Smith's Fork Segment: This stretch of trail runs over private, BLM, and USFS lands in the western part of Wyoming. The 42-mile long segment is mostly on a county road, but the setting is almost pristine. Currently, the segment is minimally protected by BLM management decisions that restrict development within ¼ mile on each side of the trail.

Bear River Divide Segment: This 31-mile long segment is mostly BLM-administered in its northern half and is in checkerboard (alternating private and BLM) in its southern half. The northern half is in excellent condition, and the southern half is in good condition, with part of it upgraded into an oil well access road. Management decisions include surface restrictions of 1 mile on each side of the trail.

Fort Bridger to Cache Cave Segment: This section of trail is mostly on private land in a checkerboard land ownership pattern. This 44-mile long segment has been affected by a large wind-energy development, and private lands have been altered by development in some areas. The scattered BLM-administered lands have restrictions to protect the historic settings, but wind-energy development on private lands is expected to continue.

The above data indicate that segments on public land generally are better preserved than those on non-public lands; this would be expected because federal agencies have been given the responsibility to manage and protect important parts of these NHTs for several decades. Other landowning agencies, such as states or counties, might or might not have trail protection as a priority. Privately owned lands tend to be managed based on other factors, including agricultural, residential, and commercial uses, and long-protected trails can quickly become threatened if these other uses become dominant.

Analysis of Cumulative Impacts – Specific Assessment Area

As discussed above, development on or around the trails has the potential to adversely impact the physical remnants of the trails and their historical settings. The degree of impact is directly related to proximity to the trails and extent of development.

As shown on Map 140, the Specific Assessment Areas are generally held in private ownership in the portion of the trails east of the planning area. As discussed above for greater sage-grouse and the CDNST, there are few limitations on development of private lands. Accordingly, development to the east of the planning area can be anticipated to adversely impact the historical setting of the trail segments in the area. There is high wind-energy potential, and wind energy (along with uranium and oil and gas) is being developed in the Casper planning area. The trend for historical setting for the portion of the trails from Fort Laramie to Independence Rock will likely continue downward, particularly if the Pathfinder and Black Mountain Wind-Energy Development projects in the Casper planning area progress beyond their current testing activities.

As with the CDNST, the portion of the NHT Specific Assessment Areas in the Rock Springs, Kemmerer, and Pinedale planning areas have protections that are likely to beneficially impact the trails within a range of ¼ to 3 miles, but are also subject to adverse impacts associated with mineral and wind-energy development. As discussed above, increased oil or gas development is likely in all BLM planning areas reviewed here, with intense development in certain areas. While some of this development might be hidden from view, much of it will not, particularly in the areas of moderate and high potential for oil or gas to the west of the Lander planning area.

While some of the development and adverse impacts will be limited by greater sage-grouse Core Area management, segments of the trails pass through or are adjacent to non-Core Area. This development also would adversely impact trails, and has led to the Specific Assessment Areas being fragmented rather than in a continuous segment, as occurs in the South Pass segment through the planning area.

The landscape-level development identified above for greater sage-grouse will adversely impact the historical setting of the trails. When combined with the different management of NHTs under the alternatives, the following cumulative impacts would result:

Alternatives A and C: The greatest threats to the NHTs in the planning area include wind-energy development, transmission lines, and pipelines. If development along the NHTs on BLM-administered lands occurs, it will likely extend into private or state lands. Similarly, development on state or private lands will likely lead to the need for ROWs across BLM-administered lands.

Lands along portions of the South Pass High Potential Segment have high potential for wind-energy development. Wind energy companies have shown interest in lands along the NHTs in the planning area by setting up meteorological towers on private lands and by applying for meteorological-tower locations on BLM-administered lands. At present, the Lander Field Office has not approved meteorological towers close to the trails. With alternatives A and C protecting the NHTs only out to ¼ mile on each side, wind farms could be present in viable wind locations near the NHTs outside of this corridor, resulting in major impacts to their historical integrity. The cumulative adverse impacts of this kind of development on a High Potential Segment such as South Pass would be major.

Wind-energy development along the segment would necessitate power transmission line construction and expansion to service wind farms, which would further impact the integrity of the trails. Like wind farms, transmission lines are highly visible and would result in major adverse impacts to the historical settings of the NHTs. Pipeline and transmission line projects not associated with wind farms would be likely to affect the South Pass segment. Alternative A does not specify corridors where transmission lines or pipelines would be clustered, so they could be proposed on intact sections of the trail, further degrading the NHTs. Alternative C specifies preferred corridor locations; however, most of the planning area is also open to major ROWs.

Other resource uses along the NHTs in the planning area are not reasonably foreseeable as high-level threats. These other uses include oil and gas exploration, locatable minerals and phosphate mining, geophysical exploration, mineral materials disposals, and major ROW actions. However, alternatives A and C would give minimal protection from new threats, and unforeseen increases in developments could adversely impact the NHTs.

Alternatives A and C would result in cumulative adverse impacts to other trail segments in this region. Allowing development along the NHTs in the planning area would encourage developers

to propose projects along other segments where NHT protection is minimal or ambiguous. These segments could include the Prospect Hill segment, portions of the South Pass segment, Big Sandy to Green River segment, the North Piney Creek to Smith's Fork segment, and portions of the Bear River Divide segment.

Alternatives B and D: Under alternatives B and D, development along the NHTs on BLM-administered lands will be restricted.

Alternatives B and D restrict wind-energy development on BLM-administered lands out to 5 miles either side of the NHTs, and require BLM-permitted wind farms past 5 miles to be hidden or to meet VRM categories. While development of wind-energy resources is always possible on private or state lands on or near the NHTs, Alternative B or D would ensure that these projects would not physically expand onto adjacent BLM-administered lands. This scenario would limit the interest in building large wind farms on BLM-administered lands in the South Pass segment, and further protect the NHTs from new disturbances and impacts. The trails in the planning area would continue to be some of the best remaining NHTs in the western United States.

Alternatives B and D limit major utility (pipeline and transmission lines) along the NHTs to designated corridors. Transmission lines or pipelines that have to cross the NHTs will be clustered, which would confine their impacts to designated areas adversely affected by earlier lines. Clustered transmission lines would mean fewer highly visible impacts on the historical settings of the NHTs.

Other resource uses along the NHTs in the planning area are expected, but are not currently seen as high-level threats. These other uses include oil and gas exploration, locatable minerals and phosphate mining, geophysical exploration, mineral materials disposals, and major ROW actions. Alternatives B and D have been designed to shield the NHTs from unforeseen threats, and the NHTs would be mostly protected from adverse impacts.

Alternative B or Alternative D could result in cumulative beneficial impacts to other trail segments in this region. Upcoming RMPs could look to this RMP for guidance and ideas about how to best manage the NHTs while still allowing development that would not adversely impact the NHTs.

4.11. Irreversible and Irretrievable Commitment of Resources

NEPA section 102(2)(C) and section 1502.16 of the CEQ NEPA implementing regulations require that the discussion of environmental consequences include a description of "...any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented." An irreversible commitment of a resource is one that cannot be reversed or cannot be renewed within a reasonable timeframe. Extinction of a species or disturbance to cultural resources would constitute irreversible impacts, as would extraction of sand, gravel, or oil or gas because these salable minerals cannot be renewed in the ground within a reasonable timeframe. An irretrievable commitment of a resource occurs when the resource or its use is lost for a some period. For example, a decision not to treat juniper encroachment into adjacent sagebrush habitat results in the irretrievable loss of forage production from the grassland community. This action is not irreversible because a treatment applied to the encroaching juniper could restore the forage production of the sagebrush habitat.

The decision to select one of the four alternatives described in this **Proposed RMP and Final EIS** does not constitute an irreversible or irretrievable commitment of resources because the decision

does not authorize implementation-level activities. Instead, decisions made under the selected alternative serve to guide future actions and subsequent site-specific decisions. Following the signing of the ROD for the RMP revision, the BLM will develop and implement implementation plans (activity- or project-specific). Implementation decisions require appropriate project-specific planning and NEPA analysis, and constitute BLM final approval authorizing on-the-ground activities to proceed.

Assuming the BLM selects one of the action alternatives, and that subsequent implementation decisions authorize activity- or project-specific plans, some irreversible and irretrievable commitment of resources would occur. However, the specific nature and extent of the impacts cannot be clearly defined because the location, scale, timing, rate of implementation, and relationship to other actions is currently unknown. Such impacts can be better assessed after site-specific implementation, including implementation of mitigation measures and assessment of the efficacy of the mitigation measures.

Even without the specifics of implementation plans, the likelihood of irreversible and irretrievable impacts to some resources can be estimated. Impacts from some actions can be both irreversible and irretrievable for some resources. Resources most likely to be affected include minerals and energy development; vegetation, including forests, forest products, and INNS; fish and wildlife and their habitats; soils; water; visual resources; wilderness; cultural resources; and paleontological resources. The management actions most likely to result in irreversible and/or irretrievable impacts include those related to development and surface disturbance such as mineral extraction, energy development, timber harvesting/silviculture treatments, livestock grazing, and trails and travel management.

In addition, the impacts of management actions are interrelated and generally affect multiple resources concurrently. For example, mineral extraction would result in an irreversible and irretrievable loss of those minerals. Impacts to vegetation, associated wildlife habitat, and livestock grazing from minerals extraction would be irretrievable and potentially irreversible if reclamation efforts prove unsuccessful. Irreversible impacts to soils and water quality could occur, depending on the implementation of mitigation measures and their efficacy. Visual resources would be irretrievably affected during extraction activities, but the effects would not necessarily be irreversible. If the extraction activities occurred near a wilderness area or lands with wilderness characteristics, those qualities could be irretrievably lost during extraction and such impacts could be irreversible. Any cultural or paleontological resources affected by extraction would be irretrievably and irreversibly lost. However, all of these impacts would be localized and could be minimized through effective mitigation.

4.12. Unavoidable Adverse Impacts

NEPA section 102(C) also mandates disclosure of “any adverse environmental effects which cannot be avoided should the proposal be implemented.” These are impacts for which there are no mitigation measures or impacts that remain even after the implementation of mitigation measures. Implementation of the RMP and subsequent activity- or project-specific plan implementation would result in unavoidable adverse impacts to some resources. Chapter 4 describes the potential impacts of implementing the RMP, summarized here. As discussed under the preceding section, *Irreversible and Irretrievable Commitment of Resources*, the specific nature and extent of implementation-level impacts cannot be clearly defined due to unknowns regarding site-specific implementation and associated mitigation measures.

In general, development and surface-disturbing activities, including those from mineral extraction, energy development, vegetative treatments or timber harvesting, OHV use, and trails and travel management would result in unavoidable adverse impacts, including soil compaction and erosion, loss of vegetative cover, spread of INNS, disturbance to and displacement of wildlife, visual intrusions on the landscape, and potential loss of cultural or paleontological resources. Conversely, proposed restrictions on some activities such as OHV use, energy development, and livestock grazing intended to protect sensitive resources and resource values would result in unavoidable adverse impacts to some users, operators, and permittees by limiting their ability to use public lands and potentially increasing their operating costs.

Chapter 5. Public Involvement, Consultation, and Coordination

This page intentionally
left blank

5.1. Introduction

Public involvement, consultation, and coordination was initiated prior to, and occurred throughout, preparation of the Lander Resource Management Plan (RMP) revision and associated Environmental Impact Statement (EIS). The Bureau of Land Management (BLM) incorporated public involvement, consultation, and coordination through public meetings, informal meetings, individual contacts, news releases, newsletters, workshops, a planning website, and the *Federal Register*. This chapter describes the public involvement process, as well as other key consultation and coordination activities undertaken to prepare the EIS in support of the RMP revision.

The BLM decision-making process is conducted in accordance with the requirements of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations implementing NEPA, and the United States (U.S.) Department of the Interior (DOI) and BLM policies and procedures implementing NEPA. NEPA and the associated regulatory and policy framework require that all federal agencies involve the interested public and potentially affected parties in their decision-making, consider reasonable alternatives to proposed actions, and prepare environmental documents that disclose the potential impacts of proposed actions and alternatives.

A Notice of Intent (NOI) published in the *Federal Register* on February 13, 2007, formally announced the BLM's intent to revise the existing plan and prepare the associated EIS. The NOI initiated the scoping process and invited participation of affected and interested agencies, organizations, and members of the public in determining the scope and issues to be addressed by alternatives and analyzed in the EIS. The BLM solicited additional public involvement at multiple meetings, including an open house and cooperating agency workshops, to help identify issues to be addressed in developing a full range of land management alternatives. Subsequent to the release of the Draft RMP and EIS on September 9, 2011, the BLM held three commenting workshops in September 2011 and five public meetings in October 2011 to discuss the commenting process, respond to questions, and solicit comments on the Draft RMP and EIS. Table 5.1, "Public Involvement, Coordination, and Consultation Events" (p. 1337) lists public involvement, coordination, and consultation events.

Table 5.1. Public Involvement, Coordination, and Consultation Events

Date	Location	Event	Type
March 19, 2007	Riverton, Wyoming	Public Scoping Meeting	Public Meeting
March 20, 2007	Shoshoni, Wyoming	Public Scoping Meeting	Public Meeting
March 21, 2007	Jeffrey City, Wyoming	Public Scoping Meeting	Public Meeting
March 22, 2007	Dubois, Wyoming	Public Scoping Meeting	Public Meeting
March 23, 2007	Lander, Wyoming	Public Scoping Meeting	Public Meeting
June 13, 2007	Lander, Wyoming	Socioeconomic Meeting	Cooperating Agency Meeting
August 14, 2007	Lander, Wyoming	Socioeconomic Meeting	Cooperating Agency Meeting
November 5, 2007	Lander, Wyoming	Travel Management Meeting	Public Meeting
November 6, 2007	Lander, Wyoming	Travel Management Meeting	Public Meeting
November 7, 2007	Dubois, Wyoming	Travel Management Meeting	Public Meeting
November 8, 2007	Dubois, Wyoming	Travel Management Meeting	Public Meeting
January 24, 2008	Riverton, Wyoming	Travel Management Meeting	Public Meeting
March 18 – 20, 2008	Lander, Wyoming	Goals and Objectives Development Workshop	Cooperating Agency Workshop
May 21 – 23, 2008	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop

Date	Location	Event	Type
June 18 – 20, 2008	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
August 20 – 21, 2008	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
September 24 – 25, 2008	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
December 3 – 5, 2008	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
January 21 – 23, 2009	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
February 18 – 20, 2009	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
December 9, 2009	Lander, Wyoming	Range of Alternatives Development Workshop	Cooperating Agency Workshop
March 31, 2010	Lander, Wyoming	Open House	Public Meeting
May 12 – 14, 2010	Lander, Wyoming	Preferred Alternative Development Workshop	Cooperating Agency Workshop
September 19, 2011	Lander, Wyoming	Commenting Workshop	Public Meeting
September 20, 2011	Riverton, Wyoming	Commenting Workshop	Public Meeting
September 21, 2011	Dubois, Wyoming	Commenting Workshop	Public Meeting
October 24, 2011	Shoshoni, Wyoming	Draft RMP and EIS Public Meeting	Public Meeting
October 25, 2011	Lander, Wyoming	Draft RMP and EIS Public Meeting	Public Meeting
October 26, 2011	Dubois, Wyoming	Draft RMP and EIS Public Meeting	Public Meeting
October 27, 2011	Riverton, Wyoming	Draft RMP and EIS Public Meeting	Public Meeting
October 28, 2011	Jeffrey City, Wyoming	Draft RMP and EIS Public Meeting	Public Meeting
RMP Resource Management Plan EIS Environmental Impact Statement			

5.2. Public Involvement

In accordance with CEQ scoping guidance, the BLM provided opportunities for public involvement as an integral part of revising the RMP and preparing the EIS. CEQ scoping guidance (1981) defines scoping as the process by which lead agencies solicit input from the public and interested agencies on the nature and extent of issues and impacts to be addressed and the methods by which they will be evaluated. The scoping comment summary report, which summarizes comments received during the scoping process, is available on the Lander RMP website at <http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander/docs.html>.

The intent of the scoping process is to provide an opportunity for the public, tribes, other government agencies, and interest groups to learn about the project and provide input on the planning issues, impacts, and potential alternatives that will be addressed in the EIS, and the extent to which those issues will be analyzed. In general, public involvement during scoping assists the agency through the following:

- Broadening the information base for decision-making
- Informing the public about the EIS and proposed RMP and the potential impacts associated with various management decisions

- Ensuring public needs and viewpoints are brought to the attention of the agency
- Determining the scope and the significant issues to be analyzed in depth in the EIS

5.2.1. Scoping Period

The scoping period for the Lander RMP revision began with the publication of the NOI in the *Federal Register* on February 13, 2007 and ended on April 16, 2007. The scoping period provides an opportunity for the public to identify potential planning issues and concerns associated with the RMP and EIS. Information obtained by the BLM during scoping is combined with issues identified by the agencies to form the scope of the EIS.

Public Notification of Scoping

The BLM issued a news release to local media on February 13, 2007, describing the Lander RMP revision, and issued a subsequent news release on March 2, 2007, listing the time, date, and location of the public scoping meetings. Copies of the news releases went out to numerous media outlets within and outside the planning area. The news releases were also posted on the Lander RMP website.

In addition to news releases and other notifications from the BLM regarding the scoping process, some members of the public received notification from other sources. Several articles and news bulletins regarding some aspect of the RMP process were published in local newspapers. Many of the articles listed the dates for the scoping period and the dates, times, and locations of public scoping meetings.

The Lander RMP website provides background information on the project, a description of the scoping process and meeting locations, instructions on how to submit comments, and copies of public information documents such as the NOI and the 1987 Lander RMP. The website is one of the methods used to communicate project news and updates to the public. The website can be accessed at: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html>.

Scoping Meetings

During the week of March 19, 2007, the BLM hosted scoping meetings in five locations across the planning area. Table 5.1, “Public Involvement, Coordination, and Consultation Events” (p. 1337) lists the scoping meeting locations and dates. The five public scoping meetings provided the public with an opportunity to learn and ask questions about the project, the planning process, and to submit their issues and concerns to the BLM. The BLM chose an open house format to encourage broader participation, to allow attendees to learn about the project at their own pace, and to enable attendees to ask questions of BLM representatives in an informal one-on-one setting. The BLM also provided handouts and presented displays at each scoping meeting.

The BLM encouraged meeting attendees to comment by submitting written comment forms (either at the meetings or via U.S. Postal Service) or by sending an e-mail. Comment sheets were available to attendees at all meetings.

5.2.2. Public Comment Period on the Draft RMP and EIS

A notice of availability announcing the release of the Draft RMP and EIS was published in the *Federal Register* on September 9, 2011, initiating a 90-day public comment period. The BLM

later extended the comment period for an additional 45 days, ending the comment period on January 20, 2012. During the 135-day public comment period, the public was provided the opportunity to review and comment on the Draft RMP and EIS.

Notification

The BLM issued a news release on September 9, 2011, announcing the release of the Draft RMP and EIS, which provided the dates and times of the public commenting workshops. The BLM also distributed a newsletter via U.S. mail and e-mail to individuals on the BLM mailing list, which provided the dates and locations of all commenting workshops and public meetings. In addition to news releases and other notifications from the BLM regarding the comment period, some members of the public received notification from other sources. Several articles and news bulletins regarding the release of the Draft RMP and EIS were published in local newspapers. Many of the articles listed the dates for the public meetings and workshops.

Public Meetings

During the public comment period, the BLM held three commenting workshops in September 2011 and five public meetings in October 2011 in towns and cities throughout the planning area (see Table 5.1, “Public Involvement, Coordination, and Consultation Events” (p. 1337) for meeting times and locations). The commenting workshops were offered to inform readers about how to navigate the Draft RMP and EIS, and how to prepare and submit substantive comments. The October public meetings provided additional opportunity for the public to ask questions and submit comments. BLM managers, resource specialists, and other representatives of the BLM were present during these meetings to discuss and answer questions.

Comment Analysis

Based on comments received during this period, the BLM revised the RMP where appropriate. Changes made to the Draft RMP and EIS based on comments are reflected in the Proposed RMP and Final EIS. The Comment Analysis Report summarizes all substantive comments received during the 135-day public comment period and the BLM responses to those comments, including how the document was revised based on comments. The report is presented in Appendix X (p. 1829).

5.2.3. Other Public Involvement

The BLM held one open house meeting in Lander, Wyoming, on March 31, 2010. Similar to the public scoping meetings, resource specialists and other representatives of the BLM were on hand to personally address questions and provide information to meeting participants. The BLM also hosted five public workshops to obtain information and input on travel management and recreational activities at locations throughout the planning area. Refer to Table 5.1, “Public Involvement, Coordination, and Consultation Events” (p. 1337) for meeting times and locations.

Mailing List

The BLM compiled a project mailing list of individuals, agencies, and organizations that participated in past BLM projects or requested to be on the general mailing list. Visitors to the scoping meetings were asked to sign in and provide their mailing address so that they could also be added to the mailing list. Other additions to the mailing list include those individuals who have submitted requests to be added to the list. Duplicate entries, changes of address, and

return-to-sender mailings were deleted from the official project mailing list as identified. Through this process, the general mailing list was revised to approximately 975 entries. Requests to be added to or to remain on the official mailing list will continue to be accepted throughout the planning process.

Newsletters

Periodic newsletters have been developed and distributed to keep the public informed of the Lander RMP revision. Eight newsletters have been e-mailed and mailed to individuals on the Lander RMP mailing list. The newsletters have also been made available for download on the Lander RMP website.

Website

The Lander RMP website can be found at: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html>. The website serves as a virtual repository for documents related to the development of the RMP, including announcements, newsletters, and documents. The documents are available in PDF format to ensure they are accessible to the widest range of interested parties. The website provides the public an opportunity to submit their comments for consideration as part of the planning process and to be added to the project mailing list.

Field Trips

On June 18, 2008, the BLM held a field trip to tour portions of the planning area with cooperating agencies. The group visited Red Canyon overlook, Crow's Nest/South Pass, Gilespie/Sweetwater Canyon, and Beaver Rim. At each area, the BLM and cooperating agencies discussed the values as well as the issues of each site in order to better understand and address the management needs of these sites.

The BLM organized field trips from September 8, 2009 to September 11, 2009, that were attended by the BLM and representatives from six Native American tribes. The field trips provided an opportunity for the BLM and the tribal representatives to discuss issues and concerns related to the RMP revision, as well as two other energy related projects proposed in the planning area. The BLM also sought input from tribal representatives about areas of cultural importance to their tribes that might be impacted by these projects. Native American consultation is discussed in Section 5.3.3, "Native American Interests" (p. 1343).

5.2.4. Future Public Involvement

Public participation efforts will be ongoing throughout the remainder of the process of revising the RMP and developing the EIS. The Proposed RMP and Final EIS considered all substantive comments received during the 135-day public comment period for the Draft RMP and EIS. Members of the public with standing will have the opportunity to protest the content of the Proposed RMP and Final EIS during the specified 30-day protest period. The Record of Decision will be issued by the BLM following the Governor's Consistency Review and protest resolution.

5.3. Consultation and Coordination

This section documents the consultation and coordination efforts undertaken by the BLM throughout the RMP revision process. Title II, Section 202 of the Federal Land Policy and

Management Act (FLPMA) directs the BLM to coordinate planning efforts with Native American tribes, other federal departments, and agencies of the state and local governments as part of its land use planning process. The BLM is directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 Code of Federal Regulations 1500.4-5). The BLM accomplished coordination with other agencies and consistency with other plans through ongoing communications, meetings, and collaborative efforts with the BLM Interdisciplinary Team, which includes BLM specialists, and federal, state, and local agencies.

5.3.1. Cooperating Agencies

The BLM invited local, state, federal, and tribal representatives to participate as cooperating agencies on the Lander RMP revision and EIS. The BLM invited the entities listed below to participate in the process because they have jurisdiction by law or because they could offer special expertise. Those who responded and requested cooperating agency status, are noted with an asterisk (*).

Counties

- Carbon County Commission*
- Fremont County Commission*
- Hot Springs County Commission*
- Natrona County Commission
- Sweetwater County Commission*

Conservation Districts

- Dubois-Crowheart Conservation District*
- Popo Agie Conservation District*
- Lower Wind River Conservation District*
- Sweetwater County Conservation District*
- Natrona County Conservation District*
- Saratoga-Encampment-Rawlins Conservation District
- Hot Springs Conservation District

Wyoming State Agencies

- Office of the Governor*
- Office of State Lands and Investments*
- Wyoming Department of Agriculture*
- Wyoming Department of Environmental Quality*
- Wyoming Department of Revenue
- Wyoming Department of State Parks and Cultural Resources*
- Wyoming Game and Fish Department*
- Wyoming Oil and Gas Conservation Commission*
- Wyoming State Engineer's Office*
- Wyoming State Forestry Division
- Wyoming State Geological Survey*
- Wyoming State Historic Preservation Office*
- Wyoming State Planning Office*
- Wyoming Trails*
- Wyoming Water Development Commission

Federal Agencies

- Bureau of Indian Affairs – Wind River Agency
- National Park Service – National Trails System, Intermountain Region*
- U.S. Environmental Protection Agency (EPA), Region 8
- U.S. Forest Service – Shoshone National Forest
- U.S. Fish and Wildlife Service*

Tribes

- Eastern Shoshone
- Northern Arapaho
- Crow Tribe
- Oglala Sioux
- Rosebud Sioux
- Northern Cheyenne
- Cheyenne River Sioux
- Northern Ute
- Shoshone Bannock

The BLM formally invited the cooperating agencies to participate in developing the alternatives, RMP and EIS, and to provide data and other information relative to their agency responsibilities, goals, mandates, and expertise. Cooperating agencies provided input during the initial scoping process, and throughout the revision process the BLM held general meetings with cooperating agencies to discuss procedures and processes. The BLM and cooperating agencies held several workshops to develop goals and objectives, a range of alternatives, and the Preferred Alternative between March 2008 and May 2010. Cooperating agencies have also provided comments on draft RMP related documents throughout the revision process. Refer to Table 5.1, “Public Involvement, Coordination, and Consultation Events” (p. 1337) for a list of meeting dates.

5.3.2. Section 7 Consultation

The Lander Field Office contacted the U.S. Fish and Wildlife Service (USFWS) regarding Section 7 of the Endangered Species Act and the Lander RMP revision. On September 6, 2007, the USFWS provided a list of threatened and endangered species likely to occur on BLM-administered land in the Lander Field Office, for evaluating BLM Section 7 responsibilities. The USFWS was also provided opportunities to comment on draft RMP related documents during the revision process. A copy of the September 2007 consultation letter is located in Section 5.5, “Consultation Letters” (p. 1349). The USFWS provided comments on the preliminary draft Biological Assessment. The Lander Field Office will continue consultation with the USFWS throughout the RMP revision process.

5.3.3. Native American Interests

Consultation with Native American tribes is a requirement of FLPMA and BLM guidance. On February 2, 2005, the BLM sent letters inviting Native American tribes to be cooperating agencies as part of the RMP revision. The BLM sent additional letters on August 10, 2009 to the 16 tribes listed below requesting further input on issues of religious and cultural importance. Consultation letters are located in Section 5.5, “Consultation Letters” (p. 1349).

- Cheyenne River Sioux
- Crow Nation
- Eastern Shoshone
- Northern Arapaho
- Northern Cheyenne
- Ute Indian
- Oglala Sioux
- Rosebud Sioux
- Shoshone Bannock
- Southern Cheyenne and Arapaho
- Three Affiliated Tribes of Mandan, Hidatsa, and Arikara Nation
- Lower Brule Sioux
- Yankton Sioux
- Fort Peck Assiniboine Sioux
- Standing Rock Sioux
- Crow Creek Sioux

The BLM requested specific information from the tribes to help identify areas of special concern and to gather input on appropriate protection measures for sensitive cultural sites. The letters also invited tribal representatives to participate in field trips within the planning area in September 2009. BLM representatives followed these letters with telephone calls to each tribe. In letters and during the follow-up calls, the BLM stressed its desire for tribal input on the Draft RMP and EIS. Representatives from six tribes attended the field trips which were held from September 8, 2009 to September 11, 2009. Government-to-government consultation with the tribes will continue throughout the RMP revision process.

5.4. Distribution List

The BLM distributed the **Proposed** RMP and **Final** EIS to the following entities for their review:

TRIBAL GOVERNMENTS

- Eastern Shoshone
- Northern Arapaho
- Crow Tribe
- Oglala Sioux
- Rosebud Sioux
- Northern Cheyenne
- Cheyenne River Sioux
- Northern Ute
- Shoshone Bannock

LOCAL GOVERNMENTS (COUNTIES, CITIES, TOWNS)

Carbon County, Wyoming

- Carbon County Commission
- Saratoga-Encampment-Rawlins Conservation District
- City of Rawlins
- Town of Saratoga

Fremont County, Wyoming

- Fremont County Commission
- Dubois-Crowheart Conservation District
- Lower Wind River Conservation District
- Popo Agie Conservation District
- City of Lander
- City of Riverton
- Town of Dubois

Hot Springs County, Wyoming

- Hot Springs County Commission
- Hot Springs Conservation District
- Town of Thermopolis

Natrona County, Wyoming

- Natrona County Commission
- Natrona County Conservation District
- City of Casper

Sweetwater County, Wyoming

- Sweetwater County Commission
- Sweetwater County Conservation District
- City of Rock Springs
- City of Green River

Teton County, Wyoming

- Teton County Commission
- Teton Conservation District

STATE OF WYOMING

- Senator Leland Christensen
- Senator Eli Bebout
- Senator Cale Case
- Senator Bernadine Craft
- Senator Larry Hicks
- Senator Gerald Geis
- Senator Kit Jennings
- Senator Bill Landen
- Senator Drew Perkins
- Senator Charles Scott
- Senator John Hastert
- Senator Stan Cooper
- Senator Don Dockstader
- Representative Donald Burkhart, Jr.
- Representative Jerry Paxton
- Representative W. Patrick Goggles
- Representative Lloyd Larsen
- Representative David Miller
- Representative Rita Campbell
- Representative Keith Gingery
- Representative Mark Baker
- Representative Nathan Winters
- Representative Tom Walters
- Representative John Freeman
- Representative Gerald Gay
- Representative Kendell Kroeker
- Representative Bunky Loucks
- Representative Steve Harshman

- Representative Thomas Lockhart
- Representative Tom Reeder
- Representative Tim Stubson
- Representative Stan Blake
- Representative Stephen Watt
- Representative Kathy Davison
- Representative Allen Jaggi
- Representative Ruth Petroff
- Representative Marti Halverson

WYOMING STATE AGENCIES

- Office of the Governor, Environmental Policy Division
- Office of State Lands and Investments
- Wyoming Business Council
- Wyoming Department of Administration and Information
- Wyoming Department of Agriculture
- Wyoming Department of Employment, Research, and Planning Division
- Wyoming Department of Environmental Quality
 - Air Quality Division
 - Land Quality Division
 - Water Quality Division
- Wyoming Department of Revenue
- Wyoming Department of State Parks and Cultural Resources
- Wyoming Department of Transportation
- Wyoming Game and Fish Department
- Wyoming State Engineer's Office
- Wyoming State Forestry Division
- Wyoming State Geological Survey
- Wyoming State Historic Preservation Office
- Wyoming State Planning Office
- Wyoming Trails

WYOMING STATE BOARDS/COMMISSIONS

- Air Quality Advisory Board
- Board of Wildlife Commissioners
- Natural Gas Pipeline Authority
- Agriculture Board
- Environmental Quality Council
- Farm Bureau Federation
- Land Quality Advisory Board
- Livestock Board
- Mining Council
- Wyoming Oil and Gas Conservation Commission
- Recreation Commission
- State Board of Outfitters and Professional Guides
- State Grazing Board
- Wyoming Trails Advisory Council
- Wyoming Water Development Commission

WEED AND PEST CONTROL DISTRICTS

- Carbon County Weed and Pest Control District
- Fremont County Weed and Pest Control District
- Hot Springs County Weed and Pest Control District
- Natrona County Weed and Pest Control District
- Sweetwater County Weed and Pest Control District

ASSOCIATIONS/COUNCILS

- Coalbed Methane Coordination Coalition
- Mormon Trails Association
- Oregon-California Trails Association
- Petroleum Association of Wyoming
- Wildlife Habitat Council
- Wyoming Association of Municipalities
- Wyoming Association of Conservation Districts
- Wyoming County Commissioners Association
- Wyoming Mining Association
- Wyoming Natural Diversity Database
- Wyoming Outdoor Council
- Wyoming Stockgrowers Association
- Wyoming Wilderness Association
- Wyoming Woolgrowers Association
- Independent Petroleum Association of Mountain States

CLUBS/ALLIANCES/SOCIETIES/GROUPS

- Alliance for Historic Wyoming
- Audubon Society
- Audubon Wyoming
- Back Country Horsemen of America
- Biodiversity Conservation Alliance
- Foundation for North American Wild Sheep
- Greater Yellowstone Coalition
- Guardians of the Range
- Izaak Walton League
- Land and Water Fund of the Rockies
- Murie Audubon Society
- National Wildlife Federation
- North American Pronghorn Foundation
- Public Lands Advocacy
- Rocky Mountain Elk Foundation
- Sierra Club
- The Conservation Fund
- The Land Trust Alliance
- The Nature Conservancy
- The Wilderness Society
- The Wildlife Society
- Trout Unlimited
- Western Lands Project
- Western Watersheds Project

- Wyoming Wildlife Federation
- Wyoming Wildlife and Natural Resource Trust

CONGRESSIONAL DELEGATION

- U.S. Senator Michael Enzi
- U.S. Senator John Barrasso
- U.S. Representative Cynthia Lummis

U.S. DEPARTMENT OF THE INTERIOR

- Bureau of Indian Affairs
- Bureau of Reclamation
- National Park Service
- Office of Environmental Policy and Compliance
- Natural Resources Library
- Office of Surface Mining
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
 - Washington, D.C.
 - Cheyenne, Wyoming
- Bureau of Land Management
 - Washington, D.C.
 - Wyoming State Office, Cheyenne
 - Wind River/Bighorn Basin District
 - Wyoming Field Offices: Buffalo, Casper, Cody, Kemmerer, Newcastle, Pinedale, Rawlins, Rock Springs, and Worland

OTHER FEDERAL AGENCIES

- U.S. Environmental Protection Agency
- U.S. Department of Agriculture Forest Service
 - Shoshone National Forest
- U.S. Department of Agriculture Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- Department of Energy Western Area Power Administration
- Federal Highway Administration
- Federal Energy Regulatory Commission
- U.S. Government Printing Office
- Oceanic and Atmospheric Administration's National Weather Service

LIBRARIES

- Library of Congress
- University of Wyoming Library
- Carbon County Library
- Fremont County Public Library
- Hot Springs County Library
- Natrona County Library
- Sweetwater County Library

EDUCATIONAL INSTITUTIONS

- Central Wyoming College

- University of Wyoming
- Western Wyoming Community College
- Wyoming Community College Commission

MEDIA

Newspapers

- Casper Journal, Casper, Wyoming
- Casper Star Tribune, Casper, Wyoming
- Dubois Frontier, Dubois, Wyoming
- Rawlins Daily Times, Rawlins, Wyoming
- Lander Journal, Lander, Wyoming
- Riverton Ranger, Riverton, Wyoming
- Rock Springs Rocket-Miner, Rock Springs, Wyoming
- The Independent Record, Thermopolis, Wyoming
- Wyoming Livestock Roundup, Casper, Wyoming

Radio

- KTHE - AM, Thermopolis
- KVOW - AM/KTAK - FM, Riverton
- KOVE - AM/KDLY - FM, Lander
- KTWO - AM/KMGW - FM/KUWC - FM, Casper
- KUGR - AM, Green River (Sweetwater County)
- KRKK - AM/KUWZ - FM, Rock Springs
- KIQZ - FM/KRAL - AM, Rawlins
- K217BP - FM, Dubois
- Wyoming Public Radio, Laramie

5.5. Consultation Letters

Section 7 Consultation Letter

BLM-0036



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

SEP - 6 2007

In Reply Refer To:

ES-61411/W.02/WY07SL0470

Memorandum

To: Robert Ross, Field Manager, Bureau of Land Management, Lander Field Office,
Lander, Wyoming
From: Brian T. Kelly, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field
Office, Cheyenne, Wyoming
Subject: Species List for Lander Field Office

Please find attached the U.S. Fish and Wildlife Service's (Service) current list of endangered, threatened, non-essential/experimental and candidate species which may occur within the Bureau of Land Management, Lander Field Office's (Bureau) area of management. This memorandum supersedes our August 8, 2007, based on (1) reviewing of species potential range and (2) changes in species status. The list is provided as a general reference for the Bureau to use when evaluating actions under the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). We have included information that may be useful in the development of a project assessment for listed species, as well as other areas of Service trust authorities such as the Migratory Bird Treaty Act (16 U.S.C. 703), the Bald and Golden Eagle Protection Act (16 U.S.C. 668), and wetlands protection.

Although we intend to update this list annually or when additions or changes in species' status occur, the Bureau should contact this office to verify the list before analyzing any federal action. If you have any questions regarding this letter or your responsibilities under the Act, please contact Alex Schubert of my staff at (307) 772-2374, extension 238.

Attachments (3)

cc: BLM, T&E Coordinator, Cheyenne (J. Carroll)
BLM, Wildlife Biologist, Lander (S. Oberlie)
BLM, Wildlife Biologist, Lander (G. Morgan)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne (V. Stelter)
WGFD, Non-Game Coordinator, Lander (B. Oakleaf)

BLM-0036

Attachment 1

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

Threatened and Endangered Species and Candidate Species
Bureau of Land Management, Lander Field Office
Updated September 4, 2007

Species	Status	Expected Occurrence
Black-footed ferret (<i>Mustela nigripes</i>)	Endangered	Prairie dog towns
Blowout penstemon (<i>Penstemon haydenii</i>)	Endangered	Sand dunes
Gray wolf (<i>Canis lupus</i>)	Experimental	Greater Yellowstone ecosystem
Canada lynx (<i>Lynx canadensis</i>)	Threatened	Montane forests
Desert yellowhead (<i>Yermo xanthocephalus</i>)	Threatened	Beaver Rim, Fremont County
Critical Habitat for Desert Yellowhead	Designated	Beaver Rim, Fremont County
Ute ladies'-tresses (<i>Spiranthes diluvialis</i>)	Threatened	Seasonally moist soils and wet meadows of drainages below 7000 feet elevation.
If the proposed action will lead to water depletion (consumption) in the Platte river systems, impacts to the following species and critical habitat should be included in the evaluation:		
Whooping crane (<i>Grus americana</i>)	Endangered	Downstream riparian and riverine habitat of the Platte River system
Interior least tern (<i>Sterna antillarum</i>)	Endangered	see above

BLM-0036			Attachment 1
Piping plover (<i>Charadrius melodus</i>)	Threatened	see above	
Pallid sturgeon (<i>Scaphirhynchus albus</i>)	Endangered	see above	
Western prairie fringed orchid (<i>Platanthera praeclara</i>)	Threatened	see above	
Critical habitat for Whooping crane Piping plover	Designated		

Federal Agency Responsibilities

The Service has responsibility, under a number of federal laws, treaties, executive orders, and memoranda of agreement, for the conservation and management of fish and wildlife resources. Some of these same authorities also require other federal agencies to consider, avoid, or prevent adverse impacts to fish, wildlife, and wetland resources. To ensure resources are afforded adequate consideration and protection, federal agencies are often required to consult with the Service regarding potential impacts their actions may have on fish and wildlife resources.

When reviewing proposed actions of other agencies, this office normally focuses on three broad categories of trust resources: (1) threatened, endangered, and candidate species, (2) migratory birds, and (3) wetlands and riparian areas. The Service provides recommendations for protective measures for threatened and endangered species in accordance with the Act. Protective measures for migratory birds are provided pursuant to the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are protected pursuant to Section 404 of the Clean Water Act, Executive Order 11990 (wetland protection) and Executive Order 11988 (floodplain management) with the goal of "no net loss of wetlands." Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661 *et seq.*), and the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-742j).

Federal agency actions may range from small, site specific, short duration projects to expansive, long-term programs. Because of the wide range of possible actions, the Service provides the following comments with the understanding that this list of comments may not be all inclusive or may not be applicable for each federal project.

Regulations implementing the Act at 50 CFR §402.12 require the preparation of a biological assessment for any federal action that is a major construction activity to determine the effects of the proposed action on listed and proposed species. If a biological assessment is not required (i.e., all other actions), the lead federal agency is responsible for review of proposed activities to determine whether listed species will be affected. If it is determined that the proposed activities may affect a listed species, you should contact the Service to discuss consultation requirements. If it is determined that any federal agency program or project "is likely to adversely affect" any listed species, formal consultation should be initiated with this office. Alternatively, informal consultation can be continued so the Service can assist you in determining how the project could be modified to reduce impacts to listed species to the "not likely to adversely affect" threshold.

BLM-0036

Attachment 1

If it is concluded that the project "is not likely to adversely affect" listed species, you should request that the Service review the assessment and concur with the determination.

For those actions where a biological assessment is necessary, it should be completed within **180 days** of receipt of a species list. This deadline can be extended by mutual agreement between the lead agency and the Service. If the assessment is not initiated within 90 days of receipt of a species list, the list of threatened and endangered species should be verified with the Service prior to initiation of the assessment. The biological assessment may be undertaken as part of the agency's compliance with section 102 of the National Environmental Policy Act (NEPA), and incorporated into the NEPA documents. The Service recommends that biological assessments include:

- | | | | | |
|---|--|--|--|--|
| 3. The current status and habitat use of threatened and endangered species in the project area. | | | | |
| 4. A discussion of the methods used to determine the information in item 3. | | | | |
| 5. The direct and indirect impacts of the project to threatened and endangered species. | | | | |
| 6. An analysis of the effects of the action on listed and proposed species and their habitats including cumulative impacts (pursuant to the Act) from State, or private projects in the area. | | | | |
| 7. Measures that can potentially reduce or eliminate adverse impacts to threatened and endangered species. | | | | |
| 8. The expected status of threatened and endangered species in the future (short and long term) during and after project completion. | | | | |
| 9. A determination of "is likely to adversely affect" or "is not likely to adversely affect" for listed species. | | | | |
| 10. A determination of "is likely to jeopardize" or "is not likely to jeopardize" for proposed species. | | | | |
| 11. Alternatives to the proposed action considered, a summary of how impacts of those alternatives on listed and proposed species would differ from the proposed actions, and the reasons for not selecting those alternatives. | | | | |
| 12. Citations of literature and personal contacts used in the assessment. | | | | |
| | | | | |
| | | | | |

Migratory Birds

Under the MBTA and BGEPA, the federal agency has a mandatory obligation to protect the many species of migratory birds, including eagles and other raptors which may occur on lands under its jurisdiction. In order to promote the conservation of migratory bird populations and their habitats, the Service recommends that the federal agency implement those strategies outlined within the Memorandum of Understanding directed by the President of the U.S. under Executive Order 13186, where possible.

During project planning analysis of the following information is recommended to determine project effects to migratory birds:

1. The current status and habitat use of migratory birds in the project area. This may include number of individuals, breeding pairs, population trends, and active nests within and adjacent to the project area.

BLM-0036

Attachment 1

2. An analysis of the effects of the proposed action on migratory birds and their habitats. Measures that will reduce or eliminate adverse impacts to migratory birds, including protective buffers, seasonal restrictions, maintenance of habitat within the project area, raptor-proofing power lines, and netting of waste pits.
3. The projected short and long term impacts to migratory birds and their trends during and after project completion using monitoring, modeling and current literature.

Potential adverse effects to migratory birds from power lines should be identified and every attempt to mitigate such effects should be implemented. Structures that are identified as affecting birds should be made safe to prevent subsequent mortalities. If you determine that power poles and/or stretches of power line are resulting in electrocution of migratory birds, especially raptors, the Service requests that specific information be documented regarding these mortalities. Based on regulations pursuant to the MBTA and BGEPA, migratory bird carcasses may only be collected, possessed or moved by state game wardens, Service refuge officers, Service special agents, or persons holding a valid salvage permit issued by the Service and the applicable state. When a migratory bird mortality is observed the Service recommends that as much of the following information as possible be documented: legal location, GPS location, all identifying numbers from the nearest power pole, date of observation, species, photographs of pole (top section), and the dead bird, and directions to the scene. Please contact our office with the information and call or email Dominic Domenici of the Service's Law Enforcement Office at 307-261-6365 / dominic_domenici@fws.gov to report your observation and obtain further guidance. The Service appreciates your efforts to protect migratory birds.

Wetlands

The functions and values of wetlands are well documented and are especially important in the arid west. Substantial degradation diminishes the effectiveness of wetlands to function as food, cover, and breeding sites for wetland dependent species; sediment transport systems; water retention/storage sites; contaminant sinks; and chemical exchange sites. To ensure the Service has sufficient information to assess project impacts on wetlands, assessments should include:

1. An enumeration of the acreage of wetlands, by type, impacted by the proposed action.
2. A discussion of why wetlands cannot be avoided.
3. A description of the functions and values of the wetlands, including sediment transport, water storage, habitat for aquatic and terrestrial organisms, and contaminant sinks, as well as the potential risks of water removal for these functions and values.
4. Measures that will reduce or eliminate adverse impacts to wetlands such as a mitigation plan to offset unavoidable impacts, protective buffers, seasonal and physical restrictions, maintenance of the natural hydrograph, and development and implementation of a monitoring program to track the effectiveness of mitigation measures.
5. Results of wetland monitoring or management activities in, or adjacent to, the proposed project site.
6. The anticipated short and long term effects to wetland and riparian areas during and after project completion.

We recommend the federal agency address each of the above concerns where applicable to the project. Without this information it may be difficult for the Service to effectively review assessments.

BLM-0036

Attachment 2



United States Department of the Interior

FISH AND WILDLIFE SERVICE

**Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001**

In Reply Refer To:
ES-61411/BFF/WY7746

February 2, 2004

Dear Interested Party:

This letter is to inform you that black-footed ferret (*Mustela nigripes*) surveys are no longer necessary in black-tailed prairie dog colonies statewide or in white-tailed prairie dog towns except those noted in the attachment. In response to requests from numerous entities and our own review of the situation regarding ferret surveys, the U.S. Fish and Wildlife Service (Service) and others have been evaluating the potential for a previously unidentified black-footed ferret population to occur in Wyoming and the need for conducting black-footed ferret surveys across the entire state. This issue has been especially pertinent when evaluating various activities for compliance with the Endangered Species Act of 1973 (Act), as amended (16 USC 1531 *et seq.*).

The black-footed ferret was listed as an endangered species in 1967, prior to the Act (under the Endangered Species Preservation Act of 1966). The Act prohibits the take of listed species without proper permits and places an additional requirement on activities funded, authorized or carried out by Federal agencies to ensure that such actions will not jeopardize the continued existence of any listed species. The latter process is known as interagency consultation and is outlined in section 7(a)(2) of the Act (50 C.F.R. ' 402.13).

The Service developed the 1989 *Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act* (Survey Guidelines) to assist with section 7 consultations for ferrets. The Survey Guidelines provide a mechanism to evaluate the possibility of locating existing ferrets in prairie dog colonies by examination of the size, density, and juxtaposition of existing prairie dog colonies. The key points of the strategy are to determine the existence of ferrets or an area's potential for ferret recovery and either may be used in section 7 consultations when determining whether an action may affect the black-footed ferret. The Survey Guidelines can be followed by interested parties (federal agencies and their partners) during the section 7 consultation process to make determinations on whether an activity may adversely affect ferrets. However, an unintended drawback to the Survey Guidelines is that repetitive surveys may be undertaken to evaluate possible impacts to ferrets on prairie dog colonies that have already been searched or that didn't present any realistic opportunities for ferret reintroduction.

BLM-0036

Attachment 2

We appreciate your efforts to conserve listed species. Without the valuable information collected to date in association with black-footed ferret surveys, we would not be able to undertake this effort to focus ferret surveys on the most promising habitat. If you have any questions regarding this letter or your responsibilities under the Act, please contact Mary Jennings of my staff at the letterhead address or phone (307) 772-2374, extension 32.

Sincerely,

/s/Brian T. Kelly

Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosure (1)

cc: WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
FWS, BFF Recovery Coordinator, Laramie, WY (M. Lockhart)

BLM-0036

Attachment 2

The Service has been coordinating with the Wyoming Game and Fish Department in reviewing information about the current and historic status of prairie dog towns throughout Wyoming. In addition to the status review, we have also been reviewing the history of black-footed ferret surveys to determine whether the survey guidelines should continue to be applied across the entire state. Through this process, the Service has developed an initial list of blocks of habitat that are not likely to be inhabited by black-footed ferrets. In these areas, take of individual ferrets and effects to a wild population are not an issue and surveys for ferrets are no longer recommended. The term Ablock clearance® has often been used to describe this type of approach. This initial list is based largely on the quality of the habitat today, as well as information regarding past population bottlenecks that may have resulted from plague and poisoning events in particular areas and may have led to the loss of ferrets in the area.

Additional information regarding the survey effort on the specific areas not yet block-cleared is currently being reviewed by the Service. Based on this review, the Service will likely add several blocks of habitat to the list in the future. The Service will continue to collect and review information on any remaining areas to determine if they should be added to the list of areas cleared from the survey recommendation. Therefore, prior to conducting surveys, you should coordinate with the Service to determine which specific areas are recommended for surveys. We have attached our initial list of areas cleared from the ferret survey recommendation. We believe this approach is not only biologically defensible, but also allows all parties involved to focus survey effort and resources on those areas where the likelihood of discovering wild ferrets is greatest.

Please note that Ablock clearance® must not be interpreted to mean that the area is free of all value to black-footed ferrets. These areas, or blocks, are merely being cleared from the need for ferret surveys. Therefore, this clearance from the survey recommendations reflects only the negligible likelihood of a wild population of ferrets occurring in an area. It does not provide insight into an area's value for survival and recovery of the species through future reintroduction efforts. Nor does this clearance relieve a Federal agency of its responsibility to evaluate the effects of its actions on the survival and recovery of the species. For example, while an action proposed in a cleared area needs no survey and is not likely to result in take of individuals, the action could have an adverse effect upon the value of a prairie dog town as a future reintroduction site and should be evaluated to determine the significance of that effect. Consultation with the Service is appropriate for any agency action resulting in an effect significant enough to diminish a site's value as a future reintroduction site. Additionally, block clearance of an area does not imply that other values of maintaining the integrity of the prairie dog ecosystem are unimportant.

BLM-0036

Attachment 3
February 1, 2004

Black-footed Ferret Survey Block Clearance List

The following blocks of black-footed ferret habitat are cleared from the recommendation for ferret surveys:

1. All black-tailed prairie dog towns in Wyoming
2. All white-tailed prairie dog towns in Wyoming EXCEPT those identified in the following table.

Complex Name	Townships	Ranges	Complex Name	Townships	Ranges
Baxter Basin	T18,T19,T20	R103, R104	Fifteen Mile	T47-T49 T48	R97, R98 R96 (west half)
Big Piney	T28 T29,T30,T31	R111, R112 R109-R111	Flaming Gorge	T12,T13 T12-T14 T13	R109 R108 R107
Bolton Ranch	T17 T18,T19	R86, R88 R86-R88	Manderson	T47, T48 T49	R90, R91 R91
Carter	T16,T17 T18	R114-R116 R115	Moxa	T15,T16 T17,T18 T19,T20 T21 T22,T23 T24	R112, R113 R111-R113 R111-R114 R110-R113 R111-R113 R112
Continental Divide	T16 T17 T18 T19 T20	R93-95 R92-95, 98-100, 97-98 R92-96, 98-99 R92-96 R92-95	Pathfinder	T27 T28 T29	R85, R86 R85-R89 R85, R89
Cumberland	T16 T17-T19 T19, T20	R1 18 R117 R116	Saratoga	T14 T15 T16	R82, R83 R82-R84 R83-R85
Dad	T15,T16 T17	R90-R93 R92, R93	Seminole	T23,T24	R84, R85
Desolation Flats	T13 T14 T15 T16	R93-95 R93-94 R93-94, 96 R93-96	Shamrock Hills	T22, T23 T24,T25 T26	R89, R90 R89 R89, R90

Native American Consultation Letters

1610/Lander RMP

February 2, 2005

CERTIFIED MAIL NO. 7003 1680 0007 2163 7250
RETURN RECEIPT REQUESTED

Ivan Posey
Chairman
Eastern Shoshone Tribe
P.O. Box 217

Ft. Washakie, Wyoming 82514

Dear Chairman Posey:

The Bureau of Land Management (BLM) Lander Field Office (LFO) will be revising the Lander Resource Management Plan (RMP). As part of this project, a supporting environmental impact statement will be prepared. As yet, we have not begun our revision effort, but would like to initiate the collaboration process early to establish effective professional and personal relationships.

The revised Lander RMP is being developed to provide future direction for managing approximately 2.5 million acres of public land and 2.7 million acres of Federal mineral estate in Fremont, Natrona, Sweetwater, Carbon, and Hot Springs counties. Attached is a map of the planning area for easy reference.

We would like to provide an opportunity for you to be a cooperator as we begin the process of revising our RMP.

The Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508) emphasize the use of such cooperation as a means of assuring timely coordination with Tribal, State, Federal, and local agencies in preparation of NEPA analyses and documentation.

We wish to seize every opportunity to work together in a cooperating agency relationship where a Tribal, State or local agency has decision making authority or special expertise that can enhance and enrich BLM's planning efforts. Not only can BLM's decisions for the public lands have an effect on neighboring communities, but Tribal, State and local participation with BLM, in the spirit of NEPA, can help assure that we make the best possible decisions.

Developing partnerships between cooperators and BLM will create a stronger, more efficient NEPA process. This will help lead to sustainable decision making for the lands and resources

under our respective jurisdictions, and a healthy economy and environment that will serve all citizens well.

An attached return form is provided for your convenience in responding to this invitation. If you would like further information or want to request a meeting, please contact Carol-Anne Murray, Lander RMP Project Manager at (307) 332-8448. We look forward to working with you on this as well as future cooperative efforts.

Sincerely,

/s/ JACK C. KELLY

Field Manager

2 Attachments:

- 1 - Map of the planning area
- 2 - Return form

CMURRAY:pd:02/01/05 E Shojtr

CORRESPONDENCE STAMP

{ } READING FILE
{X} CASE FILE



United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Lander Field Office
P.O. Box 589
Lander, Wyoming 82520



1610 (050)
Lander RMP Revision
Beaver Creek EIS
GMI EIS

August 10, 2009

CERTIFIED MAIL NO.: 7007 1490 0002 1545 0841
RETURN RECEIPT REQUESTED

Ute Indian Tribe
Mr. Curtis Cesspooch
PO Box 190
Fort Duchesne, UT 84026

Dear Mr. Cesspooch:

The Lander Field Office of the Bureau of Land Management (BLM) is revising its general land use plan, the Lander Resource Management Plan (RMP). The RMP serves as the general guidance for all resource and land use management decisions for BLM-administered lands and resources in the Lander Field Office planning area. The previous RMP was completed in 1987 and needs revision to address new management challenges. The upcoming revision will guide the use, protection, and management of natural and cultural resources in the planning area for approximately the next 20 years. See Attachment "A" for the location of the Lander Field Office planning area.

As part of the RMP revision process, the BLM is continuing to contact various tribes who may have traditional ties to or cultural concerns in the planning area¹. Identification of important tribal sites or areas of Native American cultural concerns can help guide the protection of these valuable resources through the RMP revision process. A recent successful outcome of tribal consultation during the planning process is Cedar Ridge (a large ridgeline containing numerous rock features and sites important to the Eastern Shoshone and other tribes), which was recently protected by a decision in the Casper Field Office RMP revision. A part of Cedar Ridge is located in the Lander Field Office area, and we would like your input on appropriate protection measures for this area as well.

¹ In accordance with the National Environmental Policy Act, the Federal Land Policy and Management Act, the National Historic Preservation Act, the American Indian Religious Freedom Act, and Executive Order 13007 on Indian Sacred Sites.

In addition to the RMP revision, the Lander Field Office is also working on two separate Environmental Impact Statements for two full field oil and gas developments proposals. These EIS's cover Devon Energy's Beaver Creek Field (south of Riverton), and the combined EnCana Gun Barrel, Conoco-Phillips Madden, and Noble Energy Iron Horse (GMI) fields, which are located in the Lysite area (see Attachment "B" for the locations of these oil and gas fields). The companies propose to develop approximately 230 new wells in the Beaver Creek project and 1400 new wells in the GMI project. These fields are known to contain sites that traditional elders have already expressed interest in, such as rock cairns and alignments, stone circles, possible burial sites, as well as a part of Cedar Ridge.

To better gather the views of tribes with interest in these areas, we are attempting to schedule field trips for traditional leaders or elders to visit sites or areas of concern for the week of September 8-11, 2009 (Attachment "C"). Please note that participating elders would be paid for mileage, per diem, and consultation fees, but that our funding is limited to one representative per tribe. Other participants are welcome, but funding may not be available.

Please indicate on the attached response form (Attachment "D") whether your tribe would be interested in joining us for these field tours, and which elder you would like to participate in this effort. We will follow-up on this letter with a direct e-mail or phone call to confirm your attendance.

If there are additional traditional, cultural or religious leaders or elders who you believe should be contacted to express their interests or concerns regarding the above projects, please include their names in Attachment "D". We look forward to working with you and your tribal members or authorized representatives who have considerable knowledge of tribal history and concerns.

Thank you for your attention, and if you have any questions, please do not hesitate to contact BLM archeologists Craig Bromley or Karina Bryan at 307-332-8400.

Sincerely,

James A. Cagney
Field Manager

4 Attachments

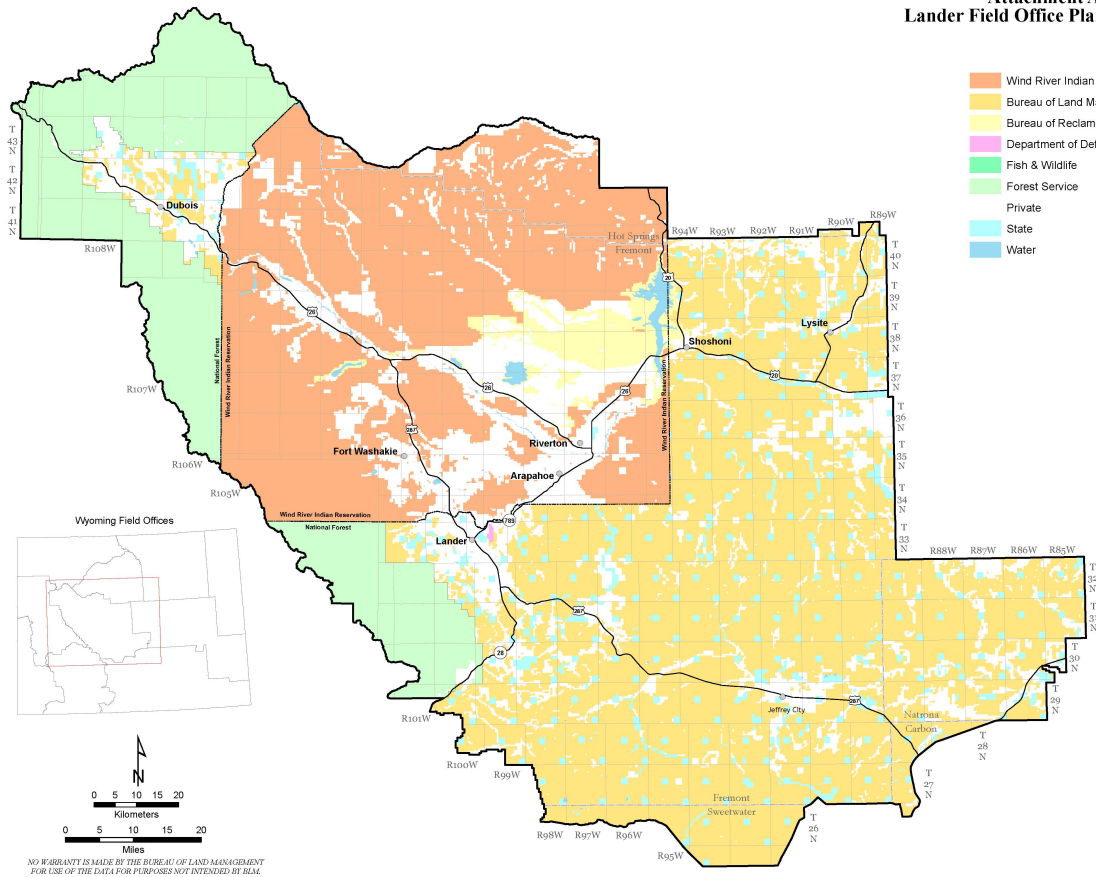
- 1 – Attachment A: Map of the Lander RMP planning area
- 2 – Attachment B: Map of the Beaver Creek and GMI projects areas
- 3 – Attachment C: Field Consultation Schedule
- 4 – Attachment D: Response Form

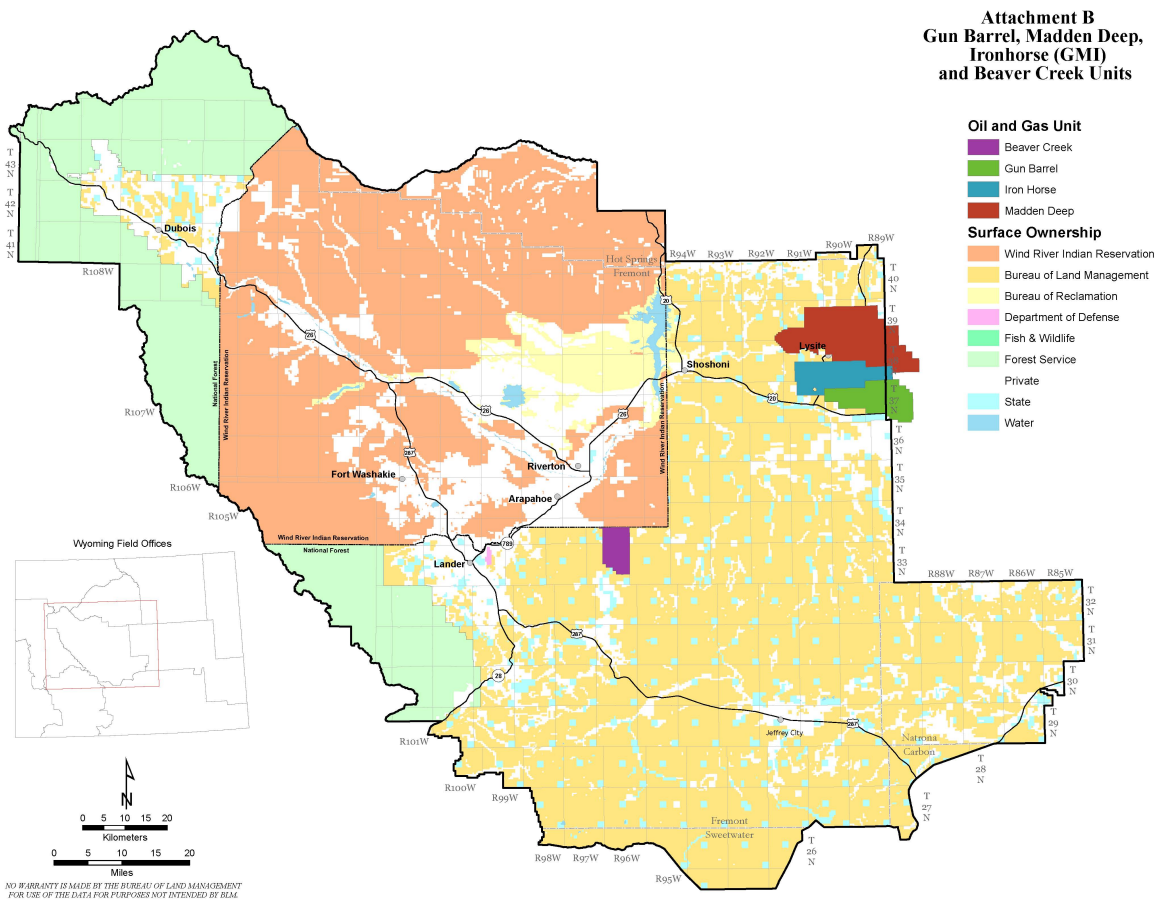
CERTIFIED MAIL NO.: 7007 1490 0002 1545 0858

RETURN RECEIPT REQUESTED

cc: Betsy Chapoose
PO Box 190
Ft. Duchesne UT 84026

**Attachment A
Lander Field Office Planning Area**





CORRESPONDENCE FILE
[] CASE FILE
[X] READING FILE

ATTACHMENT C

PROPOSED FIELD CONSULTATION SCHEDULE

Date	Time	Task
September 8, 2009 (Tuesday)	9:00 a.m.	Meet at the Lander BLM office (1335 Main Street, Lander, WY) for orientation and information regarding the RMP and EIS process
	12:30 p.m.	Field trip to the Beaver Creek oil and gas project. If time permits, visit Beaver Rim.
	5:00 p.m.	Back at BLM office
September 9, 2009 (Wednesday)	9:00 a.m.	Meet at the BLM Office; then field trip to the GMI oil and gas project, including Cedar Ridge (sack lunches included). If time permits and elders are agreeable, visit the Castle Gardens Rock Art Site
	5:00 p.m.	Return to the BLM office
September 10, 2009 (Thursday)	9:00 a.m.	Meet at the Lander BLM office; then field trip to sites of interest in other parts of the Lander Field Office RMP planning area (sack lunches included).
	5:00 p.m.	Return to the BLM office
September 11, 2009 (Friday)	9:00 a.m.	Meet at the Lander BLM office; then field trip to sites of interest in other parts of the Lander Field Office RMP planning area (sack lunches included).
	5:00 p.m.	Return to the BLM office

ATTACHMENT D

TRIBAL CONSULTATION RESPONSE FORM REGARDING THE PROPOSED LANDER RMP REVISION AND THE BEAVER CREEK AND GMI EISs

- _____ Yes, we are interested in participating in this consultation.
- _____ No, we are not interested in participating in this consultation, but information about our concerns is attached. (Any information you provide will be used in a respectful manner, and anything you would like to share with BLM but would prefer not be made public will be kept confidential.)
- _____ No, we are not interested in participating in this consultation, and have no further comments.
- _____ We would like to receive a copy of the consultation summary notes when they are completed.

Signature: _____ Date: _____

Name and Title _____

Tribal Affiliation: _____

Phone Number and/or Email: _____

Additional Contact Names Recommended: _____

Please return this form to:

Kristin Yannone
Bureau of Land Management
Lander Field Office
P.O. Box 589
Lander, WY 82520

5.6. List of Preparers

Table 5.2, “List of Preparers” (p. 1360) lists the name, education, title, project role, and years of experience of the individuals involved in the preparation of this document.

Table 5.2. List of Preparers

Name	Education	Title	Role	Years of Experience
<i>Bureau of Land Management</i>				
Kristin Yannone	B.A. History, J.D. Law	Environmental Planner and Coordinator	Project Manager/Inspector and Team Leader	22
Jim Cagney	B.S. Range/Forest Management	Field Office Manager	Lander Field Office Manager	33
Sydney Schoepke	B.S. Land Resource Management, MS Applied Geographic Information Sciences	Geographic Information System Specialist	Geographic Information System Data Management	3
Greg Bautz	B.S. Resource Management	Soil Scientist	Soil, Surface Water, Invasive Species	30
Jared Oakleaf	B.A. Geography and Recreation, B.A. Environmental and Natural Resources	Outdoor Recreation Planner	Cave and Karst, Recreation, Travel Management, Wild and Scenic Rivers, Wilderness Study Areas, Areas with Wilderness Characteristics, Visual Resources, Area of Critical Environmental Concern, National Scenic and Historic Trails	10
Scott Fluer	B.S. Range Science	Wild Horse Specialist	Vegetation, Riparian-Wetland Areas, Livestock Grazing, Area of Critical Environmental Concern	24
Tim Kramer	B.S. Rangeland Resources and History, M.S. Rangeland Resources, Crops and Soil Sciences	Natural Resource Specialist, Fire and Fuels	Forestry, Fire and Fuels	14
Sue Oberlie	B.S. Wildlife Management, B.S. Secondary Education	Wildlife Biologist	Fish and Wildlife, Special Status Species, Area of Critical Environmental Concern	26
Curtis Bryan	B.S. Rangeland Ecology and Watershed Management	Natural Resource Specialist	Riparian-wetland areas, Invasive species	8

Name	Education	Title	Role	Years of Experience
<i>Bureau of Land Management</i>				
Chris Krassin	B.S. Soil Science and Rangeland Ecology	Natural Resource Specialist	Reclamation	16
Craig Bromley	B.A. Anthropology	Archeologist	Cultural, Paleontology, National Historic Trails, Area of Critical Environmental Concern	32
Jon Kaminsky	B.A. Geology, M. Sci. Hydrogeology	Assistant Field Manager Minerals	Geology, Solid Minerals	23
Roy Packer	B.S. Forestry and Range and Watershed Management	Rangeland Management Specialist	Livestock Grazing, Vegetation, Wild Horses	36
Leta Rinker	B.S. Business Administration, B.A. Business Management	Realty Specialist	Lands and Realty, including Transportation/ Access and Rights-of-way, Renewable Energy Utility/ Communication Corridors, Land Tenure	25
Rubel Vigil	B.S. Rangeland Management	Assistant Field Manager	Livestock Grazing	25
Stuart Cerovski	B.S. Petroleum Engineering	Resource Adviser	Fluid Minerals	26
Roy Allen	B.S. Chemistry, M.S. and PhD Economics	Social Conditions/ Economic Conditions/ Environmental Justice	Socioeconomics	33
Dean Stillwell	B.S. Geology and M.S. Geology	Geologist	Oil and Gas, Reasonable Foreseeable Development	32
Stan William Davis-Lawrence	B.S. Math/Physics/ Geophysical Engineering, M.S. Geophysical Engineering	Petroleum Engineer	Oil and Gas, Reasonable Foreseeable Development	37
Alfred M. Elser	B.S. Geology, M.S. Geology, and Ph.D. Chemistry with a concentration in geochemistry	Petroleum Geologist	Oil and Gas, Reasonable Foreseeable Development	6
Melissa Hovey	B.S. Civil Engineering, M.S. Environmental Engineering	Air Quality Specialist	Air Resources	14
<i>Consultant</i>				
ICF International – Interdisciplinary Team				
Science Applications International Corporation (SAIC) – Interdisciplinary Team				

This page intentionally
left blank

Chapter 6. References

This page intentionally
left blank

Bibliography

- American Petroleum Institute. 2009. API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry. August.
- Arneson, C.S., J.C. Case, K.D. Frederick, S.P. Gloss, J.D. Hamerlink, P.W. Huntoon, L.C. Munn, S. Needham, and M. Wireman. 1998. Wyoming Groundwater Vulnerability Assessment Handbook, Volume I: Background, Model Development, and Aquifer Sensitivity Analysis, University of Wyoming SDVC Report 98-01, 201 p.
- Arno, Stephen F. 1983. Ecological Effects and Management Implications of Indian Fires. Proceedings-Symposium and Workshop on Wilderness Fire: Missoula, Montana, November 15-18, 1983. U.S. Department of Agriculture, Forest Service, General Technical Report GTR-INT-182. Ogden, Utah: Intermountain Research Station.
- Bailey, R.G. 1995. Description of the Ecoregions of the United States. 2nd edition. Revised and expanded (1st edition. 1980). Misc. Publ. No. 1391 (revised), Washington, DC: U.S. Department of Agriculture, Forest Service. 108p. with separate map at 1:7,500,000.
- Baker, W.L. 2006. Fire and Restoration of Sagebrush Ecosystems. Wildlife Society Bulletin 34:177-185.
- Barela, Jonathan. 2009. Personal Telephone Communication between J. Barela, Assistant Director, Northern Arapaho Public Relations Department, and R. Fetter, Science Applications International Corporation (SAIC). September.
- Barrett, S.W. and S.F. Arno. 1982. Indian Fires as an Ecological Influence in the Northern Rockies. Journal of Forestry. Vol. 80(10): 647-651.
- Bartos, D.L. and R.B. Campbell. 1998. Decline of Quaking Aspen in the Interior West – Examples from Utah. Rangelands 20(1):17-24.
- Bartos, T.T., T.L. Quinn, L.L. Hallberg, and C.A. Eddy-Miller. 2008. Quality of Shallow Ground Water in Three Areas of Unsewered Low-Density Development in Wyoming and Montana, 2001. Scientific Investigations Report 2008–5012. U.S. Department of the Interior, U.S. Geological Survey.
- BEA (Bureau of Economic Analysis). 2009. Regional Economic Information System, 1969-2007. Available on Internet: <http://www.bea.gov/bea/regional/reis/>. Accessed August 2009.
- Beck, J.L. and D.L. Mitchell. 2000. Influences of Livestock Grazing on Sage-Grouse Habitat. Wildlife Society Bulletin. 4: 993-1002.
- Bighorn Sheep Technical Committee. 2006. A Comprehensive Bighorn Sheep Management Plan. Dubois, Wyoming.
- BLM (Bureau of Land Management). 1982. Green Mountain Grazing Draft Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 1984. BLM Manual 8400, Visual Resource Management. U.S. Department of the Interior, Bureau of Land Management.

- BLM. 1985. BLM Manual 9113, Roads. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 1986. Historic Trails Plans 1986. Oregon/Mormon Pioneer National Historic Trails Management Plan. U.S. Department of the Interior, Bureau of Land Management. Wyoming State Office, Cheyenne.
- BLM. 1987a. Lander Field Office Final Resource Management Plan and Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 1987b. Lander Field Office Resource Management Plan Record of Decision. U.S. Department of the Interior, Bureau of Land Management. June 1987. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps.Par.19688.File.dat/lfo-rmp.pdf>.
- BLM. 1988. Record of Decision and Approved Resource Management Plan for the Washakie Resource Area. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps.Par.18302.File.dat/washakie-rmp.pdf>. Accessed September 24, 2010.
- BLM. 1990. Record of Decision and Approved Resource Management Plan for the Cody Resource Area. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps.Par.40097.File.dat/cyfo-rmp.pdf>. Accessed September 24, 2010.
- BLM. 1991. Wyoming Statewide Wilderness Study Report Wilderness Study Area Specific Recommendations. Cheyenne, Wyoming. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 1992a. Upland Game Bird Habitat Management on the Rise. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.
- BLM. 1992b. Raptor Habitat Management on Public Lands, A Strategy for the Future. U.S. Department of the Interior, Bureau of Land Management, Chief Division of Wildlife and Fisheries, Washington, D.C.
- BLM. 1992c. Nongame Migratory Bird Habitat Conservation Plan. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.
- BLM. 1993a. H-8357-1, State designation of Byways. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 1993b. Riparian Area Management, Process for Assessing Proper Functioning Condition, Technical Reference 1737-9. Revised 1995, 1998. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 1995. H-8550-1 Interim Management Policy and Guidelines for Lands Under Wilderness Review. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.
- BLM. 1996. Partners Against Weeds: An Action Plan for Bureau of Land Management. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. Available on Internet: <http://www.blm.gov/weeds/PAW/index.htm>.

- BLM. 1997a. Record of Decision and Green River Resource Management Plan. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps.Par.27940.File.dat/greenriver-rmp.pdf>. Accessed September 24, 2010.
- BLM. 1997b. Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/wy/st/en/programs/grazing/standards_and_guidelines.html.
- BLM. 1997c. Programmatic Agreement Among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in which BLM will meet its Responsibilities Under the National Historic Preservation Act.
- BLM. 1998. Record of Decision and Approved Resource Management Plan for the Grass Creek Planning Area. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps.Par.73361.File.dat/grasscreek-rmp.pdf>. Accessed September 24, 2010.
- BLM. 1999. Washington Office Instructional Memorandum No. 1999-076, Policy on the Use of Certified Weed-Free Hay, Straw, and Mulch on BLM Lands. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2000. Instruction Memorandum No. 2000-182, Mitigating and Remediating Physical Safety Hazards at Abandoned Mine Land Sites. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.
- BLM. 2001. National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/ohv/OHV_FNL.pdf. Accessed December 16, 2009.
- BLM. 2002a. Final Report of Lander Field Office Review of Potential Wild and Scenic Rivers in the Lander RMP. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps/lander.Par.18314.File.dat/WildScenicRiverRpt.pdf>.
- BLM. 2002b. National Mountain Bicycling Strategic Action Plan. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/mountain_biking/final_text.pdf. Accessed December 16, 2009.
- BLM. 2003. Instruction Memorandum No. 2003-274. Implementation of the Settlement of Utah v. Norton Regarding Wilderness Study. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2004a. National Sage-Grouse Habitat Conservation Strategy. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/fish_wildlife_and.Par.9151.File.dat/Sage-Grouse_Strategy.pdf. Accessed September 23, 2010.

- BLM. 2004b. Southern Wyoming Fire Zone Fire Management Plan. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/fire/fmpdocs.Par.2037.File.dat/012-2004southern.pdf>.
- BLM. 2004c. Proposed Resource Management Plan and Final Environmental Impact Statement for Public Lands Administered by the Bureau of Land Management Rawlins Field Office Rawlins, Wyoming. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/wy/st/en/programs/Planning/rmps/rawlins.html>. Accessed October 1, 2010.
- BLM. 2004d. BLM Manual 8110, Identifying and Evaluating Cultural Resources. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2005a. Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western States. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2005b. Land Use Planning Handbook. H-1601-1. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/pgdata/etc/medialib/blm/ak/aktest/planning/planning_general.Par.65225.File.dat/blm_lup_handbook.pdf. Accessed September 23, 2010.
- BLM. 2005c. Update to the Wyoming BLM Forest and Woodland Management Action Plan. U.S. Department of the Interior, Bureau of Land Management. May.
- BLM. 2006. State Protocol Between the Wyoming Bureau of Land Management State Director and the Wyoming State Historic Preservation Officer. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2007a. Lander Field Office Final Scoping Report. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps/lander.Par.95292.File.dat/Comment_Summary.pdf. Accessed September 23, 2010.
- BLM. 2007b. Proposed Resource Management Plan and Final Environmental Impact Statement for the Casper Field Office Planning Area. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps/casper/feis.Par.78019.File.dat/02_cover.pdf. Accessed September 24, 2010.
- BLM. 2007c. Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. Available on Internet: http://www.blm.gov/wo/st/en/prog/more/veg_eis.html.
- BLM. 2007d. Burned Area Emergency Stabilization and Rehabilitation Handbook. H-1742-1. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. Available on Internet: <http://www.blm.gov/pgdata/etc/>.

- BLM. 2007e. Salt Creek Fieldwide Expansion Environmental Assessment, EA #WY060-EA07-067. U.S. Department of the Interior, Bureau of Land Management. Casper Field Office.
- BLM. 2007f. Overland Pass Natural Gas Liquids Pipeline Record of Decision. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2008a. Pinedale Field Office Final Resource Management Plan and Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/wy/st/en/programs/Planning/rmps/pinedale/feis_prmp.html. Accessed September 24, 2010.
- BLM. 2008b. BLM Manual, 8380 Cave and Karst Management. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.51379.File.dat/MS-8380.pdf.
- BLM. 2008c. Approved Resource Management Plan Amendments/Record of Decision (ROD) for Oil Shale and Tar Sands Resources to Address Land Use Allocations in Colorado, Utah, and Wyoming and Final Programmatic Environmental Impact Statement, November 2008. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: at http://ostseis.anl.gov/documents/docs/OSTS_ROD.pdf.
- BLM. 2008d. National Environmental Policy Handbook, H-1790. U.S. Department of the Interior, Bureau of Land Management. January.
- BLM. 2008e. Manual 6840, Sensitive Species Management. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.43545.File.dat/6840.pdf.
- BLM. 2008f. Record of Decision: Final Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project in Sublette County, Wyoming. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/information/NEPA/pfodocs/anticline/rod.Par.50775.File.dat/00ROD.pdf>. Accessed January 25, 2011.
- BLM. 2009a. Summary of the Analysis of the Management Situation for the Lander Resource Management Plan Revision. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2009b. Final Mineral Occurrence and Development Potential Report. U.S. Department of the Interior, Bureau of Land Management. Lander Field Office, Wyoming.
- BLM. 2009c. Reasonable Foreseeable Development Scenario for Oil and Gas, Lander Field Office, Wyoming. U.S. Department of the Interior, Bureau of Land Management. Wyoming State Office and Resource Management Group. February 9, 2009.
- BLM. 2009d. Reasonable Foreseeable Development Scenario for Geothermal Development, Lander Field Office Planning Area. U.S. Department of the Interior, Bureau of Land Management. Wyoming State Office and Resource Management Group. March 25, 2009.

- BLM. 2009e. Recreation Management Information System. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.
- BLM. 2009f. Abandoned Mine Site Inventory. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/wo/st/en/prog/more/Abandoned_Mine_Lands/abandoned_mine_site.html. Accessed August 24, 2009.
- BLM. 2009g. Abandoned Mine Lands Projects. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/wy/st/en/programs/aml/projects.html>. Accessed August 24, 2009.
- BLM. 2009h. Instruction Memorandum No. 1999-034, Attachment 1. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2009i. Instruction Memorandum No. 2009-215, Planning for Special Designations within the National System of Public Lands. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2009j. Instruction Memorandum WY-2010-012, Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands including the Federal Mineral Estate. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2009k. Draft Environmental Assessment for the Paradise 230-kV Transmission Project, PacifiCorp, Inc. WY-100-EA09-32. U.S. Department of the Interior, Bureau of Land Management. Pinedale Field Office, Wyoming. April.
- BLM. 2010a. Wildland Fire Information, National Interagency Fire Center, Report for the Lander Field Office. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: www.nifc.blm.gov. Accessed October 1, 2010.
- BLM. 2010b. BLM Wyoming Sensitive Species Policy and List. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.blm.gov/pgdata/etc/medialib/blm/wy/resources/efoia/IMs/2010.Par.41285.File.dat/wy2010-027atch2.pdf>.
- BLM. 2010c. Lander Field Office Cultural Class I Regional Review. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2010d. Instruction Memorandum No. 2011-003, Solar Energy Development Policy. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2010e. Lander Field Office Areas of Critical Environmental Concern Report. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2010f. Geocommunicator: Solid Minerals. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://www.geocommunicator.gov>. Accessed September 23.
- BLM. 2010g. LR2000 – Land and Mineral Legacy Rehost 2000 System. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. Available on Internet: <http://www.blm.gov/lr2000/>.

- BLM. 2010h. Record of Decision for the Ruby Pipeline Project: Decision to Grant Rights of Way and Temporary Use Permits. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2010i. Personal Communication from S. Cerovski, Petroleum Engineer, BLM Lander Field Office, to R. Fetter, SAIC. January 2010 to March 2010.
- BLM. 2010j. Personal Communication from S. Fluer, Rangeland Management Specialist, BLM Lander Field Office, to R. Fetter, SAIC. January 2010 and August 2010.
- BLM. 2010k. Personal Communication from J. Oakleaf, Outdoor Recreation Planner, BLM Lander Field Office, to R. Fetter, SAIC. January and August 2010.
- BLM. 2010l. Decision Record and Environmental Assessment for the Rattlesnake Hills Gold Exploration Drilling Project. June.
- BLM. 2011a. Instruction Memorandum No. 2012-044, BLM National Greater Sage-Grouse Land Use Planning Strategy. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2011b. Personal Communication from S. Fluer, Rangeland Management Specialist, BLM Lander Field Office, and R. Allen, Economist, BLM Wyoming State Office, to R. Fetter, SAIC. January.
- BLM. 2011c. Instruction Memorandum No. 2011-004, Transmittal of Revised Recreation and Visitor Services Land Use Planning Guidance. U.S. Department of the Interior, Bureau of Land Management.
- BLM. 2012a. Geographic Information System (GIS) Data. U.S. Department of the Interior, Bureau of Land Management. Lander Field Office, Wyoming.
- BLM. 2012b. BLM Manual 6250, National Scenic and Historic Trail Administration. U.S. Department of the Interior, Bureau of Land Management.
- BLM 2012c. BLM Manual 6280, Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation. U.S. Department of the Interior, Bureau of Land Management.
- BLM 2012d. Instruction Memorandum No. WY 2012-019: Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands Including the Federal Mineral Estate. U.S. Department of the Interior, Bureau of Land Management.
- BLM 2012e. Instruction Memorandum No. WY 2012-140: Collecting Paleontological Resources Under the Paleontological Resources Preservation Act of 2009. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2012/IM_2012-140.html.
- BLM 2012f. Instruction Memorandum No. 2012-141: Confidentiality of Paleontological Locality Information Under the Omnibus Public Lands Act of 2009, Title VI, Subtitle D on Paleontological Resources Preservation. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2012/IM_2012-141.html.

- BLM and DOE (Bureau of Land Management and U.S. Department of Energy). 2003. Assessing the Potential for Renewable Energy on Public Lands. U.S. Department of the Interior, Bureau of Land Management.
- BLM and DOE. 2012. Final Solar Energy Development Programmatic Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: <http://solareis.anl.gov/documents/fpeis/endex.cfm>.
- BLM and USFS (Bureau of Land Management and U.S. Forest Service). 2007. BLM and Forest Service Announce 2007 Federal Grazing Fee. BLM-CA-N-07-31. February 2.
- BLM and USFS. 2008. Final Programmatic Environmental Impact Statement (EIS) for Geothermal Leasing in the Western United States. U.S. Department of the Interior, Bureau of Land Management. Available on Internet: http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal_nationwide.html.
- BLM and USFS. 2009. BLM and Forest Service Announce 2009 Federal Grazing Fee. January 30.
- BLS (Bureau of Labor Statistics). 2009. Local Area Unemployment Statistics. Available on Internet: <http://www.bls.gov/lau/home.htm>. Accessed September 2009.
- BLS. 2011a. Labor Force Statistics from the Current Population Survey. Available on Internet: www.bls.gov/cps. Accessed January 2011.
- BLS. 2011b. Local Area Unemployment Statistics. Available on Internet: www.bls.gov/lau. Accessed January 2011.
- Blumenthal, D.M., U. Norton, J.D. Derner, and J.D. Reeder. 2006. Long-Term Effects of Tebuthiuron on Bromus Tectorum. Western North American Naturalist 66(4):420-425.
- BOR (Bureau of Reclamation). 2007. Boysen Dam data. Available on Internet: http://www.usbr.gov/projects/Facility.jsp?fac_Name=Boysen+Dam.
- BOR and USFWS (Bureau of Reclamation and U.S. Fish and Wildlife Service). 2005. Platte River Recovery Implementation Program Final Environmental Impact Statement. U.S. Department of the Interior, U.S. Bureau of Reclamation and U.S. Fish and Wildlife Service. May 18, 2005.
- Bowker, J.M., D.B.K. English, and H.K. Cordell. 1999. Projections of Outdoor Recreation Participation to 2050. In: Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends. H.K. Cordell, ed. Champaign, IL: Sagamore Publishing.
- Bowles, A.E. 1995. Responses of Wildlife to Noise. Pages 109-156. In: Wildlife and Recreationists: Coexistence through Management and Research. Island Press, Washington, D.C.
- Braun, C.E. 1998. Sage Grouse Declines in Western North America: What are the Problems. Proceedings of the Western Association of Fish and Wildlife Agencies 78:139-156.
- Brewer, J., S.B. Smithson, S. Kaufman, and J. Oliver. 1980. The Laramide Orogeny: Evidence from the COCORP Deep Crustal Seismic Profiles in the Wind River Mountains, Wyoming. Tectonophysics 62(3-4):165-189.

- Bureau of Outdoor Recreation. 1976. Continental Divide National Scenic Trail Study Report. September 1976.
- Cagney, J., E. Bainter, B. Budd, T. Christiansen, V. Herren, M. Holloran, B. Rashford, M. Smith, and J. Williams. 2010. Grazing Influence, Objective Development, and Management in Wyoming's Greater Sage-Grouse Habitat with Emphasis on Nesting and Early Brood Rearing.
- Carbon County. 1998. Carbon County Land Use Plan. Carbon County, Wyoming. Available on Internet: <http://www.carbonwy.com/index.aspx?NID=972>. Accessed October 1, 2010.
- Castellano, M.J., and T.J. Valone. 2007. Livestock, Soil Compaction and Water Infiltration Rate: Evaluating a Potential Desertification Recovery Mechanism. *Journal of Arid Environments* 71:97-108.
- Center for Climate Strategies. 2007. Wyoming Greenhouse Gas Inventory and Reference Case Projections 1990-2020. Wyoming Department of Environmental Quality.
- Central Region Energy Resources Team. 1996. The Importance of Reserve Growth to The Nation's Supply of Natural Gas: U.S. Geologic Survey Fact Sheet FS-202-96, 3 pp. Available on Internet: <http://pubs.usgs.gov/fs/fs-202-96/FS-202-96.html>.
- Cerovski, A., M. Gorges, T. Byer, K. Duffy, and D. Felley, editors. 2001. Wyoming Bird Conservation Plan, Version 1.0. Wyoming Partners In Flight. Wyoming Game and Fish Department. Lander, Wyoming.
- Cerovski, A.O., M. Grenier, B. Oakleaf, L. Van Fleet, and S. Patla. 2004. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming. Wyoming Game and Fish Department Nongame Program, Lander, Wyoming. 206 pp.
- Certini, G. 2005. Effects of Fire on Properties of Forest Soils: A Review. *Oecologia* 143:1-10.
- Clark, R.A. and G.H. Stankey. 1979. The Recreation Opportunity Spectrum: A Framework for Planning, Management, and Research. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.
- Clark, T.W., and M.R. Stromberg. 1987. Mammals in Wyoming. University of Kansas – Museum of Natural History. Lawrence, Kansas. pp. 108-111.
- Clough, L.T. 2000. Nesting Habitat Selection and Productivity of Northern Goshawks in West-Central Montana. M.S. Thesis, The University of Montana, Missoula (87pp).
- Colby, B.R., C.H. Hembree, and F.H. Rainwater. 1956. Sedimentation and Chemical Quality of Surface Waters in the Wind River Basin, Wyoming, U.S. Geological Survey Water-Supply Paper 1373.
- Cole, D. 1993. Minimizing Conflict between Recreation and Nature Conservation. In D. Smith, & P. Hellmund (Eds.), *Ecology of Greenways: Design and Function of Linear Conservation Areas* (pp. 105-102). Minneapolis, Minnesota: University of Minnesota Press.
- Connelly, J.W. and C.E. Braun. 1997. Long-Term Changes in Sage Grouse (*Centrocercus urophasianus*) Populations in Western North America. *Wildlife Biology* 3: 229-234.

- Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to Manage Sage-Grouse Populations and their Habitats. *Wildlife Society Bulletin* 28(4):967-985.
- Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming.
- Cordell, H.M. 1999. History of Outdoor Recreation and Nature-based Tourism in the United States. Sagamore Publishing, Champaign, Illinois.
- Cordell, H. K., C.J. Betz, T.G. Green, S. Mou, V. Leeworthy, and P. Wiley. 2004. Outdoor recreation in America in the 21st Century. A report to the Nation: The National Survey on Recreation and the Environment. State College, Pennsylvania: Venture Publishing, Inc.
- Council on Environmental Quality. 1997. Environmental Justice – Guidance under the National Environmental Policy Act.
- CREG (Consensus Revenue Estimating Group). 2009a. Wyoming State Government Revenue Forecast, Fiscal Year 2009 – Fiscal Year 2014. Cheyenne, Wyoming. May. Available on Internet: http://eadiv.state.wy.us/creg/GreenCREG_May09.pdf. Accessed August 2009.
- CREG. 2009b. Wyoming State Government Revenue Forecast for Fiscal Year 2010 – Fiscal Year 2014. October. Available on Internet: http://eadiv.state.wy.us/creg/GreenCREG_Oct09.pdf.
- Crother, B.I. (Committee Chair, Committee on Standard English and Scientific Names). 2008. Scientific and Standard English Names of Amphibians and Reptiles of North America North of Mexico, with Comments Regarding Confidence in Our Understanding. 6th Edition. Herpetological Circular No. 37, published January 2008. Society for the Study of Amphibians and Reptiles. 96 pp. Available on Internet: http://ssarherps.org/pdf/HC_37_6thEd.pdf.
- Curtis, J., and K. Grimes. 2004. Wyoming Climate Atlas. Available on Internet: http://www.wrds.uwyo.edu/sco/climateatlas/title_page.html. Accessed September 30, 2010.
- Davies, K.W., R.L. Sheley, and J.D. Bates. 2008. Does Prescribed Fall Burning *Artemisia Tridentata* Steppe Promote Invasion or Resistance to Invasion after a Recovery Period? *Journal of Arid Environment* 72:1076-1085.
- Davies, K.W., J.D. Bates, and J.J. James. 2009a. Microsite And Herbaceous Vegetation Heterogeneity After Burning *Artemisia Tridentata* Steppe. *Oecologia* 159:597-606.
- Davies, K.W., T.J. Svejcar, and J.D. Bates. 2009b. Interaction of Historical and Nonhistorical Disturbances Maintains Native Plant Communities. *Ecological Applications* 19:1536-1545.
- DCCD (Dubois Crowheart Conservation District). 2004. Upper Wind River Watershed Assessment 2001-2003.
- DCCD. 2010. Land Use and Natural Resource Management Plan 2011-2015.

- De Bruin, R.H. and R.W. Jones. 1990. Coalbed methane in Wyoming: Wyoming State Geological Survey Public Information.
- Dean Runyan Associates. 2007. The Economic Impact of Travel on Wyoming, 1997-2006 Detailed State and County Estimates. State Office of Travel and Tourism Wyoming Business Council. Available on Internet: <http://www.deanrunyan.com/impactsWY.html>. Accessed February 2008.
- Dean Runyan Associates. 2008. State Office of Travel and Tourism Wyoming Business Council. Available on Internet: <http://www.deanrunyan.com/impactsWY.html>. Accessed September 2009.
- Derner, J.D., W.K. Lauenroth, P. Stapp, and D.J. Augustine. 2009. Livestock As Ecosystem Engineers for Grassland Bird Habitat in the Western Great Plains of North America. *Rangeland Ecology & Management* 62:111-118.
- Diebert, Pat. 2010. Personal Communication between Sue Oberlie, Bureau of Land Management and Pat Diebert, U.S. Fish and Wildlife Service.
- Dobkin, D.S. 1995. Management and Conservation of Sage Grouse, Denominative Species for the Ecological Health of Shrubsteppe Ecosystems. BLM. Portland, Oregon, USA. pp. 26.
- DOE (U.S. Department of Energy). 1999. Environmental Benefits of Advanced Oil and Gas Exploration and Production Technology: U.S. Department of Energy DOE-FE-0385, 168 pp.
- DOE and BLM (U.S. Department of Energy and Bureau of Land Management). 2008. Record of Decision for Programmatic Environmental Impact Statement, Designation of Energy Corridors on Federal Land in the 11 Western States (DOE/EIS-0386).
- Doherty, K., D. Naugle, B. Walker, and J. Graham. 2008. Greater Sage-grouse Winter Habitat Selection and Energy Development. *Journal of Wildlife Management* 72(1):187-195.
- DOI (U.S. Department of the Interior). 2006a. Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and the Extent and Nature of Restrictions of Impediments to their Development. Available on Internet: <http://www.blm.gov/epca/phase2/EPCA06full72.pdf>. Accessed September 23, 2010.
- DOI. 2006b. Interagency Burned Area Rehabilitation Guidebook. Interpretation of Department of the Interior 620 DM 3 for the Burned Area Rehabilitation of Federal and Tribal Trust Lands, Version 1.3. U.S. Department of the Interior.
- DOI. 2010. Secretarial Order 3289. Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources. U.S. Department of the Interior. Available on Internet: http://elips.doi.gov/app_so/act_getfiles.cfm?order_number=3289A1. Accessed November 9, 2010.
- DOI and The Nature Conservancy. 2008. Interagency Fire Regime Condition Class Guidebook. BIA (Bureau of Indian Affairs), BLM, NPS (National Park Service), USFWS, and The Nature Conservancy. Available on Internet: www.frcc.gov/. Accessed September 29, 2010.

- DOI and USDA (U.S. Department of the Interior and U.S. Department of Agriculture). 2009. Guidance for Implementation of Federal Wildland Fire Management Policy. U.S. Department of the Interior and U.S. Department of Agriculture. February 13, 2009.
- Driver, B.L. 2008. Why Outcomes-Focused Management is Needed. In Driver, Managing to Optimize the Beneficial Outcomes of Recreation (pp. 1-18). State College, PA: Venture Publishing, Inc.
- Driver, B.L. and Brown, P. 1978. The Opportunity Spectrum Concept and Behavior Information in Outdoor Recreation Resource Supply Inventories: A Rationale. In Integrated Inventories of Renewable Natural Resources: Precedings of the Workshop. General Technical Report RM-55 (pp. 24-31). Fort Collins, CO: U.S. Department of Agriculture - Forest Service Rocky Mountain Forest and Range Experiment Station.
- Dubois Telephone Exchange. 2011. Comments of Dubois Telephone Exchange, Inc. on the Lander Draft Resource Management Plan and EIS. December 1.
- Duffield, W.A. and J.H. Sass. 2003. Geothermal Energy – Clean Power From the Earth's Heat. U.S. Geological Survey Circular 1249, 36 pp.
- EIA (Energy Information Administration). 2007a. Assumptions to the Annual Energy Outlook 2007 with Projections to 2030: U.S. Department of Energy, Office of Oil and Gas DOE/EIA-0554(2007). 176 pp. Available on Internet: <http://www.eia.doe.gov/oiaf/aeo/assumption/index.html>.
- EIA. 2007b. U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 2006 Annual Report: U.S. Department of Energy Office of Oil and Gas DOE/EIA-0216(2007). 162 pp. Available on Internet: <http://www.eia.doe.gov?neic/infosheets/petroleumreserves.html>.
- EPA (Environmental Protection Agency). 1995a. AP-42, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition. U.S. EPA Office of Air Quality Planning and Standards, January 1995 with supplements.
- EPA. 1995b. Protocol for Equipment Leak Emissions Estimates EPA 453/R-95-017. November.
- EPA. 2005. Protecting Water Quality from Agricultural Runoff. Available on Internet: http://www.epa.gov/owow/NPS/Ag_Runoff_Fact_Sheet.pdf
- EPA. 2006. Office of Transportation and Air Quality. MOBILE6.2. Available on Internet: <http://www.epa.gov/otaq/mobile.htm>. March.
- EPA. 2008. National Emissions Inventory Browser, Geographic Emissions Summary, Wyoming, 2008. Available on Internet: <http://neibrowser.epa.gov/eis-public-web/geo/summary.html?jurisdictionId=52>.
- EPA. 2009a. AirData: Access to Air Pollution Data. Available on Internet: <http://www.epa.gov/air/data/index.html>.
- EPA. 2009b. Nitrous Oxide Sources and Emissions. Available on Internet: <http://www.epa.gov/nitrousoxide/sources.html>.
- EPA. 2009c. NONROAD2008a. Office of Transportation and Air Quality. Available on Internet: <http://www.epa.gov/otaq/nonrdmdl.htm>. July 6.

- EPA. 2009d. Clean Air Markets - Data and Maps. Available on Internet: <http://www.epa.gov/airmarkets/>.
- EPA. 2009e. Ecoregions of Wyoming. Available on Internet: ftp://ftp.epa.gov/wed/ecoregions/wy/wy_front.pdf.
- EPA. 2010a. Climate Change Indicators in the United States. EPA 430-R-10-007. Available on Internet: www.epa.gov/climatechange/indicators/pdfs/ClimateIndicators_full.pdf. April.
- EPA. 2010b. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008 EPA 430-R-10-006. Available on Internet: <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>. April.
- EPA. 2012a. AirData: Access to Monitored Air Quality Data from EPA's Air Quality System (AQS) Data Mart. Available on Internet: <http://www.epa.gov/airdata/>.
- EPA. 2012b. What is Nonpoint Source Pollution? Available on Internet: water.epa.gov/polwaste/nps/whatis.cfm.
- EPA. 2012c. Natural Gas Extraction - Hydraulic Fracturing. Available on Internet: <http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/index.cfm>.
- EPA. No Date. Options for Reducing Methane Emissions From Pneumatic Devices in the Natural Gas Industry. Natural Gas STAR Program. Available on Internet: http://www.epa.gov/gasstar/documents/ll_pneumatics.pdf.
- Erickson, W.P., G.D. Johnson, and D.P. Young Jr. 2005. A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions. U.S. Department of Agriculture Forest Service General Technical Report PSW-GTR-191.
- Faaborg, J., M. Brittingham, T. Donovan, and J. Blake. 1995. Habitat Fragmentation in the Temperate Zone. Pages 357-380. In: T.E. Martin and D. Finch, editors. Ecology and Management of Neotropical Migratory Birds: A Synthesis and Review of Critical Issues. New York: Oxford University Press.
- Fertig, W. 2000a. *Cirsium pulcherrimum* var. *aridum*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Cirsium_pulcherrimum_aridum.pdf. Accessed August 26, 2009.
- Fertig, W. 2000b. *Astragalus gilviflorus* var. *purpureus*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Astragalus_gilviflorus_purpureus.pdf. Accessed August 26, 2009.
- Fertig, W. 2000c. *Lesquerella fremontii*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Lesquerella_fremontii.pdf. Accessed August 26, 2009.
- Fertig, W. 2000d. *Antennaria arcuata*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Antennaria_arcuata.pdf. Accessed August 26, 2009.

- Fertig, W. 2000e. *Cryptantha subcapitata*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Cryptantha_subcapitata.pdf. Accessed August 26, 2009.
- Fertig, W. 2000f. *Artemisia porteri*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Artemisia_porteri.pdf. Accessed August 26, 2009.
- Fertig, W. and B. Heidel. 2002. *Yermo xanthocephalus*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Yermo_xanthocephalus.pdf. Accessed August 26, 2009.
- Fertig, W. and S. Mills. 2000. *Physaria saximontana* var. *saximontana*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Physaria_saximontana_saximontana.pdf. Accessed August 26, 2009.
- Fetter, C.W., Jr. 1980. *Applied Hydrogeology*. Charles E. Merrill Publishing Co. Columbus Ohio: 488.
- Finn, T.M. 2007. Source Rock Potential of Upper Cretaceous Marine Shales in the Wind River Basin, Wyoming. In *Petroleum Systems and Geologic Assessment of Oil and Gas in the Wind River Basin Province, Wyoming*.
- Forman, R.T.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, and T.C. Winter. 2003. *Road Ecology, Science and Solutions*. Washington. D.C: Island Press.
- Foulke, T., D. Olson, D. Taylor, C. Bastian, and R. Coupal. 2006. A Survey and Economic Assessment of Off-Road Vehicle Use in Wyoming, Report for The Wyoming Department of State Parks and Cultural Resources, Division of State Parks and Historic Sites, State Trails Program. University of Wyoming, Department of Agriculture and Applied Economics. July. Available on Internet: <http://agecon.uwyo.edu/EconDev/PubStorage/ORVRptFinal10Aug06.pdf>.
- Fox, D.G., A.M. Bartuska, J.G. Byrne, E. Cowling, R. Fisher, G.E. Likens, S.E. Lindberg, R.A. Linthurst, J. Messer, and D.S. Nichols. 1989. A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas. General Technical Report RM-168. Rocky Mountain Forest and Range Experimental Station, U.S. Department of Agriculture, Forest Service.
- Fremont County. 2004. *Fremont County Land Use Plan*. Fremont County, Wyoming. September 7.
- Fremont County. 2010. *Perc Test Numbers, Lander and Dubois Area, Fremont County, Wyoming, 1985-2010*.
- Fremont County Weed and Pest District. 2009. *Fremont County Weed and Pest District website*. Available on Internet: <http://www.fcwp.org/>.

- Frisina, M.R. 1992. Elk Habitat Use Within a Rest-Rotation Grazing System. *Rangelands* 14:93-96.
- Furniss, M.J., S. Flanagan, and B. McFadin. 2000. Hydrologically-Connected Roads: An Indicator of the Influence of Roads on Chronic Sedimentation, Surface Water Hydrology, and Exposure to Toxic Chemicals. In: *Stream Notes*. Stream Systems Technology Center, U.S. Department of Agriculture, U.S. Forest Service, Rocky Mountain Research Station. Fort Collins, Colorado. Available on Internet: www.stream.fs.fed.U.S./news/streamnt/jul00/jul00_2.htm#anchortop.
- GCRP (U.S. Global Change Research Program). 2009a. United States Global Change Research Program. Global Climate Change Impacts in the U.S. September 28. Available on Internet: <http://www.globalchange.gov/publications/reports/scientific-assessments/U.S.-impacts/regional-climate-change-impacts/great-plains>.
- GCRP. 2009b. United States Global Change Research Program. Global Climate Change Impacts in the U.S. September 28. Available on Internet: <http://www.globalchange.gov/publications/reports/scientific-assessments/U.S.-impacts/regional-climate-change-impacts/northwest>.
- Geist, V., J.L. Schmidt, and D.L. Gilbert, eds. 1978. Behavior. In *Big Game of North America: Ecology and Management*. Harrisburg, Pennsylvania: Stackpole Books, pp. 283-296.
- Genho, Paul C. 2012. Comments on the Draft Resource Management Plan and Environmental Impact Statement for the Lander Field Office Planning Area. Farmland Reserve, Inc. January 18.
- Gersic, J. 1993. Nonmetallic Mineral Resources of the Wind River Indian Reservation (Excluding Fuels); Wyoming Geological Association Special Symposium on Oil and Gas and Other Resources of the Wind River Basin, Wyoming, Casper, Wyoming 14-17, 1993, pp. 420-422.
- Graham, James M. No Date. Comments on the Draft Resource Management Plan and Environmental Impact Statement for the Lander Field Office Planning area. Graham Ranch, Inc.
- Grenvik, C. 2005. Personal communication between Craig Grenvik, Wyoming Department of Revenue, Mineral Tax Division and Rob Fetter, Science Applications International Corporation. February.
- Hagen, C.A., J.W. Connelly, and M.A. Schroeder. 2007. A Meta-Analysis for Greater Sage-Grouse Nesting and Brood Rearing Habitats. *Wildlife Biology* 13 (Supplement 1):42-50.
- Hamerlinck, J.D. and C.S. Arneson, editors. 1998. Wyoming Ground Water Vulnerability Assessment Handbook: Volume 1. Background, Model Development, and Aquifer Sensitivity Analysis. University of Wyoming.
- Handley, J. and B. Heidel. 2008. *Rorippa calycina*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Rorippa_calycina.pdf. Accessed August 26, 2009.

- Hann, W.J. and D.L. Bunnell. 2001. Fire and Land Management Planning and Implementation Across Multiple Scales, *International Journal Of Wildland Fire* 10:389-403.
- Hardy, C. 2006. Press Release: Congress Passes Soda Ash Royalty Relief. Office of Senator Craig Thomas. September 29. Available on Internet: <http://thomas.senate.gov/index.cfm?FuseAction=PressReleases.Detail=635=9=2006>. Accessed January 2007.
- Harris, L. 1984. *The Fragmented Forest: Island Biogeography Theory and the Preservation of Biotic Diversity*. Chicago, Illinois: University of Chicago Press.
- Hausel, W.D. 1987. Preliminary Report on Gold Mineralization, Petrology, and Geochemistry of the South Pass Granite-Greenstone Belt, Wind River Mountains, Wyoming. In *The Thrust Belt Revisited: Wyoming Geological Association 38th Annual Field Conference Guidebook*, pp. 287-304.
- Hausel, W.D. 1989. The Geology of Wyoming's Precious Metal Lode and Placer Deposits: *The Geological Survey of Wyoming Bulletin* 68:248.
- Hausel, W.D. 2004. Public Field Trip to the South Pass Gold District: Wyoming Geological Survey informal report, Metals and Precious Stones Section, 17 pp.
- Hausel, W.D. and G.S. Holden. 1978. Mineral Resources of the Wind River Basin and Adjacent Precambrian Uplifts; Wyoming Geological Association Thirtieth Annual Field Conference Guidebook, Resources of the Wind River Basin. September 1978. Casper, Wyoming. pp. 303-304.
- Headwaters Economics. 2008. Fossil Fuel Extraction as a County Economic Development Strategy: Are Energy-focusing Counties Benefiting? Bozeman, Montana. September. Available on Internet: www.headwaterseconomics.org/energy.
- Headwaters Economics. 2009a. A SocioEconomic Profile: Wind River Reservation, Wyoming. Report generated by the Economic Profile System; data and generation macros online at www.headwaterseconomics.org/. Generated February 11, 2009.
- Headwaters Economics. 2009b. A Socioeconomic Profile, 5 County Aggregation: Carbon, Fremont, Hot Springs, Natrona, and Sweetwater Counties, Wyoming. Profile run using Economic Profile System, Version Date March 25, 2009.
- Heasler, H.P., B.S. Hinckley, K.G. Buelow, S.A. Spencer, and E.R. Decker. 1983. *Geothermal Resources of Wyoming: National Geophysical Data Center National Oceanic and Atmospheric Administration for the Geothermal and Hydropower Technologies Division U.S. Department of Energy (map)*.
- Heidel, B. 2007. *Spiranthes diluvialis*. State Species Abstract. WYNDD. Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Spiranthes_diluvialis.pdf.
- Heidel, B. 2008. *Penstemon haydenii*. State Species Abstract. WYNDD. Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Penstemon_haydenii.pdf. Accessed August 26, 2009.

- Heidel, B. 2009a. *Trifolium barnebyi*. State Species Abstract. Wyoming Natural Diversity Database (WYNDD). Available on Internet: http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAbstracts/Trifolium_barnebyi.pdf. Accessed August 26, 2009.
- Heidel, B. 2009b. Status of *Lesquerella macrocarpa* (Large-fruited bladderpod) and *Phlox pungens* (Beaver Rim phlox) in the Upper Green River Basin. Prepared for the Bureau of Land Management. Wyoming Natural Diversity Database, Laramie, Wyoming.
- Holechek, J.L., R.D. Pieper, and C.H. Herbel. 2011. Range Management Principles and Practices. 6th edition. Pearson Education, Inc.
- Hopkins, B. 2008. Outcomes-Focused Management of the BLM's Red Hill Special Recreation Management Area. In B. Driver, Managing to Optimize the Beneficial Outcomes of Recreation pp. 279-285. Venture Publishing, Inc. State College, Pennsylvania.
- Hot Springs County. 2002. Hot Springs County Land Use Plan. Hot Springs County, Wyoming. Available on Internet: <http://www.hscounty.com/Departments/Planner/Default.aspx>. Accessed October 1, 2010.
- IMPROVE (Interagency Monitoring of Protected Visual Environments) Data. 2009. Available on Internet: <http://vista.cira.colostate.edu/improve>.
- IPCC (Intergovernmental Panel on Climate Change). 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4 Agriculture, Forestry, and Other Land Use, Chapter 10. Available on Internet: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.
- IPCC. 2007a. Climate Change 2007: The Physical Basis (Summary for Policymakers). Cambridge University Press. Cambridge, England and New York, New York. Available on Internet: <http://www.ipcc.ch/ipccreports/ar4-wg1.htm>.
- IPCC. 2007b. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, Pachauri, R.K., and Reisinger, A. (Eds.). Geneva, Switzerland. 104 pp.
- Jacquet, J. 2006. Sublette County Wage and Employment Study. Prepared for The Sublette County Commissioners and The Sublette County Socioeconomic Analysis Advisory Committee. July. Available on Internet: http://www.sublette-se.org/files/Sublette_County_Wage_Study.pdf. Accessed December 2006.
- Johnson, L., G. Wallace, and J. Mitchell. 1997. Visitor Perceptions of Livestock Grazing in Five Wilderness Areas: A Preliminary Assessment. *International Journal of Wilderness* 3(2):14-20.
- Jost, L. 2007. Personal communication (interview) between Loren Jost, Director, Riverton Museum, Riverton, Wyoming, and R. Fetter, Science Applications International Corporation. August 15.
- Kauffman, J. Boone and W.C. Krueger. 1984. Livestock Impacts On Riparian Ecosystems and Streamside Management Implications. A Review. *Journal of Range Management* 37(5): 430-438.

- Keefer, W.R. 1965. Stratigraphy and Geologic History of the Uppermost Cretaceous, Paleocene, and lower Eocene rocks in the Wind River Basin, Wyoming: Geology of the Wind River Basin, Central Wyoming, U.S. Geological Survey Professional Paper 495(A) 77.
- Keefer, W.R. 1970. Structural Geology of the Wind River Basin, Basin: Geology of the Wind River Basin, Central Wyoming, U.S. Geological Survey Professional Paper 495(D) 35.
- Keystone Center. 1991. Final Consensus Report of the Keystone Policy Dialogue on Biological Diversity on Federal Lands. Colorado. April.
- Kennedy, P.L. 2003. Northern Goshawk (*Accipiter gentilis atricapillus*): A Technical Conservation Assessment. U.S. Department of Agriculture, Forest Service, Rocky Mountain Region. January 3.
- Kirschbaum, M.A., T.M. Finn, R.C. Johnson, J. Kibler, P.G. Lillis, P.H. Nelson, L.N.R. Roberts, S.B. Roberts, R.R. Charpentier, T. Cook, T.R. Klett, R.M. Pollastro, and C.J. Schenk. 2005. Assessment of Undiscovered Oil and Gas Resources of the Wind River Basin Province. U.S. Geological Survey National Assessment of Oil and Gas Fact Sheet, FS-2005-3141, 2 pp. Available on Internet: <http://energy.cr.usgs.gov/oilgas/noga/>.
- Knick, S.T. and J.C. Connelly. 2011. Greater Sage-Grouse: Ecology and Conservation of a Landscape and Its Habitats. Studies in Avian Biology No. 38. A Publication of the Cooper Ornithological Society.
- Knick S.T., S.E. Hanser, R.F. Miller, D.A. Pyke, M.J. Wisdom, S.P. Finn, E.T. Rinkes, and C.J. Henny. 2011. Ecological Influence and Pathways of Land Use in Sagebrush. pp. 203-251 in S.T. Knick and J.C. Connelly (Editors). Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and Its Habitats. Studies in Avian Biology. Vol.38. University of California Press, Berkley, CA.
- Kramer, A.T. and K. Havens. 2009. Plant Conservation Genetics in a Changing World. Trends in Plant Science 14:599-607.
- LANDFIRE. 2010. Homepage of the LANDFIRE project, U.S. Department of Agriculture, Forest Service. U.S. Department of the Interior. Available on Internet: <http://www.landfire.gov/index.php>.
- Langner, L.L. and C.H. Flather. 1994. Biological Diversity: Status and Trends in the United States. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.
- Lawler, J.J., S.L. Shafer, D. White, P. Kareiva, E.P. Maurer, A.R. Blaustein, and P.J. Bartlein. 2009. Projected Climate-Induced Faunal Change in the Western Hemisphere. Ecology 90(3):588-597.
- Lindsey, N.P., J.E. Staples, J.A. Lehman, and M. Fisher. 2010. Surveillance for Human West Nile Virus Disease – United States, 1999-2008. Centers for Disease Control and Prevention; Division of Vector-Borne Diseases, National Center for Emerging and Zoonotic Infectious Diseases.

- Love, J.D., A.C. Christiansen, and A.J. Ver Ploeg. 1993. Stratigraphic Chart Showing Phanerozoic Nomenclature for the State of Wyoming: Geological Survey of Wyoming Map Series 41, 1 Plate.
- Lower Wind River Conservation District. 2010. Land Use and Natural Resource Management Plan 2011-2015.
- Mack, R.N. and J.N. Thompson. 1982. Evolution in Steppe with Few Large Hooved Mammals. *American Naturalist* 119: 757-773.
- Massey, G.M. 2004. Making Sense of Work on the Wind River Indian Reservation. *American Indian Quarterly*, Summer/Fall. Volume 28(3-4):786-816.
- Massey, G. and A. Blevins. 1999. Employment and Unemployment on the Wind River Indian Reservation. Wyoming Department of Employment, Research & Planning. October 6.
- McGuinness, C.L. 1963. The Role of Groundwater in the National Water Situation. U.S. Geological Survey Water Supply Paper 1800. 1121 pp.
- Mealor, Rachel D. 2007. Exurban Landowners in Wyoming: Their Land Management and How They are Perceived by Natural Resource Advisors. M.S. Thesis, Department of Renewable Resources, University of Wyoming, Laramie.
- Meinzer, O.E. 1923. The Occurrence of Goundwater in the United States, with Discussion of Principles: U.S. Geological Survey Water Supply Paper 489, 321.
- Merrill. 2008. Tribe Pushes Boundary Issue. *Star-Tribune*. October 2. Available on Internet: http://trib.com/news/state-and-regional/article_e427ec32-fa11-564a-90ed-035e26acaa6c.html.
- Miller, R.F., S.T. Knick, D.A. Pyke, C.W. Meinke, S.E. Hanser, M.J. Wisdom, and A.L. Hild. 2011. Characteristics of Sagebrush Habitats and Limitations to Long-Term Conservation. Pp. 145-184 in S.T. Knick and J.W. Connelly (editors). *Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and its Habitats*. Studies in Avian Biology 38. University of California Press, Berkeley, California.
- Miller, R.F., T.J. Svejcar, and N.E. West. 1994. Implications of Livestock Grazing in the Intermountain Sagebrush Region: Plant Composition. Pages 101–146 in M. Vavra, W.A. Laycock, and R.D. Pieper, Editors. *Ecological Implications of Livestock Herbivory in the West*. Society for Range Management, Denver, Colorado.
- Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of Recreational Trails on Breeding Bird Communities. *Ecological Applications* 8(1):162-169.
- Moline B.R., R.R. Fletcher, and D.T. Taylor. 1991. Impact of Agriculture on Wyoming's Economy. Cooperative Extension Service, Department of Economics, College of Agriculture, University of Wyoming Laramie, Wyoming. B-954. April.
- Moore, R.L. and B.L. Driver. 2005. Introduction to Outdoor Recreation: Providing and Managing Natural Resource Based Opportunities. Venture Publishing, Inc. State College, Pennsylvania.

- NADP (National Atmospheric Deposition Program). 2009. NADP/NTN Monitoring. Available on Internet: <http://nadp.sws.uiuc.edu/nadpdata>.
- NASS (National Agricultural Statistics Service). 2009. Range Review, February 2009. Issue 2009-02. Cheyenne, Wyoming.
- National Academy of Sciences. 2006. Understanding and Responding to Climate Change: Highlights of National Academies Reports. Division on Earth and Life Studies. National Academy of Sciences. Washington, D.C. Available on Internet: <http://dels.nas.edu/climatechange/understanding-climate-change.shtml>.
- National Energy Policy Development Group. 2001. Reliable, Affordable, and Environmentally Sound Energy for America's Future. Report of the National Energy Policy Development Group. May.
- National Fire Plan. 2009. National Fire Plan Operations and Reporting System. Available on Internet: <http://www.nfpors.gov>.
- National Wildfire Coordinating Group. 2003. Fire Regime Condition Class Definition. Available on Internet: <http://www.nwcg.gov/teams/wfewt/message/FrccDefinitions.pdf>.
- NativeBiz. 2009. Wyoming Casinos' Economic Impact Tops \$90 Million. January 16.
- Natrona County. 1998. Natrona County Development Plan. Natrona County, Wyoming. Available on Internet: <http://www.natrona.net/index.aspx?nid=173>. Accessed October 1, 2010.
- Natrona County Conservation District. 2010. Long Range Strategic Plan 2011-2015.
- NCSL (National Conference of State Legislatures). 2004. State Casino Taxes. June 4. Available on Internet: <http://www.ncsl.org/default.aspx?tabid=12805>. Accessed September 2009.
- NISC (National Invasive Species Council). 2008. 2008-2012 National Invasive Species Management Plan (NISMP).
- NOAA (National Oceanic and Atmospheric Administration). 2009. NWS (National Weather Service) Climate Data - Lander, Wyoming. Available on Internet: http://www.crh.noaa.gov/riw/?n=cms_climate_lander_2008_summary.
- NOLS (National Outdoor Leadership School). 2006. PowerPoint Presentation for Shoshone National Forest Cooperators' Meeting. February.
- Northern Arapaho Public Relations Department. 2009. Hei'towoot News: The Northern Arapaho Tribal News 2(6). August.
- NPS (National Park Service). 1981. Oregon National Historic Trail Comprehensive Management and Land Use Plan. U.S. Department of the Interior, National Park Service, August.
- NPS. 1993. Indian Lands Judicially Established 1978. Map updated 1993. U.S. Department of the Interior, National Park Service. Available on Internet: <http://www.nps.gov/history/nagpra/ONLINEDB/INDEX.HTM>. Accessed August 2009.
- NPS. 1999. Comprehensive Management and Land Use Plan Final Environmental Impact Statement California National Historic Trail and Pony Express National Historic Trail;

Management and Use Plan Update Final Environmental Impact Statement Oregon
National Historic Trail and Mormon Pioneer National Historic Trail.

- NPS. 2006. Mandatory Class I Areas. Government Printing Office, Washington, D.C. Available on Internet: www.nature.nps.gov/air/Maps/images/ClassIAreas.jpg.
- NPS. 2010. Observed and Projected Ecological Response to Climate Change in the Rocky Mountains and Upper Columbia Basin: A Synthesis of Current Scientific Literature. U.S. Department of the Interior, National Park Service. Natural Resource Report NPS/ROMN/NRR-2010/220.
- NRCS (Natural Resources Conservation Service). 2003. National Range and Pasture Handbook, 190-VI, 1st Revision, December 2003. Ecological Sites and Forage Suitability Groups. U.S. Department of Agriculture, National Resources Conservation Service. Available on Internet: <http://www.glti.nrcs.usda.gov/technical/publications/nrph.html>.
- NRCS. No Date. National Soil Survey Handbook, Title 430-VI. Available on Internet: <http://soils.usda.gov/technical/handbook/>.
- NREL (National Renewable Energy Laboratory). 2002. Pacific_Northwest_Regional_Wind_High_Resolution.zip. Golden, CO: TrueWind Solutions/National Renewable Energy Laboratory. Available: <http://www.nrel.gov/gis/>. February 24.
- Nuclear Regulatory Commission. 2010. Location of Uranium Recovery Facilities. Available on Internet: <http://www.nrc.gov/info-finder/materials/uranium/index.html#licensed-facilities>. Accessed January 25, 2011.
- Office of Management and Budget. 1992. Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. Office of Management and Budget.
- Over, E. 2009. Casinos Add Reservation Jobs, Boost Morale. April 10. Wyoming Business Report. Available on Internet: <http://www.wyomingbusinessreport.com/article.asp?id=99531>. Accessed September 2009.
- Pannell, F. 2008. Personal communication between Fred Pannell, Wyoming Office of State Lands and Investments, and J. Sidon, SAIC. March.
- Parker, P.L. and T.F. King. 1998. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin 38. U.S. Department of the Interior, National Park Service.
- Paton, P.W. 1994. The Effect of Edge on Avian Nest Success: How Strong is the Evidence. Conservation Biology 8(1):17-26.
- Patricelli, Gail L., J.L. Blickley, S.L. Hooper. 2012. The Impacts of Noise on Greater Sage-Grouse: A Discussion of Current Management Strategies in Wyoming with Recommendations for Further Research and Interim Protections. Prepared for the Bureau of Land Management, Lander Field Office and Wyoming State Office, Cheyenne and Wyoming Game and Fish Department.
- Paysen, T.E., R.J. Ansley, J.K. Brown, G.J. Gottfried, S.M. Haase, M.G. Harrington, M.G. Narog, S.S. Sackett, and R.C. Wilson. 2000. Chapter 6: Fire in Western Shrubland, Woodland,

- and Grassland Ecosystems. USDA, Forest Service, Gen. Tech. Rep. RMRS-GTR-42-vol 2.
- Pew (Pew Commission on Industrial Farm Animal Production). 2008. Putting Meat on the Table: Industrial Farm Animal Production In America. Available on Internet: <http://ncifap.org/>. Accessed October 1, 2010.
- Pierskalla, C.D., M.E. Lee, T.V. Stein, D.H. Anderson, and R. Nickerson. 2004. Understanding Relationships Among Recreation Opportunities: A Meta-Analysis of Nine Studies. *Leisure Sciences* 26:163-180.
- Pierson, F.B., P.R. Robichaud, C.A. Moffet, K.E. Spaeth, S.P. Hardegree, P.E. Clark, C.J. Williams. 2008. Fire Effects on Rangeland Hydrology and Erosion in a Steep Sagebrush-Dominated Landscape. *Hydrological Processes* 22:2916-2929.
- Pinkerton, J.T. 1981. *Knights of the Broadax*. Caxton Printers, Caldwell, Idaho.
- Plafcan, M., C.A. Eddy-Miller, G.F. Fritz, and J.P.R. Holland II. 1995. Water Resources of Fremont County, Wyoming: U.S. Geological Survey Water-Resources Investigations Report 95-4095, 3 sheets, 133 pp.
- Popo Agie Conservation District. 2007. Popo Agie Conservation District Long Range Plan 2008-2012. Available on Internet: <http://www.popoagie.org/publications/docs/2008-2012longrangeplan.pdf>. Accessed September 24, 2010.
- Prichard, D., J. Anderson, C. Correll, J. Fogg, K. Gebhardt, R. Krapf, S. Leonard, B. Mitchell, and J. Staats. 1998. Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and Supporting Science for Lotic Areas. U.S. Department of the Interior, Bureau of Land Management, U.S. Department of Agriculture, Forest Service, and Natural Resources Conservation Service Technical Reference 1737-15.
- Qwest Corporation. 2011. Comments of Qwest Corporation dba CenturyLink QC on the Lander Draft Resource Management Plan and Environmental Impact Statement. December 7.
- Responsive Management. 2004. Wyoming Resident and Nonresident Deer, Elk, and Antelope Hunter Expenditure Survey, Conducted for the Wyoming Game and Fish Department. Available on Internet: http://www.responsivemanagement.com/download/reports/WY_Hunter_Expend_Survey_Report.pdf.
- Reynolds, R.T., R.T. Graham, and D.A. Boyce, Jr. 2006. An Ecosystem-Based Conservation Strategy for the Northern Goshawk. *Studies in Avian Biology* 31: 299-311.
- Reynolds, R.T., R.T. Graham, and D.A. Boyce Jr. 2008. Northern Goshawk Habitat: An Intersection of Science, Management, and Conservation. *Journal of Wildlife Management* 72, No. 4 1047-55.
- Rice, J., A. Tredennick, and L.A. Joyce. 2012. Climate Change on the Shoshone National Forest, Wyoming: A Synthesis of Past Climate, Climate Projections, and Ecosystem Implications. United States Department of Agriculture, Forest Service. January.
- Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States. General Technical Report RM-217, 90

- pp. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO, USA.
- Richter, J.R. 1981. Occurrence and Characteristics of Groundwater in the Wind River Basin, Wyoming, Volume IV-A: Wyoming Water Resources Research Institute, 149 pp.
- Riverton Museum. 2007. Riverton History Page. Available on Internet: <http://www.wyoming.com/~rivmus/rivhist.htm>. Accessed February 28, 2008.
- Rocky Mountain Federal Leadership Forum. 2002. Reasonably Foreseeable Development Scenarios and Cumulative Effects Analysis for Oil and Gas Activities on Federal Lands in The Greater Rocky Mountain Region: U.S. Department of the Interior, U.S. Environmental Protection Agency, and U.S. Department of Agriculture, Forest Service. Final Draft Published August 30, 2002.
- Roper Starch. 2000. Outdoor Recreation in America 2000: Addressing Key Societal Concerns. Prepared for The Recreation Roundtable. September.
- Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and U.S. National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.
- Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski. 1994. The Scientific Basis for Conserving Forest Carnivores American Marten, Fisher, Lynx, and Wolverine in the Western United States. General Technical Report RM-254. Fort Collins, CO: U.S. Department of Agriculture, Forest Service.
- Sanderson, H.R., R.A. Meganck, and K.C. Gibbs. 1986. Range Management and Scenic Beauty as Perceived by Dispersed Recreationists. *Journal of Range Management* 39(5):464-469.
- Saratoga-Encampment-Rawlins Conservation District. 2006. Saratoga-Encampment-Rawlins Conservation District 2007-2011 Long Range and Natural Resource Management Plan. Available on Internet: http://www.sercd.org/index_files/SERCD_LRP_2007.pdf. Accessed September 24, 2010.
- Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological Consequences of Ecosystem Fragmentation: A Review. *Conservation Biology*, 5:18-32.
- Shepler, G. 2008. Personal communication between Glenda Shepler, Wyoming Field Office, National Agricultural Statistics Service, and J. Sidon, SAIC. March.
- Shepperd, W.D. 2001. Manipulations to Regenerate Aspen Ecosystems. In: Shepperd, W.D., D. Binkley, D.L. Bartos, T.J. Stohlgren, L.G. Eskew, compilers. *Sustaining Aspen in Western Landscapes: Symposium Proceedings, June 13-15, 2000, Grand Junction, Colorado. Proceedings RMRS-P-18*. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 460 p.
- Skillman, J.B., R.F. Sage, and A. Meyer. 2010. Do C3 and C4 Plants Respond Similarly to Climate Change? Comparative Studies with C4 Grass *Muhlenbergia richardsonis* at High Elevations in California's White Mountains.

- Smith, B. 2010. Personal communication between Brian Smith, Rawlins Field Office Outdoor Recreation Planner and Jared Oakleaf, Lander Field Office. November.
- Smithson, S.B., J.A. Brewer, S. Kaufman, J.E. Oliver, and C.A. Hurich. 1979. Structure of the Laramide Wind River Uplift, Wyoming, from COCORP Deep Reflection Data and from Gravity Data. *Journal of Geophysical Research* 84(11):5955-5972.
- Sonoran Institute. 2007. Population, Employment, Earnings, and Personal Income Trends: Fremont County, Wyoming. Bozeman, Montana: Sonoran Institute.
- Sowers, T.C. 1941. Petroglyphs of Castle Gardens, Wyoming. Wyoming Archaeological Survey, Work Projects Administration.
- Squires, J.R. and L.F. Ruggiero. 1996. Nest-site Preference of Northern Goshawks in Southcentral Wyoming. *The Journal of Wildlife Management* 60, No. 1 170-77.
- Stacey, M.E. and C. Lindstone, Lindstone and Associates. 2003. Wyoming State Water Plan: Wind/Bighorn River Basin Plan. Wyoming Water Development Office. Available on Internet: <http://waterplan.state.wy.us/plan/bighorn/techmemos/grnddet.html#appd>.
- State of Wyoming. 2004. Wyoming Statute 9-4-601. Distribution and Use; Funds, Accounts, Cities and Towns Benefited; Exception for Bonus Payments. Available on Internet: <http://legisweb.state.wy.us/statutes/titles/title09/c04a06.htm>.
- Stewart, B. 2008. Personal communication between Bud Stewart, Wyoming Game and Fish Department, and J. Sidon, Science Applications International Corporation. February.
- Stynes, D.J. and E.M. White. 2003. Spending Profiles of National Forest Visitors. Joint Venture Agreement Between U.S. Department of Agriculture - Forest Service Inventory and Monitoring Institute and Michigan State University, Joint Venture Agreement #01JV-11130149-203.
- Sweetwater County. 2002. Sweetwater County Comprehensive Plan. Available on Internet: http://www.sweet.wy.us/pz/dev_codes/comprehensive_plan/Comprehensive_Plan.pdf. Accessed December 16, 2010.
- Sweetwater County Conservation District. 2005. Sweetwater County Conservation District Land and Resource Use Plan and Policy. Available on Internet: <http://www.swccd.U.S./plansandpolicies/landresourceuseplan.html>. Accessed September 24, 2010.
- Taylor, D.T. 2010. Personal Communication between D.T. Taylor, Professor - Department of Agricultural Economics, University of Wyoming, and T. Robert Fetter, SAIC. March 2010.
- Taylor, D.T. and R.H. Coupal. 2000. The Cost of Rural Community Services in Wyoming. Department of Agricultural and Applied Economics, University of Wyoming. Laramie, Wyoming. June.
- Taylor, D.T., R.H. Coupal, T. Foulke, and J.G. Thompson. 2004. The Economic Importance of Livestock Grazing on BLM Land in Fremont County Wyoming. Department of Agricultural and Applied Economics, University of Wyoming. October.

- Thorson, T.A. 1983. Commercial Development of Big Horn Basin Bentonite Reserves; Wyoming Geological Association Thirty-Fourth Annual Field Conference Guidebook, Geology of the Bighorn Basin. September 17-21, 1983. Billings, Montana. pp. 167-170.
- Towry, R.K., Jr. 1984. Wildlife Habitat Requirements. Pages 73-211. In: Hoover, R.L. and D.L. Wills, edited. Managing Forested Lands for Wildlife. Colorado Division of Wildlife in cooperation with U.S. Department of Agriculture Forest Service, Rocky Mountain Region. Denver, CO.
- U.S. Census Bureau. 1990. 1990 Census of Population and Housing. Washington, D.C.
- U.S. Census Bureau. 2000a. 2000 Census of Population and Housing. Washington, D.C.
- U.S. Census Bureau. 2000b. Census 2000 Summary File 3 (SF 3) - Table H6. Occupancy Status [3] - Universe: Housing Units.
- U.S. Census Bureau. 2007. Poverty Thresholds for 2007 by Size of Family and Number of Related Children Under 18 Years. Housing and Household Economic Statistics Division. Available on Internet: <http://www.census.gov/hhes/www/poverty/threshld/thresh07.html>.
- U.S. Census Bureau. 2008a. American Community Survey. Available on Internet: <http://www.census.gov/acs/www/>. Accessed September 2009.
- U.S. Census Bureau. 2008b. 2007 County Business Patterns (NAICS). Carbon, Fremont, Hot Springs, Natrona, and Sweetwater Counties. Available on Internet: <http://censtats.census.gov/cbpnaic/cbpnaic.shtml>. Accessed September 2009.
- U.S. Census Bureau. 2008c. Table 1: 2007 Poverty and Median Income Estimates – Counties. U.S. Census Bureau, Small Area Estimates Branch. Released December 2008.
- U.S. Census Bureau. 2009a. Annual County Resident Population Estimates by Age, Sex, Race, and Hispanic Origin: April 1, 2000 to July 1, 2008. Population Division. Washington, D.C. Released May 14. Available on Internet: <http://www.census.gov/popest/counties/asrh/>. Accessed June 2009.
- U.S. Census Bureau. 2009b. Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for States: April 1, 2000 to July 1, 2008. Washington, D.C.
- U.S. Census Bureau. 2009c. Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States: April 1, 2000 to July 1, 2008 (NC-EST2008-03). Population Division. Washington, D.C. Available on Internet: <http://www.census.gov/popest/national/asrh/NC-EST2008-srh.html>. Accessed June 2009.
- University of Wyoming. 1994. GAP Analysis Program (GAP) Data.
- University of Wyoming. 2008. Drought. Available on Internet: <http://www.wrds.uwyo.edu/sco/drought/drought.html>. Accessed August 25, 2009.
- USDA. 1997. 1997 Census of Agriculture – State Data. Available on Internet: http://www.agcensus.usda.gov/Publications/1997/Vol_1_National,_State_and_County_Tables/ac97awy.pdf.

- USDA. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Available on Internet: <http://soils.usda.gov/survey/geography/mlra/>.
- USDA. 2009. 2007 Census of Agriculture: Wyoming State and County Data. Volume 1, Geographic Area Series, Part 50, AC-07-a-50. Available on Internet: http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Wyoming/wyv1.pdf.
- USDA - NASS (United States Department of Agriculture – National Agricultural Statistics Service). 2009. 2009 Wyoming Agricultural Statistics. Available on Internet: http://www.nass.usda.gov/Statistics_by_State/Wyoming/Publications/Annual_Statistical_Bulletin/bulletin2009.pdf. Accessed August 2009.
- USFS (U.S. Forest Service). 2004a. Percentage of County Area in Public Land Cover, 2000. U.S. Department of Agriculture - Forest Service, Recreation, Wilderness, Urban Forest, and Demographic Trends Research Group. Athens, Georgia.
- USFS. 2004b. Disturbed Water Erosion Prediction Project (WEPP). Available on Internet: <http://forest.moscowfsl.wsu.edu/cgi-bin/fswepp/wd/weppdist.pl>.
- USFS. 2008. Black Hills National Forest - FY 2007 Monitoring and Evaluation Report.
- USFS. 2009a. Draft Proposed Land Management Plan Shoshone National Forest. U.S. Department of Agriculture, Forest Service. Available on Internet: http://www.fs.fed.U.S./r2/shoshone/projects/planning/revision/revision_documents/april_2009/2009_0413_plan.pdf. Accessed September 23, 2010.
- USFS. 2009b. Continental Divide National Scenic Trail Comprehensive Plan. U.S. Department of Agriculture, Forest Service, Rocky Mountain Region. Available on Internet: <http://www.fs.fed.us/cdt/>.
- USFS and BLM (U.S. Forest Service and Bureau of Land Management). 1992. Grazing Fee Review and Evaluation: Update of the 1986 Final Report. Washington, D.C.
- USFWS (U.S. Fish and Wildlife Service). 1996. Platte River Minor Water Depletion Biological Opinion. Amendment to the Intra-Service Section 7 Consultation for Federal Agency Actions Resulting in Minor Water Depletions to the Platte River System to Extend the Period of Coverage for Reasonable and Prudent Alternative Measures. U.S. Department of the Interior, Fish and Wildlife Service, Mountain-Prairie Region. Denver, Colorado.
- USFWS. 2002a. Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances. U.S. Fish and Wildlife Service. Utah Field Office, Salt Lake City, Utah.
- USFWS. 2002b. Revised Intra-Service Endangered Species Act Section 7 Consultation for Federal Agency Actions Resulting in Minor Water Depletions to the Platte River System. U.S. Department of the Interior, U.S. Fish and Wildlife Service. March 2002.
- USFWS. 2004. Pathfinder Interim Management Plan. U.S. Fish and Wildlife Service. December.
- USFWS. 2008a. Species List for the Lander Field Office.

- USFWS. 2008b. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation – Wyoming. FHW/06-WY. Available on Internet: <http://www.census.gov/prod/2008pubs/fhw06-wy.pdf>. May.
- USFWS. 2010. Federal Register - 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered. March 5, 2010. U.S. Department of the Interior, Fish and Wildlife Service.
- USFWS and BLM (U.S. Fish and Wildlife Service and Bureau of Land Management). 2000. Interagency Memorandum of Agreement. U.S. Department of the Interior, Fish and Wildlife Service and Bureau of Land Management.
- USGS (U.S. Geological Survey). 1999. Environmental Setting of the Yellowstone River Basin, Montana, North Dakota, and Wyoming. U.S. Geological Survey Water Resources Investigation Report 98-4269.
- USGS. 2001. Water Resources Data, Water Year 2001. Available on Internet: http://pubs.usgs.gov/wdr/WDR_WY_01/pdf/WDR_WY_01_1.pdf.
- USGS. 2002. Assessment of Undiscovered Oil and Gas Resources of the Southwestern Wyoming Province. National Assessment of Oil and Gas Fact Sheet, FS-145-02, 2 pp. Available on Internet: <http://pubs.usgs.gov/fs/fs-145-02/>.
- USGS. 2005a. Assessment of Undiscovered Oil and Gas Resources of the Wind River Province: USGS Fact Sheet, FS-2005-3141, 2 pp. Available on Internet: <http://energy.cr.usgs.gov/oilgas/noga/>.
- USGS. 2005b. Petroleum Systems and Geologic Assessment of Oil and Gas in the Southwestern Wyoming Province, Wyoming, Colorado, and Utah: National Assessment of Oil and Gas Project, USGS Digital Data Series DDS-69-D, Version 1.0. Available on Internet: <http://pubs.usgs.gov/dds/dds-069/dds-069-d/>.
- USGS. 2008. Petroleum Systems and Geologic Assessment of Oil and Gas in the Wind River Province, Wyoming: Digital Data Series 069-J. Available on Internet: <http://pubs.usgs.gov/dds/dds-069/dds-069-j/>.
- USGS. 2010. Climate Change in Mountain Ecosystems. U.S. Geological Survey. Available on Internet: www.nrmssc.usgs.gov/research/global.htm. Accessed July 27, 2010.
- USGS, Wyoming Department of Agriculture, Wyoming DEQ. 2000. Pesticides in Ground Water - Fremont County, Wyoming, 1998-99. Available on Internet: <http://pubs.usgs.gov/fs/fs03500/>.
- Valentine, J.F. 1990. Grazing Management. San Diego, California: Academic Press, Inc.
- Ver Ploeg, A.J. 1986. Reconnaissance Examination of Selected Oil Sand and Oil Spring Occurrences In Wyoming: Wyoming State Geological Survey Open File Report 86-14, 47p. Also published by DOE as DOE/LC/10916-1984.
- WAFWA (Western Association of Fish and Wildlife Agencies). 2003. Mule Deer: Changing Landscapes, Changing Perspectives. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

- Wallace, G.N., J.E. Mitchell, and M.D. Wells. 1996. Visitor Perceptions About Cattle Grazing on National Forest Land. U.S. Department of Agriculture - Forest Service Research Paper RM-RP-321. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- WARMS (Wyoming Air Resource Monitoring System). 2009. Available on Internet: <http://12.183.80.118/station.php>.
- Westerling, A.L., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam. 2006. Warming and Earlier Spring Increase Western U.S. Wildfire Activity. *Science* 313(5789):940-943.
- Western Regional Climate Center Data. 2009. Historical Climate Information. Available on Internet: <http://www.wrcc.dri.edu>.
- WGFD (Wyoming Game and Fish Department). 2003. Determining the Value of Wildlife Associated Recreation per U.S. Bureau of Land Management Field Office Region in Wyoming. Wyoming Game and Fish Department, Cheyenne, Wyoming.
- WGFD. 2005. A Comprehensive Wildlife Conservation Strategy for Wyoming. Wyoming Game and Fish Department. Cheyenne, Wyoming. Available on Internet: <http://gf.state.wy.us/wildlife/CompConvStrategy/index.asp>.
- WGFD. 2008. 2007 Annual Report. Available on Internet: <http://gf.state.wy.us/downloads/pdf/annualreports/2007/WGFD2007AnnualReport.pdf>. March.
- WGFD. 2009a. Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats. Version 4.0. Revised November 2009. Wyoming Game and Fish Department. Cheyenne, Wyoming.
- WGFD. 2009b. The Wyoming Mule Deer Initiative. Prepared by the Mule Deer Working Group, Wyoming Game and Fish Department. April 24, 2009.
- WGFD. 2010. Wildlife Protection Recommendations for Wind Energy Development in Wyoming. Commission Approved April 23, 2010. Wyoming Game and Fish Department. Cheyenne, Wyoming.
- WGFD. 2011. Wyoming Game and Fish Department Protocols for Treating Sagebrush to be Consistent with Wyoming Executive Order 2011-5; Greater Sage-Grouse Core Area Protection. July 8, 2011. Available on Internet: http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/SG_TREATINGSAGEBRUSHPROTOCOL0000668.pdf.
- WGFD. 2012. Walk-in Hunt Areas. Available on Internet: <http://wgfd.wyo.gov/plpwhmprogram/frmWalkinHuntingHome.aspx>.
- Whicker, A., and J.K. Detling. 1988. Ecological Consequences of Prairie Dog Disturbances. *Bioscience* 38(11):778-785.
- Whitcomb, H.A. and M.E. Lowry. 1968. Ground-Water Resources and Geology of the Wind River Basin Area, Central Wyoming: Hydrologic Investigations Atlas HA-270, scale 1:250 000, 3 sheets, 13 pp.

- WIA (Wyoming Infrastructure Authority). 2009. Map of the Current Projects Under Development. Available on Internet: <http://wyia.org/projects>. Accessed September 2, 2009.
- WLSO (Wyoming Legislative Service Office). 2003. Short Report: Background and Framework for Business Taxation. Written by D.C. Richards and B.P. Farmer. Wyoming Legislative Service Office. Cheyenne, Wyoming.
- WRAP (Western Regional Air Partnership). 2005. 2002 Fire Emission Inventory For the WRAP Region - Phase II. Western Regional Air Partnership. Available on Internet: <http://www.wrapair2.org/>. July.
- WSGS (Wyoming State Geological Survey). 2002. State Geological Survey Completes Rattlesnake Hills Geologic Map. Office of the Wyoming State Geologist Press Release, September 13, 2002. 1 p.
- WSGS. 2012. Wind/Bighorn River Basin Water Plan Update, Groundwater Study, Level 1 (2008-2011). Available on Internet: http://waterplan.state.wy.us/plan/bighorn/2010/finalrept/gw_toc.html.
- WSWG (Wild Sheep Working Group). 2012. Domestic Sheep and Goat Management in Wild Sheep Habitat. Western Association of Fish and Wildlife Agencies.
- WTT (Wyoming Travel and Tourism). 2007. Discover the Impact of Tourism in Wyoming – 2006 Impact Report. Available on Internet: <http://www.wyomingbusiness.org/tourism/traveltourismresearch.aspx>.
- WWDC (Wyoming Water Development Commission). 2010. Wyoming State Water Plan, Wind-Bighorn Basin Plan Update. Prepared by MWH Americas, Inc., Harvey Economics, and Short Elliott Hendrickson, Inc.
- Wyoming Board of Agriculture and the Wyoming Weed and Pest Council. 2010. Wyoming Weed and Pest Control Act Designated List. Available on Internet: <http://www.wyoweed.org/statelist.html>.
- Wyoming Department of Agriculture. 2010. Weed and Pest Declared List (by County). Available on Internet: <http://www.wyoweed.org/Documents/DocumentPage/2010%20Declared%20List.pdf>.
- Wyoming Department of Education. 2008a. Historical District Assessed Valuations for 1999 through 2008. Available on Internet: http://www.k12.wy.us/statistics/stat1/2008_historical_district_assessed_valuations_for_1999_through_2008.pdf. Accessed September 2009.
- Wyoming Department of Education. 2008b. Education Report Series #2, Historical Enrollment by Grade and District for Years 1999 Through 2008. Available on Internet: http://www.k12.wy.us/statistics/stat2/2008_historical_enrollment.pdf. Accessed September 2009.
- Wyoming Department of Employment. 2009a. Table 10A: Wyoming Statewide Employing Units, Employment, & Wages by NAICS Subsectors, All Ownerships, Fourth Quarter, 2008.

- Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t10.htm. Accessed September 2009.
- Wyoming Department of Employment. 2009b. Table 120: Employing Units, Employment, & Wages by NAICS Subsectors for Carbon County - Central Region - Fourth Quarter 2008. Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t120.htm. Accessed September 2009.
- Wyoming Department of Employment. 2009c. Table 125: Employing Units, Employment, & Wages by NAICS Subsectors for Natrona County - Central Region - Fourth Quarter 2008. Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t125.htm. Accessed September 2009.
- Wyoming Department of Employment. 2009d. Table 50: Employing Units, Employment, & Wages by NAICS Subsectors for Fremont County – Northwest Region - Fourth Quarter 2008. Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t50.htm. Accessed September 2009.
- Wyoming Department of Employment. 2009e. Table 53: Employing Units, Employment, & Wages by NAICS Subsectors for Hot Springs County – Northwest Region - Fourth Quarter 2008. Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t53.htm. Accessed September 2009.
- Wyoming Department of Employment. 2009f. Table 7: Wyoming Statewide Covered Employment, Total Wages, & Average Weekly Wages by NAICS Industries, Fourth Quarters 2007 and 2008. Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t7.htm. Accessed September 2009.
- Wyoming Department of Employment. 2009g. Table 89: Employing Units, Employment, & Wages by NAICS Subsectors for Sweetwater County – Southwest Region - Fourth Quarter 2008. Available on Internet: http://doe.state.wy.us/lmi/08Q4_QCEW/08q4t89.htm. Accessed September 2009.
- Wyoming DEQ (Wyoming Department of Environmental Quality). 2006. Wyoming's 2006 305(b) Integrated State Water Quality Assessment Report. Wyoming Department of Environmental Quality. Cheyenne, Wyoming.
- Wyoming DEQ. 2008a. Wyoming Water Quality Rules and Regulations, Chapter 1. Wyoming Department of Environmental Quality. Cheyenne, Wyoming.
- Wyoming DEQ. 2008b. Abandoned Mine Land Division. Lander Office. Personal communication regarding status of AML projects within the Lander Field Office.
- Wyoming DEQ. 2009. Air Quality Division. Wyoming Department of Environmental Quality. Cheyenne, Wyoming. Available on Internet: <http://deq.state.wy.us/aqd/>.
- Wyoming DEQ. 2010a. Wyoming Water Quality Assessment and Impaired Waters List (2010 Integrated 305(b) and 303(d) Report). Document #10-0230.
- Wyoming DEQ. 2010b. The Chapter 6 Section 2 Oil and Gas Production Facilities Permitting Guidance. March.

Wyoming DEQ. No Date-a. Abandoned Mine Land Division. Abandoned Mine Land General Information.

Wyoming DEQ. No Date-b. Wyoming Surface Water Quality Standards – Implementation Policies for Anti-degradation, Mixing Zones, Turbidity, Use Attainability Analysis. Wyoming Department of Environmental Quality.

Wyoming Department of Transportation. 2009. The Wyoming Scenic Byways and Backways Program.

Wyoming Division of Criminal Investigation. 2001. Crime in Wyoming - Annual Report for Year 2000. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2002. Crime in Wyoming - Annual Report for Year 2001. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2003. Crime in Wyoming - Annual Report for Year 2002. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2004. Crime in Wyoming - Annual Report for Year 2003. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2005. Crime in Wyoming - Annual Report for Year 2004. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2006. Crime in Wyoming - Annual Report for Year 2005. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2007. Crime in Wyoming - Annual Report for Year 2006. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed February 2008.

Wyoming Division of Criminal Investigation. 2008. Crime in Wyoming - Annual Report for Year 2007. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed September 2009.

Wyoming Division of Criminal Investigation. 2009. Crime in Wyoming - Annual Report for Year 2008. Available on Internet: <http://attorneygeneral.state.wy.us/dci/CrimeInWyomingReports.html>. Accessed September 2009.

Wyoming DOR (Wyoming Department of Revenue). 1999. 1999 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.

Wyoming DOR. 2000. 2000 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.

- Wyoming DOR. 2001a. 2001 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2001b. Property Tax System in Wyoming. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/uploads/propertytaxsystem.pdf>. Accessed July 9, 2004.
- Wyoming DOR. 2001c. Severance Tax Rates. Available on Internet: <http://revenue.state.wy.us/>.
- Wyoming DOR. 2002. 2002 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2003. 2003 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2004. 2004 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2005. 2005 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2006. 2006 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2007. 2007 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=3=10>. Accessed February 2008.
- Wyoming DOR. 2008. 2008 Annual Report. Available on Internet: <http://revenue.state.wy.us/PortalVBVS/uploads/2008%20DOR%20Annual%20Report.pdf>. Accessed September 2009.
- Wyoming Economic Analysis Division. 2000. Wyoming Cost of Living for the Second Quarter 2000. Cheyenne, Wyoming. October 3.
- Wyoming Economic Analysis Division. 2002. Population for Wyoming, Counties, Cities, and Towns: 1990 to 2000. Available on Internet: <http://eadiv.state.wy.us/pop/c> Accessed February 2008.
- Wyoming Economic Analysis Division. 2008. Wyoming Sales, Use, and Lodging Tax Revenue Report. State of Wyoming, Department of Administration and Information, Economic Analysis Division. Cheyenne, Wyoming.
- Wyoming Economic Analysis Division. 2009a. Wyoming Incorporated Place Population Estimates: April 1, 2000 to July 1, 2008. Available on Internet: <http://eadiv.state.wy.us/pop/SUB-08EST.htm>. Accessed September 2009.
- Wyoming Economic Analysis Division. 2009b. Wyoming and County Population Estimates: July 2001 to July 2008. Available on Internet: <http://eadiv.state.wy.us/pop/CO-08EST.htm>. Accessed September 2009.
- Wyoming Economic Analysis Division. 2009c. Estimates of the Population by Age and Sex for Wyoming Counties: 2000 to 2008. Available on Internet: http://eadiv.state.wy.us/pop/CO_AS08.htm. Accessed September 2009.

- Wyoming Economic Analysis Division. 2009d. Annual Estimates of Housing Units for Counties in Wyoming: April 1, 2000 to July 1, 2008. Available on Internet: <http://eadiv.state.wy.us/pop/cty08hu-est.htm>. Accessed September 2009.
- Wyoming Economic Analysis Division. 2009e. Wyoming Cost of Living for the Fourth Quarter 2008. State of Wyoming, Department of Administration and Information, Economic Analysis Division. Cheyenne, Wyoming. March 31.
- Wyoming Geographic Information Science Center. 2003. Wyoming Geographic Information Science Center data.
- Wyoming Geological Association. 1989. Wyoming Oil and Gas Fields Symposium: Bighorn and Wind River Basins: Wyoming Geological Association Oil and Gas Field Symposium Committee, 598 pp.
- Wyoming Housing Database Partnership. 2009. A Profile of Wyoming Demographics, Economics and Housing, Semiannual Report, Ending December 31, 2008. Available on Internet: http://www.wyomingcda.com/index.php?option=com_content=view=42=94. Accessed September 2009.
- Wyoming Oil and Gas Conservation Commission. 2008. Wyoming Well Data and Statistics. Wyoming Oil and Gas Conservation Commission. Available on Internet: <http://wogcc.state.wy.us>.
- Wyoming Sage-Grouse Working Group. 2003. Wyoming Greater Sage-grouse Conservation Plan. Wyoming Game and Fish Department, Cheyenne, Wyoming.
- Wyoming SHPO (State Historic Preservation Office). 2009. Cutoffs Seminoe. Oregon, California, Mormon, Pioneer and Pony Express Trails. Available on Internet: <http://wyoshpo.state.wy.us/trailsdemo/seminoecutoff.htm>. Accessed August 28, 2009.
- Wyoming State Auditor. 2008. Comprehensive Annual Financial Report - Basic Financial Statements for the Fiscal Year Ended June 30, 2008. Available on Internet: http://sao.state.wy.us/CAFR/cafr_report.htm#newestcafr. Accessed September 2009.
- Wyoming State Forestry Division. 2001. Wyoming Forest Health Report 1995-1998.
- Yarmoloy, C., M. Bayer, and V. Geist. 1988. Behavior Responses and Reproduction of Mule Deer, *Odocoileus hemionus*, Does Following Experimental Harassment with an All-Terrain Vehicle. Canadian Field-Naturalist 102:425-429.
- Zouhar, J.K., J.K. Smith, S. Sunderland, and M.L. Brooks. 2008. Wildland Fire in Ecosystems: Fire and Nonnative Invasive Plants. U.S. Department of Agriculture - Forest Service General Technical Report RMRS-GTR-42-Volume 6. Rocky Mountain Research Station, Fort Collins, Colorado.

This page intentionally
left blank

Glossary

Active Use:

The current authorized use, including livestock grazing and conservation use. Active use may constitute a portion, or all, of permitted use. Active use does include temporary nonuse or suspended use of forage within all or a portion of an allotment.

Allotment:

An area of land where one or more livestock operators graze their livestock. Allotments are Bureau of Land Management (BLM)-administered lands, but may also include other federally managed, state-owned, and private lands. An allotment may include one or more separate pastures. Livestock numbers and periods of use are specified for each allotment. Allotments are classified by the following:

Category I – Improve Existing Resource Conditions. Criteria for placing allotments into this category include: (1) present range condition is unsatisfactory and where range condition is expected to decline further; (2) present grazing management is not adequate; (3) the allotment has potential for medium to high vegetative production but production is low to moderate; (4) resource conflicts/controversy with livestock grazing are evident; (5) there is potential for positive economic return on public investment.

Category M – Maintain Existing Resource Conditions. Criteria for placing allotments into this category include: The category for allotments where (1) the present range condition and management are satisfactory with good to excellent condition and will be maintained under present management, or fair condition and improving with improvement expected to continue under present management, or opportunities for BLM management are limited because percentage of public land is low or acreage of public lands is small; (2) the allotment has a potential for moderate or high vegetative production and is producing at or near this potential; (3) there are no significant land-use resource conflicts with livestock grazing; (4) land ownership status may or may not limit management opportunities; (5) opportunities for positive economic return from public investment may exist.

Category C – Custodial Management. Criteria for placing allotments into this category include: The category for allotments where (1) present range condition is not in a downward trend; (2) the allotment has a low vegetative production potential and is producing near this level; (3) there may or may not be limited conflicts between livestock grazing and other resources; (4) present management is satisfactory or is the only logical management under existing conditions; and (5) opportunities for a positive economic return on public investments do not exist.

Analysis Area:

Any lands, regardless of jurisdiction, for which the BLM synthesizes, analyzes, and interprets data for information that relates to planning for BLM-administered lands.

Animal Unit Month:

A standardized measurement of the amount of forage necessary for the sustenance of one cow unit or its equivalent for 1 month (approximately 800 pounds of forage).

Areas Administratively Unavailable to Leasing:

BLM Handbook H-1601-1 – Land Use Planning, Appendix C uses the term areas closed to oil and gas leasing. Areas administratively unavailable or closed to oil and gas leasing are areas where it has been determined that other land uses or resource values cannot be adequately protected with even the most restrictive oil and gas leasing stipulations; appropriate protection can be ensured only by making the areas administratively unavailable to oil and gas leasing for the life of the plan. Lands currently under lease would remain leased for the life of the leases. After expiration of these leases, no lands would be available for lease.

Authorized Officer:

A manager/supervisor at a BLM Field Office, District Office, or State Office who has been delegated to take action pursuant to the various provisions of Title 43 Code of Federal Regulations (CFR) – Public Lands.

Authorized Surface-disturbing Activities:

Public Land resource uses/activities that disturb the endemic vegetation, surface geologic features, and/or surface/near surface soil resources beyond ambient site conditions that are permitted by previously-approved management actions. Examples of surface-disturbing activities include: construction of well pads and roads, pits and reservoirs, pipelines and powerlines, and most types of vegetation treatments (e.g., prescribed fire, etc.). NOTE: Some resource uses, commodity production and other actions that remove vegetative growth, geologic materials, or soils (e.g., livestock grazing, wildlife browsing, timber harvesting, sand and gravel pits, etc.) are allowed, and in some instances formally authorized, on the public lands. When utilized as a land use restriction, (e.g., No Surface-Disturbing Activities), this phrase prohibits all resource use or activity, except those uses and activities that are specifically authorized, likely to disturb the endemic vegetation, surface geologic features, and surface/near surface soils.

Avoidance Areas:

Areas where negative routing factors exist. Rights-of-way (ROWs) either will not be granted in these areas, or, if granted, will be subject to stringent terms and conditions. In other words, ROWs would be restricted, but not necessarily prohibited, in avoidance areas. Special stipulations will likely apply. Current avoidance criteria are provided in Appendix E (p. 1483).

Big Game Crucial Winter Range:

Winter habitat on which a wildlife species depends for survival. Because of severe weather conditions or other limiting factors, no alternative habitat would be available.

Borrow Material:

A term used in conjunction with construction. The term refers to unprocessed material excavated from a borrow pit for use as fill at another location.

Carbon Dioxide Flood:

A carbon dioxide flood is an enhanced oil recovery technique that injects fluid into the reservoir. When carbon dioxide is injected, it mixes with the oil and the two compounds dissolve into one another. The injected carbon dioxide acts as a solvent to overcome forces that trap oil in tiny rock pores and helps sweep the immobile oil left behind after the effectiveness of water injection decreases, resulting in increased oil production.

Casual Use:

One of the three types of operations for locatable minerals (43 CFR 3809 et seq.). Casual use means “activities ordinarily resulting in no or negligible disturbance of the public lands or resources” (43 CFR 3809.5). An example of casual use is collection of rock or mineral specimens using hand tools or nonmotorized sluicing. It may include the use of small portable suction dredges. Casual use does not include the use of mechanized earthmoving equipment or truck-mounted drilling equipment and other mechanized devices. See also notice-level operations and Plan of Operations.

Cheatgrass:

Cheatgrass is an annual grass that forms tufts up to 2 feet tall. The leaves and sheaths are covered in short, soft hairs. The flowers occur as drooping, open, terminal clusters that can have a greenish, red, or purple hue. Flowering occurs in the early summer. These annual plants will germinate in fall or spring (fall is more common), and senescence usually occurs in summer. Cheatgrass invades rangelands, pastures, prairies, and other open areas. Cheatgrass has the potential to completely alter the ecosystems it invades. It can completely replace native vegetation and change fire regimes and is most problematic in areas of the western United States with lower precipitation levels.

Class II Wells:

Injection wells that are:

- (1) Brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production, and may be commingled with wastewaters from gas plants, which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.
- (2) For enhanced recovery of oil or natural gas.
- (3) For storage of hydrocarbons that are liquid at standard temperature and pressure.

Class I Wells:

Injection wells that are:

- (1) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within ¼ mile of the wellbore, an underground source of drinking water.
- (2) Other industrial and municipal disposal wells that inject fluid beneath the lowermost formation containing, within ¼ mile of the wellbore, an underground source of drinking water.
- (3) Radioactive waste disposal wells that inject fluid below the lowermost formation containing, within ¼ mile of the wellbore, an underground source of drinking water.

Closed:

Generally denotes that an area is not available for a particular use or uses; refer to specific definitions found in law, regulations, or policy guidance for application to individual programs.

Commodity:

An economic good, such as a product of agriculture or mining.

Commodity Production:

The materialization of an economic good, such as a product of agriculture or mining.

Communication Site Management Plan:

A plan that provides for effective administration of a communications site. The site plan defines the principles and technical standards adopted in the site designation. The site plan provides direction for the day-to-day operations of the site in connection with the lease. The site plan shall delineate the types of uses that are appropriate at this site and the technical and administrative requirements for management of the site. The site plan should reflect the complexity of the current situation and the anticipated demand for the site.

Comprehensive Grazing Strategy:

A Comprehensive Grazing Strategy is a management approach that incorporates a documented grazing prescription that tailors the timing and intensity (utilization) of grazing to specific vegetation objectives to maintain, or make significant progress toward, fulfillment of the Wyoming Standards for Healthy Rangelands. The grazing prescription is clearly linked to the physiological requirements of the species identified in the objectives and is considerate of other resource values (e.g., greater sage-grouse and critical wildlife habitats). Objectives are established for locations preferred by livestock. A Comprehensive Grazing Strategy gives specific attention to the critical growing season on upland ranges and the hot season in riparian-wetland habitat. The kind and class of livestock along with the season of use will affect the timing and intensity requirements.

Comprehensive Weed Management Plan:

A plan for controlling invasive plant species that incorporates integrated weed management techniques and accounts for pertinent considerations, such as management actions and allocations affecting weeds.

Congressionally Designated Trails:

In 1968, the National Trails System Act (NTSA) (Public Law 90-543) provided for the development of a national system of trails in urban, rural, and wilderness settings. Originally, the NTSA specified three categories of national trails: National Scenic Trails (NSTs), recreation trails, and connecting or side trails. In 1978, historic trails were added as another category. Today, only Congress can designate National Historic Trails (NHTs) and NSTs. Congressionally Designated Trails in the planning area include the Continental Divide National Scenic Trail (CDNST) and the Oregon, Mormon Pioneer, California, and Pony Express NHTs. Management of Congressionally Designated Trails is guided by Instruction Memorandum 2009-215 (Planning for Special Designations within the National System of Public Lands).

Controlled Surface Use:

Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. Identified resource values require special operational constraints that may modify the lease rights. Controlled surface use is used for operating guidance, not as a substitute for the No Surface Occupancy (NSO) or Timing Limitation Stipulations (TLS).

Cooperative Monitoring:

Joint monitoring by more than one entity.

Core Area:

Executive Order 2008-2, which was superseded by Executive Order 2010-4 and again by 2011-5, issued by the Governor of Wyoming, delineated a Core Area to protect populations of greater sage-grouse in the state. The Order also outlines restrictions on the density of future development and other human activities that limit impacts to greater sage-grouse populations.

Cultural Resource Inventory Levels:

A three-tiered process for discovering, recording, and evaluating cultural resources.

- (a) Class I – A review of existing literature and oral informant data combined with an analysis of a specific geographic region (e.g., an area of potential effect, drainage basin, resource area, etc.).
- (b) Class II – A sampling survey usually aimed at developing and testing a predictive model of cultural resource distribution.
- (c) Class III – An on-the-ground survey to discover, record, and evaluate cultural resources within a specific geographic area (e.g., usually an area of potential effect for a proposed undertaking).

Decibel (dB):

A unit of measurement of the loudness or strength of a signal. One decibel is considered the smallest difference in sound level that the human ear can discern. Decibels are a relative measurement derived from two signal levels; a reference input level and an observed output level. A decibel is the logarithm of the ratio of the two levels. One Bel is when the output signal is 10 times that of the input and one decibel is 1/10th of a Bel.

Designated Invasive Species:

Designated invasive species are species that have been formally declared as “noxious” by federal and state governments in accordance with the Federal Noxious Weed Act of 1974, and the Wyoming Weed and Pest Control Act of 1973. Table 3.34, “Wyoming Weed and Pest Control Act Designated List” (p. 382) and Table 3.35, “Declared List of Weeds and Pests by Counties in the Planning Area” (p. 383) identify species that are formally declared noxious and invasive species for Wyoming. The list of federal noxious weeds, as defined by the Federal Noxious Weed Act of 1974, can be found on the Natural Resources Conservation Service website: <http://plants.usda.gov/java/noxiousDriver>.

Designated Roads and Trails:

Specific roads and trails on which some type of motorized vehicle use is allowed, either seasonally or year-long.

Desired Plant Community:

Of the several plant communities that may occupy a site, the desired plant community is the community that has been identified through a management plan to best meet the plan’s objectives for the site. At a minimum, it must protect the site.

Disruptive Activities:

Those public land resource uses/activities that are likely to alter the behavior, displace, or cause excessive stress to existing animal or human populations occurring at a specific location

and/or time. In this context, disruptive activity(ies) refers to those actions that alter behavior or cause the displacement of individuals such that reproductive success is adversely affected, or an individual's physical ability to cope with environmental stress is compromised. This term does not apply to the physical disturbance of the land surface, vegetation, or features. Examples of disruptive activities may include noise, human foot or vehicle traffic, domestic animal roundups, or other human presence regardless of the activity. When administered as a land use restriction (e.g., No Disruptive Activities), this term may prohibit or limit the physical presence of sound above ambient levels, light beyond background levels, and/or the nearness of people and their activities. The term is commonly used in conjunction with protecting wildlife during crucial life stages (e.g., breeding, nesting, birthing, etc.), although it could apply to any resource value on the public lands. The use of this land use restriction is not intended to prohibit all activity or authorized uses.

Ecological Integrity:

The condition of an unimpaired ecosystem as measured by combined chemical, physical (including physical habitat), and biological attributes.

Ecological Site:

A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in that the site has the ability to produce distinctive kinds and amounts of vegetation and to respond to management. Ecological sites are defined and described with information about soil, species composition, and annual production.

Ephemeral Stream:

A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "ephemeral" be arbitrarily restricted to streams that do not flow continuously for at least 30 days (Prichard et al. 1998). Ephemeral streams support riparian-wetland areas when streamside vegetation reflects the presence of permanent subsurface water.

Exceedance:

An event in which measurements of ambient air quality are above the National Ambient Air Quality standard (NAAQS) or Wyoming Department of Environmental Quality (DEQ) standard set for a particular pollutant. For example, an annual average nitrogen dioxide value of 110 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) is an exceedance of both the NAAQS and Wyoming DEQ annual average standard for nitrogen dioxide of 100 $\mu\text{g}/\text{m}^3$.

Exception:

A one time exemption for a particular site within an oil and gas leasehold. Exceptions are determined on a case-by-case basis and the stipulation continues to apply to all other sites within the leasehold.

Exclusion Areas:

Areas not available for location of ROWs under any circumstances (BLM 2005b).

Extensive Recreation Management Areas:

Administrative units that require specific management consideration to address recreation use, demand, or Recreation and Visitor Services program investments. The Extensive Recreation Management Areas (ERMA) are managed to support and sustain the principal recreation

activities and the associated qualities and conditions of the ERMA. Management of ERMA is commensurate with management of other resources and resource uses.

Final Reclamation:

The long term goal identified by the Wyoming Reclamation Policy (WY-2012-034) to facilitate eventual native plant community and ecosystem reconstruction to maintain a safe and stable landscape, and meet the desired outcomes of the land use plan.

Fire Management Plan:

Identifies appropriate strategies to achieve resource objectives. Identifies fire policy, objectives, and prescribed actions; may include maps, charts, tables, and statistical data.

Fire Regime Condition Class:

A classification of the amount of departure from the natural fire regime. The departure results in changes to one or more of the following ecological components: vegetation characteristics (e.g., species composition, structural stages, stand age, canopy closure, and mosaic pattern), fuel composition, fire frequency, severity, and pattern, and other associated disturbance (e.g., insect and disease mortality, grazing, and drought). The three condition classes are listed below.

(a) Condition Class 1

- The historic disturbance regime is largely intact and functioning (e.g., has not missed a fire return interval).
- Potential intensity and severity of fire within historic range.
- Effects of disease and insects within historic range.
- Hydrologic functions within normal historic range.
- Vegetation composition and structure resilient to disturbances.
- Nonnative species currently not present or to a limited extent.
- Low risk of loss for key ecosystem components.

(b) Condition Class 2

- Moderate alterations to historic disturbance regime evident (e.g., missed one or more fire return intervals).
- Effects of disease and insects pose an increased risk of loss of key community components.
- Riparian-wetland areas and associated hydrologic function show measurable signs of adverse departure from historic conditions.
- Vegetation composition and structure shifted toward conditions less resilient to disturbances.
- Populations of nonnative species may have increased, increasing the risk of further increases following disturbance.

(c) Condition Class 3

- Historic disturbance regime significantly altered; historic disturbance processes and impacts may be precluded (e.g., missed several fire return intervals).
- Effects of disturbance (fire, insects, and disease) may cause significant or complete loss of key community components.
- Hydrologic functions may be adversely altered; high potential for increased sedimentation and reduced streamflows.
- Invasive, nonnative species may be common and in some cases the dominant species on the landscape; disturbance will likely increase both the dominance and geographic extent of these invasive species.
- Highly altered vegetation composition and structure predisposes community to disturbance events outside the range of historic availability; disturbance may have effects not observed or measured before.

Fire Return Interval:

The number of years between two successive fire events at a specific site or area.

Flaring/Venting:

The controlled burning (flare) or release (vent) of natural gas that cannot be processed for sale or use because of technical or economic reasons.

Floodplain Connectivity:

Maintenance of lateral, longitudinal, and vertical pathways for biological and hydrological processes in the floodplain. Examples of failures to maintain connectivity could include culverts or levees that restrict flow in the floodplain and that focus overbank flow into the channel.

Flushing Livestock:

Flushing livestock is the holding of livestock in an invasive, nonnative plant species seed-free area where they are fed an invasive, nonnative plant species seed-free ration for 72 hours, thus flushing invasive, nonnative plant species seed from the animals' digestive systems.

Foreground-Middle Ground Zone:

An area that can be seen from a travel route for a distance of 3 miles (foreground) to 5 miles (middle ground) where management activities might be viewed. A distance from 5 to 15 miles is called the Background Zone and the area beyond 15 miles is called the Seldom-Seen Zone.

Geologic Resources:

Resources associated with the scientific study of the Earth, including its composition, structure, physical properties, and history. Geologic resources commonly include the study of minerals (mineralogy) and rocks (petrology), the structure of the Earth (structural geology) and volcanic phenomena (volcanology), and landforms and the processes that produce them (geomorphology and glaciology).

Goal:

A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established timeframes for achievement.

Grazing Relinquishment:

The voluntary and permanent surrender by an existing permittee or lessee (with concurrence of any base property lineholder(s)), of their priority (preference) to use a livestock forage allocation on public land as well as their permission to use this forage. Relinquishments do not require consent or approval by the BLM. The BLM's receipt of a relinquishment is not a decision to close areas to livestock grazing.

Guzzler:

A water development for wildlife.

Heavy Equipment Use:

This phrase is used in fire management and is relative to limiting fire suppression tactics. In this context it refers to not using dozers, skidders, or graders in areas where important resource values are in need of protection. Fire engines and water tenders used during suppression activities would be allowed.

Held by Production:

Leases that become productive and do not terminate until all wells on the lease have ceased production.

Historic American Buildings Survey/Historic American Engineering Record:

The Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) is an integral component of the federal government's commitment to historic preservation. The program documents important architectural, engineering and industrial sites throughout the United States and its territories. A complete set of HABS/HAER documentation, consisting of measured drawings, large-format photographs, and written history plays a key role in accomplishing the mission of creating an archive of American architecture and engineering and in better understanding what historic resources tell us about America's diverse ethnic and cultural heritage. To insure that such evidence is not lost to future generations, the HABS/HAER Collections are archived at the Library of Congress, where they are made available to the public.

Hot Season:

The part of the grazing season that occurs during the hot part of the summer between June 15 and August 31.

Hummocking:

A small, rounded or cone-shaped, low hill or a surface of other small, irregular shapes.

Impact Analysis for Planning 2000 Model:

Impact Analysis for Planning (IMPLAN) 2000 Model is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the "ripple effect" (also called the "multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly affected) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

Important Wildlife Habitat:

Big game crucial winter range, big game parturition areas, designated critical migration corridors, sage-grouse breeding and nesting areas, raptor concentration areas, and critical fish spawning areas.

Integrated Pest Management:

Ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism.

Integrated Weed Management:

The use of all appropriate weed control measures, including fire, as well as mechanical, chemical, biological, and cultural techniques, in an organized and coordinated manner on a site-specific basis.

Interim Reclamation:

The short-term goal identified by the Wyoming Reclamation Policy (WY-2012-034) to immediately stabilize disturbed areas and provide conditions necessary to achieve the long term goal.

Intermittent Stream:

A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "intermittent" be arbitrarily restricted to streams that flow continuously for periods of at least 30 days (Prichard et al. 1998).

Land Tenure:

To improve the manageability of the BLM-administered lands and improve their usefulness to the public, the BLM has numerous authorities for "repositioning" lands into a more consolidated pattern, disposing of lands, and entering into cooperative management agreements. These land-pattern improvements are completed primarily through the use of land exchanges, but also through land sales, jurisdictional transfers to other agencies, and through the use of cooperative management agreements and leases. These ownership or jurisdictional changes are referred as "Land Tenure Adjustments."

Laramide Orogeny:

The Laramide orogeny (orogeny is the Greek word for mountain building) was a period of mountain building in western North America which began during the Late Cretaceous period, 70 to 80 million years ago, and ended 35 to 55 million years ago. The major feature that was created by this orogeny was the Rocky Mountains, but evidence of this period is found from Alaska to Mexico and as far east as the Black Hills. The phenomenon is named for the Laramie Mountains of eastern Wyoming.

Leasable Minerals:

Those minerals or materials subject to lease by the federal government under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium, and sodium minerals; oil and gas, as well as geothermal resources.

Locatable Minerals:

Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872, as amended. This includes deposits of metallic minerals such as gold, silver, and other uncommon materials not subject to lease or sale.

Major Constraints (Oil and Gas):

Any stipulations or conditions of approval which may restrict the timing or placement of oil and gas developments and may result in an operator dropping the development proposal. Major constraints include NSOs, areas of overlapping TLS that last more than 6 months, areas closed to surface-disturbing activity, areas where surface-disturbing activity is prohibited, and visual resource management (VRM) Class I areas. Leaseholders have the right to explore, develop, and produce mineral resources from any valid, existing lease, even if the area containing the lease were proposed to be closed to future leasing.

Major Right-of-Way:

A Federal Land Policy and Management Act (FLPMA) ROW grant under 43 CFR Par 2800 et seq. which the BLM determines to be a Category 4, 5, or 6 type of authorization under 43 CFR 2804.14.

Mechanized Travel:

Moving by means of a mechanical device, such as a bicycle, and not powered by a motor.

Mineral Materials:

Materials such as common varieties of sand, stone, gravel, pumice, pumicite, and clay that are not obtainable under the mining or leasing laws, but can be acquired under the Mineral Materials Act of 1947, as amended. Also known as salable minerals.

Mineral Withdrawal:

A formal order that withholds federal lands and minerals from entry under the Mining Law of 1872, as amended, and closes the area to mineral location (i.e., staking mining claims) and development.

Minor Right-of-Way:

A FLPMA ROW grant under 43 CFR Par 2800 et seq. which the BLM determines to be a Category 1, 2, or 3 type of authorization under 43 CFR 2804.14.

Mitigation:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- (e) Compensating for the impact by replacing or providing substitute resources or environments.

Moderate Constraints (Oil and Gas):

Any stipulations or conditions of approval which may restrict the timing or placement of oil and gas development, but would not otherwise restrict the overall development.

Moderate constraints include all timing restrictions (TLS), controlled surface use, areas where surface-disturbing activity is avoided, and VRM Class II areas.

Modern Intrusions:

Modern elements or developments that would be out of character with a historic landscape or resource. Modern intrusions can be visual, audible, or atmospheric. An example of a modern intrusion is a new structure or building that would be visible from a historic trail or site, whose setting is primarily historically intact. It could also include a modern scar on the landscape that would be visible from the trail or site.

Motorized Use:

Use of public lands by means of vehicles that are propelled by motors, such as cars, trucks, off-highway vehicles (OHVs), motorcycles, etc.

Multiple Use Reservoir:

A human-created lake or pond with a combination of balanced uses, including, but not limited to, recreation, livestock watering, watershed health, and wildlife and fish.

Native Species Status:

Native Species Status (NSS) refers to the population status of species native to the area in which their habitats occur. The NSSs are divided into the following categories:

NSS1

- Populations are greatly restricted or declining, extirpation appears possible; or ongoing significant loss of habitat.

NSS2

- Populations are declining, extirpation appears possible; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance.

OR

- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.

NSS3

- Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable, but no loss; species is not sensitive to human disturbance.

OR

- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance.

OR

- Species is widely distributed; population status or trends are unknown, but are suspected to be stable; ongoing significant loss of habitat.

NSS4

- Populations are greatly restricted or declining, extirpation appears possible; habitat is stable and not restricted.

OR

- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable, but no loss; species is not sensitive to human disturbance.

OR

- Species is widely distributed, population status or trends are unknown, but are suspected to be stable; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance.

OR

- Populations that are stable or increasing and not restricted in numbers and/or distribution; ongoing significant loss of habitat.

Natural Fire Regime:

The general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (National Wildfire Coordinating Group 2003).

Nature and Purposes:

The term used to describe the character, characteristics, and Congressional intent for a designated National Trail, including the resources, qualities, values, and associated settings of the areas through which such trails may pass; the primary use or uses of a National Trail; and activities promoting the preservation of, public access to, travel within, and enjoyment and appreciation of National Trails.

Necessary Tasks:

Temporary excursions leaving existing vehicular routes are permitted only to accomplish necessary tasks. Necessary tasks are actions that support commercial or industrial uses of public lands, which need to be accomplished by a person or organization seeking or holding authorization from the BLM to build, maintain, or place infrastructure necessary to achieve planning goals and objectives, or exercise valid existing rights. Tasks associated with such activities typically require motorized vehicles to haul materials, tools, and equipment to the project site.

The majority of necessary tasks will occur as a result of a BLM authorization. At the time of project authorization, offices will assume and analyze a level of motorized vehicle use for construction and maintenance. It is feasible that a new road will develop as a result of the exemption, and therefore offices should consider if this new road will be open to the public, only for administrative access, or reclaimed. Additional mitigation measures may be necessary

to reduce motorized vehicle impacts. Mitigation measures pertaining to the necessary task exemption will be included in the terms and conditions, Conditions of Approval, or stipulations. Monitoring and evaluation will be conducted at these known locations.

Sometimes necessary tasks (as defined above) are and will be accomplished without formal written approval or in advance of receiving an authorization. Cross-country OHV travel in these cases is authorized so long as resource damage does not occur. While generally defined, the determination of whether resource damage has occurred is left to the discretion of field managers and law enforcement personnel. For this reason, project proponents are encouraged to contact their local field offices prior to using OHVs cross-country, so as to ensure use will not cause resource damage. In addition, project proponents must notify the BLM in writing when and where cross-country travel has occurred prior to an authorization. This can be done at the application phase, but must occur prior to final authorization.

Other Authorizations and Uses:

It is recognized that in many cases, cross-country motorized vehicle use is the most efficient tool for operators and industry to achieve BLM (Planning/Resource/Statutory) objectives and requirements. Livestock herding, scientific studies, habitat treatments, etc., are all examples of actions that may require cross-country motorized vehicle travel. In these cases, the project proponent is expected to submit a request for exemption from travel management regulations. The request for exemption will contain the following elements:

1. Who? Name of company, individuals, agency, and/or other entities traveling cross-country.
2. Description of proposed action and why the action is necessary to achieve agency objectives?
3. Type of motorized vehicle to be used and description of how the vehicle will be used for the proposed action?
4. A map with specific areas where projected cross-country travel is necessary?
5. Season, frequency, and duration of cross-country travel.
6. Why this action can't be accomplished using nonmotorized conveyances (e.g., horses)?
7. Expected outcome if this authorization is granted? Expected outcome if this authorization is not granted?
8. Methods and measures to minimize resource damage?
9. Other information.

Waivers/authorizations will be conditional upon consistency with Land Use and Activity Level planning decisions and other BLM objectives. The project proponent is encouraged to be as detailed as possible in the application for exception. The BLM will consider an application for exception complete when the information provided is sufficient to facilitate impact analysis, enforcement, monitoring, and evaluation. Project proponents are encouraged to submit the waiver request in tandem with other applications, renewals, or proposals, but the agency will accept the applications at all times. Waiver applications will not be accepted for individuals that are being actively investigated for violation of a OHV rule. Waivers and authorizations will not be granted to individuals who have been convicted of an OHV violation.

Any and all individuals conducting cross-country travel under such a waiver or authorization will carry a copy of the waiver and conditions associated with the waiver. The project proponent associated with the waiver will be required on an annual basis to provide an 'actual

occurrence' report that documents the location (legal description), time, and date of each and all incidents where motorized vehicles were used to travel cross-country or off-road.

Failure to adequately document all occurrence of cross-country or off-road travel will result in termination of the waiver. Upon evaluation and monitoring, if it is determined that unacceptable conditions or resource damage is occurring, the waiver may be revoked. Additionally, if an evaluation shows no increased progress towards objectives and/or requirements (part 2 of the request information) then the waiver can be revoked.

No Surface Occupancy:

The term “no surface occupancy” is used in two ways. It is used in one way to define a no surface occupancy (NSO) area where no surface-disturbing activities of any nature or for any purpose would be allowed. For example, construction or the permanent or long-term placement of structures or other facilities for any purpose would be prohibited in an NSO area.

The other way the “no surface occupancy” term is used is as a stipulation or mitigation requirement for controlling or prohibiting selected land uses or activities that would conflict with other activities, uses, or values in a given area. When used in this way, the NSO stipulation or mitigation requirement is applied to prohibit one or more specific types of land and resource development activities or surface uses in an area, while other – perhaps even similar – types of activities or uses (for other purposes) would be allowed. For example, protecting important rock art relics from destruction may require closing the area to the staking of mining claims and surface mining, cross-country vehicle travel, construction or long-term placement of structures or pipelines, powerlines, general purpose roads, and livestock grazing. Conversely, the construction of fences to protect the rock art from vandalism or from trampling or breakage by livestock, an access road or trail, and other visitor facilities to provide interpretation and opportunity for public enjoyment of the rock art would be allowed. Further, if there were interest in development of leasable minerals in the area, leases for oil and gas, coal, and so forth, could be issued with a “no surface occupancy” stipulation or mitigation requirement for the rock art site, which would still allow access to the leasable minerals from adjacent lands and underground. The term “no surface occupancy” has no relationship or relevance to the presence of people in an area.

Notice-level Operations:

Non-casual use operations that will disturb 5 acres or less of public lands on which reclamation has not been completed. A notice must be submitted 15 calendar days before exploration is commenced. See casual use and Plan of Operations and 43 CFR 3809.5.

Objective:

A description of a desired condition for a resource. Objectives can be quantified and measured and, where possible, have established timeframes for achievement.

Occupied Lek:

A lek that has been active during at least one strutting season within the last 10 years.

Off-highway Vehicle:

Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding: (1) any nonamphibious registered motorboat; (2) any military, fire, emergency, or law enforcement vehicle being used for emergency purposes; (3) any vehicle whose use is expressly authorized by the Authorized Officer, or otherwise

officially approved; (4) vehicles in official use; and (5) any combat or combat support vehicle when used in times of national defense emergencies.

Off-highway Vehicle Management Designations:

Designations apply to all OHVs regardless of the purposes for which they are being used. Emergency vehicles are excluded. The OHV designation definitions have been developed in cooperation with representatives of the U.S. Forest Service, National Park Service, and the BLM state and field office personnel. The BLM recognizes the differences between OHVs and over-snow vehicles in terms of use and impact. Therefore, travel by over-snow vehicles will be permitted off existing routes and in all open or limited areas (unless otherwise specifically limited or closed to over-snow vehicles) if they are operated in a responsible manner without damaging the vegetation or harming wildlife.

Closed:

Vehicle travel is prohibited in the area. Access by means other than motorized vehicle is permitted. This designation is used if closure to all vehicular use is necessary to protect resources, to ensure visitor safety, or to reduce conflicts.

Open:

Vehicle travel is permitted in the area (both on and off roads) if the vehicle is operated responsibly in a manner not causing, or unlikely to cause, significant undue damage to or disturbance of the soil, wildlife, wildlife habitats, improvements, cultural or vegetative resources, or other authorized uses of the public lands. These areas are used for intensive OHV use where there are no compelling resource needs, user conflicts, or public safety issues to warrant limiting cross-country travel.

Limited:

(a) Vehicle travel is permitted only on roads and vehicle routes which were in existence prior to the date of designation in the *Federal Register*. Vehicle travel off of existing vehicle routes is permitted only to accomplish necessary tasks and only if such travel does not result in resource damage. Random travel from existing vehicle routes is not allowed. Creation of new routes or extensions and/or widening of existing routes are not allowed without prior written agency approval.

(b) Vehicle travel is permitted only on roads and vehicle routes designated by the BLM. In areas where final designation has not been completed, vehicle travel is limited to existing roads and vehicle routes as described above. Designations are posted as follows:

1. Vehicle route is open to vehicular travel.
2. Vehicle route is closed to vehicular travel.

(c) Vehicle travel is limited by number or type of vehicle. Designations are posted as follows:

1. Vehicle route limited to four-wheel drive vehicles only.
2. Vehicle route limited to motorbikes only.
3. Area is closed to over-snow vehicles.

(d) Vehicle travel is limited to licensed or permitted use.

(e) Vehicle travel is limited to time or season of use.

(f) Where specialized restrictions are necessary to meet resource management objectives, other limitations also may be developed.

The BLM may place other limitations, as necessary, to protect other resources, particularly in areas that motorized OHV enthusiasts use intensely or where they participate in competitive events.

Offsite Mitigation:

Mitigation located away from the adversely affected site.

Open:

Generally denotes that an area is available for a particular use or uses. Refer to specific program definitions found in law, regulations, or policy guidance for application to individual programs.

Overgrazing:

Continued heavy grazing that exceeds the recovery capacity of the forage plants and creates deterioration of the grazing lands (Valentine 1990).

Over-snow Vehicle:

An over-snow vehicle is a motor vehicle that is designed for use over snow that runs on a track or tracks and/or a ski or skis. An over-snow vehicle does not include machinery used strictly for the grooming of nonmotorized trails.

Perennial Stream:

A stream that flows continuously. Perennial streams generally are associated with a water table in the localities through which they flow (Prichard et al. 1998).

Permitted Use:

The forage allocated by, or under the guidance of, an applicable land use plan for livestock grazing in an allotment under a permit or lease and expressed in animal unit months.

Pest:

With the exception of vascular plants classified as invasive nonnative plant species, a pest can be any biological life form that poses a threat to human or ecological health and welfare. For the purposes of this planning effort, an “animal pest” is any vertebrate or invertebrate animal subject to control by Animal and Plant Health Inspection Service (APHIS). APHIS is currently the BLM’s authorized agent for controlling “animal pests.” For this reason, “animal pests” will be considered a subset of Pest.

Planned Ignition:

The intentional initiation of a wildland fire by hand-held, mechanical, or aerial device, where the distance and timing between ignition lines or points and the sequence of igniting them is determined by environmental conditions (weather, fuel, topography), firing technique, and other factors which influence fire behavior and fire effects (see *Prescribed Fire*).

Planning Area:

A geographic area for which land use and resource management plans are developed and maintained.

Plan of Operations:

Projects disturbing more than 5 acres require an approved Plan of Operations before work can begin. Once a Plan of Operations is filed with the BLM, the proposed action is analyzed and those mitigating measures needed to prevent unnecessary or undue degradation are required for approval. A Plan of Operations must always be filed, regardless of disturbance acreage, for activities which exceed casual use and occur in special management areas such as areas of critical environmental concern, wild and scenic rivers and areas closed to off-road vehicle use. A Plan of Operations is required in wilderness study areas for other than casual use level activities. The non-impairment criteria will determine the required mitigating measures in the Plan of Operations.

Potential Fossil Yield Classification:

Geologic units in the planning area are classified according to the Potential Fossil Yield Classification, usually at the formation or member level, according to the probability of yielding resources of concern to land managers, primarily vertebrate fossils. The classification uses a ranking of 1 through 5, with Class 5 assigned to units with a high potential for fossils. Within the planning area, Class 4 and Class 5 geologic formations account for approximately 50 percent of the total acreage, including all ownerships. About 35 percent of public land in the planning area is underlain by Class 4 and Class 5 formations. The classifications are described as below:

Class 1. Igneous and metamorphic geologic units, or units with highly disturbed preservational environments that are not likely to contain recognizable fossil remains. Management concern is negligible for Class 1 resources and mitigation requirements are rare.

Class 2. Sedimentary geologic units that are not likely to contain vertebrate fossils or significant nonvertebrate fossils. Management concern is low for Class 2 resources and mitigation requirements are not likely.

Class 3. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence, or units of unknown fossil potential. Management concern may extend across the entire range of management. Ground-disturbing activities require sufficient assessment to determine whether significant resources occur in the area of the proposed action.

Class 4. Class 4 units are Class 5 units with a lowered risk of human-caused adverse impacts or lowered risk of natural degradation. Ground-disturbing activities require assessment to determine whether significant resources occur

in the area of the proposed action and whether those actions will impact the resource. Mitigation may include full monitoring of significant localities.

Class 5. Highly fossiliferous geologic units that regularly produce vertebrate fossils or significant nonvertebrate fossils and that are at risk of natural degradation or human-caused adverse impacts. Class 5 areas receive the highest level of management focus. Mitigation of ground-disturbing actions is required and may be intense. Areas of special interest may be designated and intensely managed.

Potential Natural Community:

The biotic community that would become established if all successional sequences were completed without interference by humans under the present environmental conditions. Natural disturbances are inherent in development. Potential natural community includes naturalized nonnative species.

Prairie Dog “Complex”:

Defined as a cluster of two or more prairie dog towns within 3 kilometers of each other (Clark and Stromberg 1987), and bounded by either natural or artificial barriers (Whicker and Detling 1988), which effectively isolate one cluster of colonies from interacting/interchanging with another. Prairie dogs may commonly move among colonies of a cluster, and thereby foster reproductive/genetic viability, but exhibit little emigration/immigration between clusters. A cluster may include some currently unoccupied, through physically suitable (i.e., vegetation, soils, topography, etc.), land immediately adjacent to occupied colonies that support other prairie dog-associated (ecosystem function), obligate or facultative species (e.g., swift fox, mountain plover, burrowing owl, etc.).

Preference:

A superior or priority position against others for the purpose of receiving a grazing permit or lease. This priority is attached to base property or controlled by a permittee or lessee.

Prescribed Burning:

Controlled application of fire to wildland fuels in either their natural or modified state under specified environmental conditions that allow the fire to be confined to a predetermined area, and at the same time, to produce the fire intensity and rate of spread required to attain planned resource management objectives.

Prescribed Fire:

A wildland fire originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed fire plan for which National Environmental Policy Act requirements (where applicable) have been met prior to ignition.

Priority Fish Species:

Species considered to be sport fish and native species.

Produced Water:

Groundwater removed to facilitate the extraction of minerals, such as coal, oil, or gas.

Proper Functioning Condition:

The on-the-ground condition of a riparian-wetland area, referring to how well the physical processes are functioning and the state of resiliency that will allow a riparian-wetland area

to hold together during a high-flow event, sustaining that system's ability to produce values related to both physical and biological attributes.

Proper Grazing:

Proper grazing is the practice of managing forage use by grazing animals at a sustainable level that maintains rangeland health. Proper grazing will maintain or increase plant cover, including residue, which acts to slow down or reduce runoff, increase water infiltration, and keep erosion and sedimentation at or above acceptable levels within the potential of ecological sites within a given geographic area (e.g., watershed, grazing allotment, etc.).

Range Improvement Project:

A structural improvement requiring placement or construction to facilitate management or control distribution and movement of grazing or browsing animals. Such improvements may include, but are not limited to, fences, wells, troughs, reservoirs, water catchments, pipelines, and cattleguards. The project also may include a practice or treatment which improves rangeland condition and or resource production for multiple use. Nonstructural types of projects may include, but are not limited to, seeding and plant control through chemical, mechanical, and biological means or prescribed burning.

Rangeland:

Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Rangeland Health:

The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained.

Raptor:

Bird of prey with sharp talons and a strongly curved beak, such as hawks, falcons, owls, vultures, and eagles.

Recreational Outcomes:

The beneficial and non-beneficial consequences (i.e., outcomes) of the management and use of recreation and related amenity resources and programs (Driver 2008).

Recreational Use:

The public is allowed to pursue recreational (e.g., picking up big game kills, camping, parking) activities up to 300 feet away from roads and trails, as long as such activities do not cause resource damage or create new roads or extend existing roads. The existing road system and this cross-country travel allowance is designed to accommodate the needs of recreational activities on the public lands. This applies only to all "Limited" travel designations.

Recreation Management Areas:

Recreation management areas are classified as either Special Recreation Management Areas (SRMAs) or ERMAs. The recreation management areas are land units where Recreation and Visitor Services objectives are recognized as a primary resource management consideration, and specific management is required to protect the recreation opportunities. The recreation management area designation is based on recreation demand and issues, recreation setting

characteristics, resolving use/user conflicts, compatibility with other resource uses, and resource protection needs (BLM Instruction Memorandum 2011-004 [BLM 2011c]).

Extensive Recreation Management Areas: Administrative units that require specific management consideration to address recreation use, demand, or Recreation and Visitor Services program investments. ERMA's are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMA's is commensurate with management of other resources and resource uses.

Special Recreation Management Areas: Administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially compared to other areas used for recreation. The SRMA's are managed to protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics. SRMA's may be subdivided into recreation management zones (RMZs) to further delineate specific recreation opportunities.

Responsible Official:

The BLM official who has been delegated authority to approve an action by signing a Record of Decision in the matter of an Environmental Impact Statement, or Decision Records in the matter of an Environmental Assessment.

Restricted Disposal:

Parcels identified for restricted disposal may be disposed of under the Recreation and Public Purposes Act, by exchange, may limit the disposal to a particular type of entity capable of preserving the resource values, or may include the use of covenants in the deed or land sale patent to ensure the resource values are protected.

Retirement:

Ending livestock grazing on a specific area of land.

Rights-of-Way:

A ROW grant is an authorization to use a specific piece of public land for a specific project, such as roads, pipelines, transmission lines, and communication sites. The grant authorizes rights and privileges for a specific use of the land for a specific period of time.

Rights-of-Way Avoidance Areas:

Areas where adverse routing factors exist. ROWs either will not be granted in these areas, or, if granted, will be subject to stringent terms and conditions. In other words, ROWs would be restricted (but not necessarily prohibited) in these avoidance areas (see BLM Manuals 2800 and 2880).

Rights-of-Way Exclusion Area:

Areas with sensitive resource values where ROW and 302 permits, leases, and easements would not be authorized (see BLM Manuals 2800 and 2880).

Riparian Areas:

Riparian areas are a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with

perennially and intermittently flowing rivers and streams, glacial potholes, playas, and the shores of lakes and reservoirs with stable water levels, are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

Riparian-Wetland Functionality Classification:

Functional At-Risk: Riparian-wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

Proper Functioning Condition (PFC): A riparian or wetland area is considered to be in PFC when adequate vegetation, landform, or large woody debris is present to do the following:

- Dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality.
- Filter sediment, capture bedload, and aid floodplain development.
- Improve floodwater retention and groundwater recharge.
- Develop root masses that stabilize stream banks against cutting action.
- Develop diverse ponding and channel characteristics to provide the habitats and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses.
- Support greater biodiversity.

Nonfunctional: Riparian or wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, and so on, as listed above. The absence of certain physical attributes, such as a floodplain where one should be, are indicators of nonfunctioning conditions.

Unknown: Riparian or wetland areas that the BLM lacks sufficient information on to make any form of determination.

Salable Minerals:

See *Mineral Materials*.

Seasonal Ranges:

The Wyoming Game and Fish Department has identified various ranges for big game species. These ranges are defined as follows:

Summer or Spring-Summer-Fall: A population or portion of a population of animals use the documented habitats within this range annually from the end of previous winter to the onset of persistent winter conditions.

Severe Winter Relief: A documented survival range, which may or may not be considered a crucial range area as defined above. It is used to a great extent, but

only in extremely severe winters. It may lack habitat characteristics that would make it attractive or capable of supporting major portions of the population during normal years, but is used by and allows at least a significant portion of the population to survive the occasional extremely severe winter.

Winter: A population or portion of a population of animals annually use the documented suitable habitat sites within this range in substantial numbers during the winter period only.

Winter/Year-long: A population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges.

Year-long: A population or substantial portion of a population of animals makes general use of the suitable documented habitat sites within the range on a year-round basis. On occasion, animals may leave the area under severe conditions.

Parturition Areas: Documented birthing areas commonly used by females. They include calving areas, fawning areas, and lambing grounds. These areas may be used as nurseries by some big game species.

Section 106 of National Historic Preservation Act:

“The head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. The head of any such federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking” (16 United States Code 47 df).

Sensitive Sites or Resources:

Sensitive sites or resources refer to significant cultural resources that are, or may be eligible, for nomination to the National Register of Historic Places.

Sensitive Species:

Species designated as sensitive by the BLM State Director include species that are under status review, have small or declining populations, live in unique habitats, or require special management. BLM Manual 6840 provides policy and guidance for special status species management. The BLM Wyoming Sensitive Species Policy and List are provided in a memorandum updated annually. Primary goals of the BLM Wyoming policy include maintaining vulnerable species and habitat components in functional BLM ecosystems and preventing a need for species listing under the Endangered Species Act.

Seral Stage:

One of a series of plant communities that follows another in time on a specific ecological site.

Setting:

Setting is the physical environment of a historic property and how the property evokes a sense of feeling and association with past events. Accordingly, setting refers to the character of the place in which the property played its historic role. It involves how, not just where, the property is situated and its relationship to surrounding features and open space. These features and their relationships should be considered not only within the exact boundaries of the property, but also between the property and its surroundings.

Special Recreation Management Areas:

Administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially as compared to other areas used for recreation. The SRMAs are managed to protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics. SRMAs may be subdivided into RMZs to further delineate specific recreation opportunities.

Special Status Species:

Special status species are species proposed for listing, officially listed as threatened or endangered, or are candidates for listing as threatened or endangered under the provisions of the Endangered Species Act; those listed by a state in a category such as threatened or endangered, implying potential endangerment or extinction; and those designated by the State Director as sensitive (BLM 2008e).

Split-estate:

Surface land and mineral estate of a given area under different ownerships. Frequently, the surface will be privately owned and the minerals federally owned.

Standards for Healthy Rangelands:

A description of the physical and biological conditions or degree of function required for healthy, sustainable lands (e.g., land health standards).

State-listed Species:

Species proposed for listing or listed by a state in a category implying, but not limited to, potential endangerment or extinction. Listing is either by legislation or regulation.

Surface-disturbing Activities (or Surface Disturbance):

The physical disturbance and movement or removal of land surface and vegetation. These activities range from the very minimal to the maximum types of surface disturbance associated with such things as OHV travel or use of mechanized, rubber-tired, or tracked equipment and vehicles; some timber cutting and forest silvicultural practices; excavation and development activities associated with use of heavy equipment for road, pipeline, powerline and other types of construction; blasting; strip, pit, and underground mining and related activities, including ancillary facility construction; oil and gas well drilling and field construction or development and related activities; range improvement project construction; and recreation site construction.

Surface Water Classes and Uses:

The following water classes are a hierarchical categorization of waters according to existing and designated uses. Except for Class 1 waters, each classification is protected for its specified uses plus all the uses contained in each lower classification. Class 1 designations are based on value determinations rather than use support and are protected for all uses in existence at

the time of or after designation. There are four major classes of surface water in Wyoming with various subcategories within each class.

(a) Class 1, Outstanding Waters. Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Pursuant to Section 7 of these regulations, the water quality and physical and biological integrity that existed on the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archeological, fish and wildlife, the presence of substantial quantities of developable water, and other values of present and future benefit to the people.

(b) Class 2, Fisheries and Drinking Water. Class 2 waters are waters, other than those designated as Class 1 that are known to support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent, or ephemeral and are protected for the uses indicated in each subcategory listed below. Five subcategories of Class 2 waters exist.

(c) Class 3, Aquatic Life Other than Fish. Class 3 waters are waters other than those designated as Class 1 that are intermittent, ephemeral, or isolated waters, and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning or certain perennial waters that lack the natural water quality to support fish (e.g., geothermal areas). Class 3 waters provide support for invertebrates, amphibians, or other flora and fauna that inhabit waters of the state at some stage of their life-cycles. Uses designated on Class 3 waters include aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value. Generally, waters suitable for this classification have wetland characteristics; and such characteristics will be a primary indicator used in identifying Class 3 waters. There are four subcategories of Class 3 waters.

(d) Class 4, Agriculture, Industry, Recreation, and Wildlife. Class 4 waters are waters other than those designated as Class 1 where it has been determined that aquatic life uses are not attainable pursuant to the provisions of Section 33 of these regulations. Uses designated on Class 4 waters include recreation, wildlife, industry, agriculture and scenic value (Wyoming DEQ No Date-b).

Suspension:

The temporary withholding from active use, through a decision issued by the authorized officer or by agreement, of part or all, of the permitted use in a grazing permit or lease.

Type E Fence:

Identified as a wildlife-friendly fence type that more effectively accommodates wildlife passage than other traditional fence types. Four-wire construction allows most wildlife species to pass over or under the fence and provides adequate containment for livestock.

Unique Forest and Woodland Communities:

Forest and woodland habitats recognized as significant for at least one factor such as density, diversity, size, public interest, remnant character, age, or having limited distribution throughout the planning area.

Utilization Levels:

The proportion or degree of current year's forage production that is consumed or destroyed by animals (including insects). It may refer either to a single plant species, a group of species, or to the vegetation as a whole, generally expressed as a percentage.

Vegetative Diversity:

The variety of vegetative types in an area, including species, the genetic differences among species and populations, the communities and ecosystems in which vegetation types occur, and the structure and seral stage of these communities. Vegetative diversity includes rare, as well as common vegetative types, and typically supports a diverse array of animal species and communities.

Viewshed:

Viewshed is used in VRM to describe "... landscape that can be seen under favorable atmospheric conditions from a viewpoint (key observation point) or along a transportation corridor" (BLM 1984).

Visual Resource Management Classes:

Class I. The objective of this class is to maintain a landscape setting that appears unaltered by humans. It is applied to wilderness areas, some natural areas, wild portions of wild and scenic rivers, and other similar situations in which management activities are to be restricted.

Class II. The objective of this class is to design proposed alterations so as to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III. The objective of this class is to design proposed alterations so as to partially retain the existing character of the landscape. Contrasts to the basic elements (form, line, color, and texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape; however, the changes should remain subordinate to the existing characteristic landscape.

Class IV. The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, changes should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape.

Rehabilitation Area. Change is needed or change may add acceptable visual variety to an area. This class applies to areas where the naturalistic character

has been disturbed to a point at which rehabilitation is needed to bring it back into character with the surrounding landscape. This class would apply to areas identified in the scenic evaluation where the quality class has been reduced because of unacceptable cultural modification. The contrast is inharmonious with the characteristic landscape. It may also be applied to areas that have the potential for enhancement; i.e., add acceptable visual variety to an area or site. It should be considered an interim or short-term classification until one of the other VRM Class objectives can be reached through rehabilitation or enhancement. The desired VRM class should be identified.

Visual Resources:

The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

Waiver:

A permanent exemption of a stipulation.

Wetlands:

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian-Wetland Area Management, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

Wildfire:

An unplanned ignition of a wildland fire (such as a fire caused by lightning, volcanoes, unauthorized and accidental human-caused fires) and escaped prescribed fires.

Wildland Fire:

A general term describing any non-structure fire that occurs in the wildland.

Wildland Industrial Interface:

The area where industrial development meets or intermingles with undeveloped wildland.

Wildland-Urban Interface:

The Healthy Forest Recreation Act 2003 defines wildland urban interface (Section 101) as an area within or adjacent to an at risk community that has been identified by a community in its wildfire protection plan or, for areas that do not have such a plan, an area extending; (1) ½ mile from the boundary of an at risk community, or; (2) 1½ miles when other criteria are met. (e.g., a sustained steep slope or a geographic feature aiding in creating an effective fire break or is condition class III land, or; (3) is adjacent to an evacuation route.

Wildlife-disturbing Activity:

BLM-authorized activities other than routine maintenance that may cause displacement of or excessive stress to wildlife during critical life stages. Wildlife-disturbing activities include human presence, noise, and activities using motorized vehicles or equipment.

Wind River Indian Reservation:

Indian reservation shared by the Eastern Shoshone and Northern Arapaho tribes of Native Americans in the central western portion of Wyoming. It is the seventh-largest Indian reservation by area in the United States, encompassing a land area of 3,473.272 square miles. It encompasses just over one-third of Fremont County and over one-fifth of Hot Springs

County, and the reservation is located in the Wind River Basin, surrounded by the Wind River Mountain Range, Owl Creek Mountains, and the Absaroka Mountains.

Withdrawal:

Removal or withholding of public lands, by statute or Secretarial order, from operation of some or all of the public land laws. A mineral withdrawal includes public lands potentially valuable for leasable minerals, precluding the disposal of the lands except with a mineral reservation clause, unless the lands are found not to contain a valuable deposit of minerals. A mineral withdrawal is the closing of an area to mineral location and development activities.

Yellowcake:

Yellowcake is the product of the uranium extraction (milling) process. Early production methods resulted in a bright yellow compound, hence the name yellowcake. The material is a mixture of uranium oxides that can vary in proportion and color from yellow to orange to dark green (blackish), depending at which temperature the material was dried (level of hydration and impurities). Higher drying temperatures produce a darker, less soluble material. Yellowcake is commonly referred to as U_3O_8 and is assayed as pounds U_3O_8 equivalent. This fine powder is packaged in drums and sent to a conversion plant that produces uranium hexafluoride as the next step in the manufacture of nuclear fuel.

Appendix A. Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority

Table A.1. Federal Laws and Statutes

Federal Law or Statute	Year
Independent Offices Appropriation Act of 1952 (31 United States Code [U.S.C.] 9701)	1952
American Indian Religious Freedom Act (42 U.S.C. 1996)	1978
Antiquities Act (Public Law [P.L.] 59-209; 34 Stat. 225; 16 U.S.C. 431-433)	1906
Archeological Resources Protection Act (P.L. 96-95; 93 Stat. 721; 16 U.S.C. 470aa et seq.) as amended (P.L. 100-555; P.L. 100-588)	1979
Archeological and Historic Preservation Act (16 U.S.C. 469-469c-1, P.L. 86-523, 74 Stat. 220, 88 Stat. 174)	1974
Archeological and Paleontological Salvage for Federal Highway Projects (23 U.S.C. 305; 72 Stat. 913 [1958], 74 Stat. 525 [1960])	1960
Bald Eagle Protection Act (16 U.S.C. 668-668d, 54 Stat. 250)	1940
Carlson-Foley Act of 1968 (42 U.S.C. 1241-1243)	1968
Clean Air Act (42 U.S.C. 7401–7626, P.L. 159), as amended (P.L. 108–201)	1970
Coastal Zone Management Act (P.L. 92-583, 16 U.S.C. 1451-1456)	1972
Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601)	1980
Department of the Interior Secretarial Order 3226	2001
Desert Land Act (19 Stat. 377; 43 U.S.C. 321-323), as amended	1877
Domestic Minerals Program Extension Act	1953
Economy Act 1932 (P.L. 72-211; 47 Stat. 417; 31 U.S.C. 686), as amended	1932
Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001-11050)	1986
Emergency Wetland Resources Act	1986
Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended	1973
Energy Independence and Security Act	2007
Energy Policy Act (P.L. 109–58)	2005
Executive Order 11514 – Protection and Enhancement of Environmental Quality	1970
Executive Order 11593 – Protection and Enhancement of the Cultural Environment	1971
Executive Order 11644 – Use of Off-Road Vehicles on the Public Lands	1972
Executive Order 11738 – Providing for administration of the Clean Air Act and the Federal Water Pollution Control Act with respects to federal contracts, grants, or loans	1973
Executive Order 11987 – Exotic organisms	1977

Appendix A Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority

Federal Law or Statute	Year
Executive Order 11988 – Floodplain Management	1977
Executive Order 11989 – Off-Road Vehicles on Public Lands	1977
Executive Order 11990 – Protection of Wetlands	1977
Executive Order 11991 – Relating to protection and Enhancement of Environmental Quality	1977
Executive Order 12088 – Federal Compliance with Applicable Pollution Control	1978
Executive Order 12580 – Superfund Implementation and 13016 – Amendment to Executive Orders 12580	1987, 1996
Executive Order 13007 – Indian Sacred Sites	1996
Executive Order 13084 – Consultation and Coordination with Indian Tribal Governments	1998
Executive Order 13112 – Invasive Species	1999
Executive Order 13148 – Greening of the Government through Leadership in Environmental Management	2000
Executive Order 13195 – Trails for America in the 21st Century	2001
Executive Order 13212 – Actions to Expedite Energy-Related Projects	2003
Executive Order 13287 – Preserve America	2003
Executive Order Public Water Reserve 107	1926
Executive Order 10355 – Designating the Provisional Intergovernmental Committee for the movement of migrants from Europe as a public international organization entitled to enjoy certain privileges, exemptions, and immunities	1952
Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments	2000
Executive Order 6910 and Executive Order 6964, and amendments	1934
Federal Aid Highway Act (23 U.S.C. 107[d] and 317)	1958
Federal Cave Resources Protection Act (16 U.S.C. 4301-4309)	1988
Federal Coal Leasing Amendments Act (90 Stat. 1083-1092), as amended	1976
Federal Coal Management Program Coal Screening Process (43 Code of Federal Regulations [CFR] 3420.1-4)	1997
Federal Facilities Compliance Act of 1992	1992
Federal Land Policy and Management Act	1976
Federal Land Recreation Enhancement Act	2004
Federal Land Transaction Facilitation Act (43 U.S.C. 2301, et seq.)	2000
Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 et seq.)	1974
Federal Oil and Gas Royalty Management Act	1982
Federal Plant Pest Act (7 U.S.C. 150aa et seq.)	1957
Federal Property and Administrative Services Act of 1949	1949
Federal Water Pollution Control Act (33 U.S.C. 1251-1376), as amended	1948
Federal Water Projects Recreation Act 916 U.S.C 460[L][12]-460[L][21]), as amended	1965
Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661-667e), as amended	1934

Federal Law or Statute	Year
Fish and Wildlife Conservation Act (16 U.S.C. 2901-2911)	1980
Food Security Act of 1985 (16 U.S.C. 3801-3862)	1985
General Allotment Act, Section 4 (25 U.S.C. 334), as amended	1887
General Mining Law of 1872, as amended	1872
Healthy Forests Restoration Act (P.L. 108-148)	2003
Historic Sites Act of 1935 (16 U.S.C. 461 et seq.)	1935
Lacey Act (18 U.S.C. 42), as amended	1988
Land & Water Conservation Act (16 U.S.C. 4601-4), as amended	1965
Lode Law Act of 1866 (14 Statute 251)	1866
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715r)	1929
Migratory Bird Treaty Act of 1918 (16 U.S.C. 703 et seq.)	1918
Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.)	1920
Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351 et seq.)	1947
Mining and Mineral Policy Act of 1970 (30 U.S.C. 181 et seq.)	1970
Mining Claim Rights Restoration Act (30 U.S.C. 621-625)	1955
National Environmental Policy Act	1969
National Fire Plan	2000
National Historic Trails System Act (16 U.S.C. 1241-1249), as amended	1968
National Historic Preservation Act of 1966 (16 U.S.C. 470)	1966
National Materials and Minerals Policy, Research and Development Act of 1980 (P. L. 96-479, 94 Stat. 2305)	1980
National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300)	1998
National Parks and Recreation Act of 1978 (16 U.S.C. 1242 and 1243)	1978
National Trails System Act of 1968 (16 U.S.C. 1241 et seq.), as amended	1968
National Wild & Scenic Rivers Act (16 U.S.C. 1271 et seq.)	1968
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.)	1990
Neotropical Migratory Bird Conservation Act (P.L. 106-247)	2000
Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 U.S.C. 4701 et seq.), as amended	1990
Noxious Weed Control Act of 2004 (P.L. 108-412)	2004
O&C Lands Act of 1937 (62 Stat. 162)	1948
Occupational Safety and Health Act (29 U.S.C. 651 et seq.)	1970
Oil Pollution Act (33 U.S.C. 2701 et seq.)	1990
Omnibus Public Land Management Act (P.L. 111-11)	2009
Plant Protection Act (7 U.S.C. 7701-7772)	2000
Pollution Prevention Act (42 U.S.C. 13101)	1990
Public Range Improvement Act (43 U.S.C. 1901 et seq.)	1978

Federal Law or Statute	Year
Public Rangelands Improvement Act of 1978 (43 U.S.C. 1901 et seq.)	1978
The Recreation and Public Purposes Act (43 U.S.C. 869), as amended in 1988	1926
Reorganization Plan No. 3 of 1946 (5 U.S.C. Section 402)	1946
Reservoir Salvage Act of 1960 (16 U.S.C. 469), as amended by Archeological and Historic Preservation Act of 1974	1960
Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.), as amended, and the Beville Amendment (Section 3001[b][3][A][ii] and 40 CFR 261.4[b][7])	1976
Riparian-Wetlands Initiative for the 1990s, U.S. Department of the Interior, Bureau of Land Management, January 22, 1992	1992
Rivers and Harbors Act of 1899 (10 U.S.C. 1899, Section 10)	1899
Safe Drinking Water Act (L. 95-190; 42 U.S.C. 201, 300 et seq.), as amended	1977
San Juan Basin Wilderness Protection Act of 1984 (16 U.S.C. § 1132)	1984
National Historic Preservation Act of 1966 (16 U.S.C. 470)	1966
Sikes Act of 1974, as amended (16 U.S.C. 670 et seq.)	1974
Soil and Water Resources Conservation Act of 1977 (16 U.S.C. 2001 et seq.)	1977
Soil Conservation and Domestic Allotment Act of 1935 (16 U.S.C. 590), as amended	1935
Soil Information Assistance for Community Planning and Resource Development Act of 1966 (42 U.S.C. 3271)	1966
Stock Raising Homestead Act of 1916 (43 U.S.C. 299), as amended	1916
Surface Mining Control and Reclamation Act (30 U.S.C. 1201 et seq.)	1977
Surface Resources Act of 1955 (30 U.S.C. 611-614)	1955
The Airport and Airway Improvement Act, Section 516 (49 U.S.C. 2215)	1982
The Department of Energy Organization Act (42 U.S.C. 7101 et seq.)	1977
The Engle Act (43 U.S.C. 155 et seq.)	1958
The Geothermal Steam Act of 1970 (30 U.S.C. 1001 et seq.), as amended	1970
The Land and Water Conservation Fund (43 U.S.C. 460 et seq.)	1965
The Mining and Minerals Policy Act of 1970	1970
The Multiple Mineral Development Act (30 U.S.C. 521-531 et seq.)	1954
The Wilderness Act of 1964 (16 U.S.C. 1131), as amended	1964
Toxic Substance and Control Act of 1976 (P.L. 104-66), as amended in 1995	1976
Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management	2000
U.S. Onshore Orders	

Federal Law or Statute	Year
Onshore Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases	1983
Onshore Order No. 2 – Onshore Oil and Gas Drilling Operations on Federal and Indian Oil and Gas Leases	1988
Onshore Order No. 3 – Site Security on Federal Oil and Gas Leases	1989
Onshore Order No. 4 – Measurement of Oil on Federal Oil and Gas Leases	1989
Onshore Order No. 5 – Measurement of Gas on Federal Oil and Gas Leases	1989
Onshore Order No. 6 – Hydrogen Sulfide Operations on Federal Oil and Gas Leases	1991
Onshore Order No. 7 – Disposal of Produced Water from Federal Oil and Gas Leases	1993
Water Quality Act of 1987, as amended from the Federal Water Pollution Control Act of 1977 (Clean Water Act) (33 U.S.C. 1251 et seq.), as amended	1987
Water Resources Development Act	1974
Water Resources Planning Act (42 U.S.C. 1962a-1962[a][4][e]), as amended	1965
Watershed Protection and Flood Protection Act (16 U.S.C. 1001 et seq.), as amended	1954
Watershed Restoration and Enhancement Agreements (“Wyden Amendment”) (P.L.-104-208, Sec. 124, P.L. 10-5-277, Sec. 136 of the 1999 Interior Appropriations Act of 1998)	1998
Wild and Free Roaming Horse and Burro Act (P.L. 92-195)	1971
Wild and Scenic Rivers Act (16 U.S.C. 1271 et seq.)	1968
Federal Wildland Fire Management Policy	2001
U.S. V. Peck, No. 97-8122, 1999 WL 33022	1999
Placer Law – Act of July 9, 1870 (16 Stat. 217)	1870
Carey Act of August 18, 1894 (43 U.S.C. 641 et seq.), as amended	1894
Earl Douglass, 44 L.D. 325, August 6, 1915	1915
Act of April 23, 1932; 47 Stat. 136	1932
The Act of June 28, 1934; Section 7 (43 U.S.C. 315f), as amended	1934
The Materials Act of July 31, 1947 (30 U.S.C. 601-604), as amended	1947
Acquired Lands Act – Act of August 7, 1947; 61 Stat. 913	1947
Act of September 1, 1949, Section 3 (30 U.S.C. 192c)	1949
Act of June 30, 1950 (16 U.S.C. 508[C] and [e])	1950
Act of August 13, 1954 (68 Stat. 708, 30 U.S.C. 521 subpart)	1954
Multiple Mineral Development Act of August 13, 1954 (30 U.S.C. 521-531 et seq.)	1954
Act of July 23, 1955 (P.L. 167; 43 CFR 3710)	1955
Act of September 28, 1962 (P.L. 87-713, 76 Stat. 652)	1962
Classification and Multiple Use Act of September 19, 1964 (78 Stat. 986, 43 U.S.C. 1411-18)	1964

Federal Law or Statute	Year
Act of October 30, 1978 (92 Stat. 2073-2075)	1978
Naval Petroleum Reserves Production Act (43 CFR 2361.1[f])	1976

Table A.2. Bureau of Land Management Regulations and Policies

Bureau of Land Management Directive	Year
Abandoned Mine Lands National Strategic Plan	2006
Applications for Permit to Drill Fees	2007
Applications for Permits to Drill	2007
Best Management Practices – “The Gold Book”	2007
Bureau of Land Management (BLM) 3809 Manual (1985, revised 2001)	2001
BLM Handbook (Draft) H-2101-5 – Environmental Site Assessments for Disposal of Real Property	2004
BLM Handbook 2200-1, Land Exchange Handbook	2005
BLM Handbook 3809 (Draft 2006)	2006
BLM Handbook H-1112-2, Safety and Health for Field Operations Manual	1998
BLM Handbook H-1601-1, Land Use Planning	2005
BLM Handbook H-1703-1, Response Actions NCP/Comprehensive Environmental Response, Compensation, and Liability Act	2001
BLM Handbook H-1742-1, Burned Area Emergency Stabilization and Rehabilitation Handbook	2007
BLM Handbook H-1745-1, Native Plant Materials Handbook	2001
BLM Handbook H-1790-1, National Environmental Policy Act	2008
BLM Handbook H-2101-4, Pre-Acquisition Environmental Site Assessments	2000
BLM Handbook H-3510-1, Phosphate Leasing Handbook	1989
BLM Handbook H-3042-1, Solid Minerals Reclamation Handbook	1992
BLM Handbook H-3720-1, Abandoned Mine Land Program Policy	2007
BLM Handbook H-3809-1, for Mineral Examiners, v. 3-332, Sept. 11, 2007	2007
BLM Handbook H-3809-3, Validity Mineral Reports, June 1969	1969
BLM Handbook H-4180-1, Rangeland Health Standards	2001
BLM Handbook H-4700-1, Wild Horses and Burros Management Handbook	2010
BLM Handbook H-8160-1, General Procedural Guidance for Native American Consultation	1994
BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management	1998
BLM Handbook H-8342, Travel and Transportation Handbook	2012
BLM Handbook H-8550-1, Interim Management Policy for Lands Under Wilderness Review	1987
BLM Handbook H-9214-1, Prescribed Fire Management Handbook	1998

Bureau of Land Management Directive	Year
BLM Information Bulletin No. Washington Office (WO)-2002-101, Cultural Resource Considerations in Resource Management Plans	2002
BLM Instruction Memorandum No. 2008-009, Potential Fossil Yield Classification System for Paleontological Resources on Public Lands	2007
BLM Instruction Memorandum No. WO-2003-147, Application for Permit to Drill – Process Improvement #3 – Cultural Resources	2003
BLM Instruction Memorandum No. WO-2005-003, Cultural Resources and Tribal Consultation for Fluid Minerals Leasing	2005
BLM Instruction Memorandum No. WO-2005-227, National Historic Preservation Act Section 106 and Oil and Gas Permitting	2005
BLM Instruction Memorandum No. WO-99-039, Issuance of Grazing Permits in Compliance with Applicable Laws, Regulations and Policy	1999
BLM Instruction Memorandum No. WY-97-111, Report of Conformance of BLM Land Use Plans with the Standards & Guidelines on the Public Lands; Follow-up Maintenance of Land Use Plans	1997
BLM Instruction Memorandum No. WY-98-061, Guidance for Water Quality Assessment and Monitoring for the Implementation of Standard Number five of the Wyoming Standards for Healthy Rangelands and Guidelines for Livestock Grazing	1998
BLM Instruction Memorandum No. WY-99-20, Complying with Section 106 in Conformance with WOIM No. 99-039	1999
BLM Instruction Memorandum No. WO-2003-147, Application for Permit to Drill – Process Improvement #3 – Cultural Resources	2003
BLM Instruction Memorandum No. WO-2005-003, Cultural Resources and Tribal Consultation for Fluid Minerals Leasing	2005
BLM Instruction Memorandum No. WO-2005-227, National Historic Policy Act Section 106 and Oil and Gas Permitting	2005
BLM Instruction Memorandum No. WO-99-039, Issuance of Grazing Permits in Compliance with Applicable Laws, Regulations and Policy	1999
BLM Instruction Memorandum No. WY-2005-046, Conservation Measures and Best Management Practices for the Management of Potential Gray Wolf Habitat	2005
BLM Instruction Memorandum No. WY-2005-058, Conservation Measures and Best Management Practices for the Management of Potential Canada Lynx Habitat	2005
BLM Instruction Memorandum No. WY-2006-037, Conservation Measures and Best Management Practices for the Management of Potential Black-footed Ferret Habitat	2006
BLM Instruction Memorandum No. WY-2006-049, Conservation Measures and Best Management Practices for the Management of Grizzly Bear Habitat	2006

Bureau of Land Management Directive	Year
BLM Instruction Memorandum No. WY-2006-197, BLM Energy and Non-Energy Mineral Policy	2006
BLM Instruction Memorandum No. WY-2007-018, Conservation Measures and Best Management Practices for the Management of Mountain Plover Habitat	2007
BLM Instruction Memorandum No. WY-2010-013, Oil and Gas Leasing Screen for Greater Sage-Grouse	2010
BLM Instruction Memorandum No. WY-2010-012, Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management (BLM) Administered Public Lands including the Federal Mineral Estate	2009
BLM Instruction Memorandum No. WY-2012-019, Greater Sage-Grouse Habitat Management Policy on Wyoming Bureau of Land Management Administered Public Lands including the Federal Mineral Estate	2012
BLM Instruction Memorandum No. 1999-076, Policy on the Use of Certified Weed-Free Hay, Straw, and Mulch on BLM Lands	1999
BLM Instruction Memorandum No. 2002-164, Guidance to Address Environmental Justice in Land Use Plans	2002
BLM Instruction Memorandum No. 2006-073, Weed-Free Seed Use on Lands Administered by the Bureau of Land Management	2006
BLM Instruction Memorandum No. 2007-097, Solar Energy Development Policy	2007
BLM Instruction Memorandum No. 2009-011, Assessment and Mitigation of Potential Impacts to Paleontological Resources	2008
BLM Instruction Memorandum No. 2009-018, Process for Setting Priorities for Issuing Grazing Permits and Leases	2008
BLM Instruction Memorandum No. 2009-043, Guidance for Wind-energy Development on BLM Land	2009
BLM Instruction Memorandum No. 2009-215, Planning for Special Designations within the National System of Public Lands.	2009
BLM Instruction Memorandum No. 2010-088, Guidance on 43 CFR 3809.100 and its Application	2010
BLM Instruction Memorandum No. 2010-117, Oil and Gas Leasing Reform — Land Use Planning and Lease Parcel Reviews	2010
BLM Instruction Memorandum No. 2011-003, Solar Energy Development Policy	2010
BLM Instruction Memorandum No. 2011-004, Transmittal of Revised Recreation and Visitor Services Land Use Planning Guidance	2010
BLM Instruction Memorandum No. 2012-043, Greater Sage-Grouse Interim Management Policies and Procedures	2011
BLM Instruction Memorandum No. 2012-044, BLM National Greater Sage-Grouse Land Use Planning Strategy	2011

Bureau of Land Management Directive	Year
BLM Instruction Memorandum No. 2011-154, Requirement to Conduct and Maintain Inventory Information for Wilderness Characteristics and to Consider Lands with Wilderness Characteristics in Land Use Plans	2011
BLM Instruction Memorandum No. 2012-067, Clarification of Cultural Resource Considerations for Off-Highway Vehicle Designations and Travel Management	2012
BLM Instruction Memorandum No. 2012-141, Confidentiality of Paleontological Locality Information Under the Omnibus Public Lands Act of 2009	2012
BLM Instruction Memorandum No. 2012-140, Collecting Paleontological Resources Under the Paleontological Resources Preservation Act of 2009	2012
BLM Instruction Memorandum No. 2012-169, Resource Management Plan Alternative Development for Livestock Grazing	2012
BLM Manual 1601, Land Use Planning	2000
BLM Manual 1613, Areas of Critical Environmental Concern	1988
BLM Manual 1626, Travel and Transportation Manual	2012
BLM Manual 1737, Riparian Habitat	1992
BLM Manual 1740, Renewable Resource Improvements and Treatments	2008
BLM Manual 2800, Cadastral Surveys-General	1985
BLM Manual 2880, Mineral Leasing Act Rights-of-Way, Glossary of Terms	2012
BLM Manual 3031, Energy and Mineral Resource Assessment	1985
BLM Manual 3060, Mineral Reports – Preparation and Review, April 7, 1994	1994
BLM Manual 4180, Land Health	2001
BLM Manual 4700, Wild Free-Roaming Horses and Burros Management	2010
BLM Manual 6250, National Scenic and Historic Trail Administration	2012
BLM Manual 6280, Management of National Scenic and Historic Trails and Trails Under Study or Recommended as Suitable for Congressional Designation	2012
BLM Manual 6330, Management of Wilderness Study Areas	2012
BLM Manual 6500, Manual of Wildlife, Fish and Plant Resources	2002
BLM Manual 6840, Special Status Species Management	1988
BLM Manual 6840, Special Status Species Policy	2008
BLM Manual 8100, Cultural Resource Management	2004
BLM Manual 8110, Identifying Cultural Resources	2004
BLM Manual 8120, Tribal Consultation Under Cultural Resources	2004
BLM Manual 8130, Planning for Uses of Cultural Resources	2004
BLM Manual 8140, Protecting Cultural Resources	2004
BLM Manual 8160, Native American Consultation and Coordination	1990

Bureau of Land Management Directive	Year
BLM Manual 8270, Paleontological Resource Management	1998
BLM Manual 8340, Off-Road Vehicles	1982
BLM Manual 8341, Conditions of Use (Off- Road Vehicles)	1979
BLM Manual 8342, Designation of Roads and Trails	1988
BLM Manual 8343, Vehicle Operations	1979
BLM Manual 8344, Permits	1979
BLM Manual 8351, Wild and Scenic Rivers	1992
BLM Manual 8400, Visual Resource Management	1980
BLM Manual 9113, Roads Manual	2011
BLM Manual Section 1703, Hazardous Materials Management	2007
BLM Manual Section 7240, Water Quality	1978
BLM Manual Section 7250, Water Rights	1984
BLM Policy Statement on Riparian Area Management	1987
BLM TR 1734-6 Version 4: Interpreting Indicators of Rangeland Health	2005
BLM TR 1737 series: Riparian Area Management Assessing Proper Functioning Condition for Lotic and Lentic Areas	1998
BLM Wyoming Riparian Management Activity Guide	1991
BLM Wyoming Sensitive Species Policy and List	2002
Board of Regents of the University of Oklahoma, 165 IBLA 231	2005
BLM Grazing Administration Range Improvements and Water Rights (43 CFR 4100 et seq.)	2002 (revised)
Cave Management (43 CFR 37.4[c] and 37.11[c][3][iii])	1988
Competitive Leasing (43 CFR 3120)	2002
Delegation of Authority, Cooperative Agreements & Contracts for Oil & Gas Inspection (43 CFR 3190)	1987
Federal Coal Management Program Regulations (43 CFR Group 3400)	1979
Federal Manual for Identifying and Delineating Jurisdictional Wetlands	1991
Fish and Wildlife 2000 BLM National, State and District policies	2000
Geothermal Resource Leasing (43 CFR 3200)	1998
Geothermal Resources Unit Agreements (43 CFR 3280)	1973
Instruction Memorandum 2002-196	2002
Instruction Memorandum 2003-020, Interim Wind Energy Development Policy	2003
Instruction Memorandum 2005-069, Offsite Compensatory Mitigation Guidelines	2005
Instruction Memorandum 2005-176, Filing of Protests on lands Included in Oil and Gas Lease Sales	2005
Instruction Memorandum 2005-210, Energy Policy and Conservation Act Inventory – Data Compilation for Phases III and IV	2005
Instruction Memorandum 2005-247, National Environmental Policy Act Compliance for Oil, Gas, and Geothermal Development	2005
Instruction Memorandum 2006-071, Process Improvement for Oil, Gas, Geothermal, Geophysical, and Related Rights-of-Way Approvals	2006

Bureau of Land Management Directive	Year
Instruction Memorandum 2006-197, BLM Energy and Non-Energy Mineral Policy	2006
Instruction Memorandum 2006-206, Oil and Gas Bond Adequacy Reviews	2006
Instruction Memorandum 2006-145, Cooperative Conservation Based Strategic Plan for the Abandoned Mine Lands Program	2006
Instruction Memorandum 2007-096, Refinement of the Methodology to Identify Abandoned Mine Land Sites Near Populated Places and High Use Areas	2007
BLM Instruction Memorandum 2009-011, Assessment and Mitigation of Potential Impacts to Paleontological Resources	2008
Instruction Memorandum No. WY-2003-011	2002
Instruction Memorandum No. WY-2006-009	2006
Mineral Leasing Act of 1920 (43 CFR From 3100-11 [July 2006], 43 CFR Part 3160)	1920
Mineral Leasing Act of 1920 (43 CFR 2006 3425.1-7[a][2][iv, v])	1920
Mineral Leasing Act of 1920 (43 CFR 2006 3461.5[h][2][i])	1920
Mineral Leasing Act of 1920 and others (43 CFR 2006 3591.1[b][10])	1920
Mineral Leasing Act of 1920 and others (43 CFR 2006 3430.4-4[a][10]; 43 CFR 2006 3430.4-4[b][8])	1920
Minerals Management, Generally (43 CFR 3000)	1983
National Contingency Plan Regulations (40 CFR 300)	1994
National Management Strategy for Motorized Off-Highway Vehicle Use on BLM Public Lands	2001
National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties	1990
National Register of Historic Places Eligibility (36 CFR Part 60.4)	1966
Natural Resource Damage Assessment Regulations (43 CFR Part 11)	1986
Noncompetitive Leasing (43 CFR 3110)	1988
Off-Road Vehicle Implementation Strategy Washakie Resource Area	1994
Oil and Gas Leasing (43 CFR 3100)	1983
Onshore Oil and Gas Geophysical Exploration (43 CFR 3150)	1988
Onshore Oil and Gas Operations (43 CFR 3160)	1982
Onshore Oil and Gas Unit Agreements; Unproven Areas (43 CFR 3180)	1983
Permits for Recreation on Public Lands (43 CFR 2930)	2004
Riparian-Wetlands Initiative for the 1990s, the U.S. Department of the Interior, BLM	1992
Solicitor's Opinion of January 17, 1986	1986
Solicitor's Opinion of July 10, 1963	1963
Solicitor's Opinion of October 12, 1956	1956
Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming	2004
Standards for Healthy Rangelands, Standard #2	1997

Bureau of Land Management Directive	Year
The Standards for Healthy Rangelands and Guidance for Livestock Grazing Management (43 CFR 4180)	1997
WO – Instruction Memorandum – 2002-034, Recent Changes in Management Direction: Federal Wildland Fire Management Policy, National Fire Plan	2002
WY Instruction Memorandum No. 2005-034, Travel Management Guidelines for the Public Lands in Wyoming	2005
WY Instruction Memorandum No. 89-402, April 3, 1989, Inspection and Enforcement Program for Locatable Minerals Activities	1989
WY-2001-040, Issuance of BLM (Wyoming) Sensitive Species Policy and List (Expires 9/30/02)	2001
Wyoming BLM Coal/Coal Bed Methane Policy	2000
Wyoming BLM Soil Program Ten Year Strategy	2003
Wyoming Instructional Memorandum 87-672, August 26, 1987	1987

Table A.3. Applicable Wyoming State Laws and Regulations

Wyoming State Laws and Regulations
Wyoming State Engineer's Office Statutes, Rules and Regulations
State of Wyoming Occupational Health and Safety Rules and Regulations
State of Wyoming Oil & Gas Conservation Commission Rules and Regulations
Wyoming Department of Environmental Quality Rules and Regulations
State of Wyoming Occupational Health and Safety Rules and Regulations
State of Wyoming Oil & Gas Conservation Commission Rules and Regulations
Wyoming Department of Environmental Quality Rules and Regulations
Wyoming Environmental Quality Act
State of Wyoming Water Quality Rules and Regulations
Wyoming Executive Department, Office of the Governor, Executive Order 2011–5. Greater Sage-grouse Core Area Protection

Table A.4. Memoranda and Agreements

Memoranda and Agreements	Year	Description
Association of Fish and Wildlife Agencies, U.S. Forest Service (USFS), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service	2006	Policies and guidelines for fish and wildlife management in National Forest and BLM Wilderness.
Yellowstone River Compact	1950	Between the states of Wyoming, Montana, and North Dakota was agreed upon to create an equitable division and apportionment of such waters; this compact ultimately controls the future and current uses of surface water resources in the basin. Ongoing litigation between Wyoming and Montana over the inclusion of groundwater in this compact is yet to be resolved.

Memoranda and Agreements	Year	Description
Memorandum of Understanding No. WY 19	2003	Between the U.S. Department of the Interior (DOI), BLM, and the Wyoming Department of Environmental Quality (DEQ)-Land Quality Division (LQD) and addresses Management Of Surface Mining and Exploration for Locatable Minerals on Public Lands. It was signed November 11, 2003. This is a Supplemental Memorandum to the General Statewide Memorandum of Understanding (Memorandum of Understanding) dated October 1975, between the Governor of Wyoming and the United States, by and through the State Director, BLM, DOI.
Wyoming DEQ	N/A	There are currently no agreements between BLM and the State of Wyoming DEQ-LQD regarding exploration for or development of non-energy leasable minerals. Wyoming DEQ-LQD processes applications for these minerals under their “Non-Coal” rules and regulations. It is possible that the same Memorandum of Understanding between BLM and Wyoming DEQ-LQD for locatable minerals would have some valuable application should these two agencies need to work together to process applications related to non-energy leasable minerals.
Clean and Diversified Energy Initiative	2005	Recommends initiatives to facilitate the timely leasing and permitting of geothermal resources.
BLM Memorandum of Understanding WO300-2006-08, April 2006	2006	Facilitate interagency coordination and establish policies and procedures to implement Section 225 of the Energy Policy Act of 2005.
National Memorandum of Understanding between the BLM and the Department of Defense	—	This Memorandum of Understanding outlines procedures for processing Notices of Intent (NOIs) to conduct geophysical operations when Air Force, Army, and Navy lands are involved. The Department of Defense will be the lead agency when their lands are involved in an NOI.
Interagency between BLM and Bureau of Reclamation Agreement	—	The BLM has jurisdiction over NOIs to conduct geophysical exploration which involve Bureau of Reclamation Agreement lands. The Bureau of Reclamation Agreement will be contacted for their conditions of approval.

Memoranda and Agreements	Year	Description
Memorandum of Understanding between BLM and State of Wyoming Oil and Gas Conservation Commission	—	Outlines the handling of NOIs to conduct geophysical exploration and sharing of information and compliance inspections. The State of Wyoming Oil and Gas Conservation Commission has jurisdiction over injection wells and spacing.
Memorandum of Agreement, between the Wyoming DEQ and the State of Wyoming Oil and Gas Conservation Commission	1999	Wyoming DEQ delegated permitting of road applications for oilfield wastes when the wastes are to be applied on the lease, unit, or communitized area. Wyoming DEQ still has the jurisdiction for permitting road application of oil field wastes outside of the lease, unit, or communitized area.
Interagency Agreement between the USFS and the BLM	2006	Establishes procedures for the administration of oil and gas operations on federal leases within the National Forest System.
Memorandum of Understanding BLM/Animal and Plant Health Inspection Service-Wildlife Services	2003	Detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BLM lands (Document #03-8100-0870-MU, February 27, 2003) and local Natural Resources Conservation Service.
Western Association of Fish and Wildlife Agencies /USFS/BLM/USFWS Memorandum of Understanding (08-31-2000)	2000	Involving the management of sage grouse and their habitat.
Memorandum of Understanding between the BLM and the Department of Agriculture (60F26045-48)	1995	Predator control protocols were formalized in this Interagency Memorandum of Understanding.
Cooperative Agreements with Weed and Pest Districts: Bighorn County, Hot Springs County, Park County, Washakie County	—	Details cooperative efforts for noxious weed control on BLM-administered lands by the county weed and pest districts.
Programmatic Agreement Among BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Offices (SHPO)	1997	Regarding the manner in which BLM will meet its responsibilities under the National Historic Preservation Act.
State Protocol Agreement Between the Wyoming BLM State Director and the Wyoming SHPO	2006	Regarding the manner in which the BLM will coordinate with the Wyoming SHPO.
Memorandum of Agreement WY-7	—	Memorandum of Agreement between the BLM and the Wyoming Recreation Commission; addresses land classifications and withdrawals to protect public lands generally, and specifically to protect historic trails.
Memorandum of Agreement WY-19	—	Memorandum of Agreement between the BLM and the Wyoming Governor, addresses overall cooperation in public and state land management efforts.

Memoranda and Agreements	Year	Description
Memorandum of Agreement WY-20	—	Memorandum of Agreement between the BLM and the Wyoming Game and Fish Commission, addresses a myriad of land and resource management issues, including classifications, land acquisition and disposal, and access.
Memorandum of Agreement WY-21	—	Memorandum of Agreement between the BLM and Region II and Region IV of the USFS, addresses overall coordination on a myriad of land and resource management issues.
Memorandum of Agreement WY-63	—	Memorandum of Agreement among the BLM, the USFS, Wyoming Department of Public Lands and the Wyoming Game and Fish Commission, addresses public land access and management of access problems.
Memorandum of Agreement WY-65	—	Memorandum of Agreement between the BLM and the Agricultural Stabilization and Conservation Service (ASCS), addresses overall coordination on a myriad of land and resource management issues.
Memorandum of Agreement WY-77	—	Memorandum of Agreement among the BLM, the ASCS, USFS, AES, and Wyoming State Conservation Commission, addresses overall coordination on conservation planning projects.
Memorandum of Agreement WY-117	—	Memorandum of Agreement among the BLM and the Wyoming Board of Land Commissioners, the Wyoming SHPO and the Advisory Council on Historic Preservation, addresses cultural resource protection in state exchanges.
Memorandum of Agreement WY-118	—	Memorandum of Agreement between the BLM and the Wyoming Board of Land Commissioners, addresses processing state exchanges.
Memorandum of Agreement WY-119	—	Memorandum of Agreement between the BLM and the ASCS, addresses management of agricultural trespass.
Memorandum of Agreement WY-121	—	Memorandum of Agreement between the BLM and the National Park Service, addresses management of the Oregon National Historic Trails.
Memorandum of Agreement WY-122	—	Memorandum of Agreement among the BLM and the USFS, Wyoming Department of Public Lands, Wyoming Game and Fish Commission, Wyoming Recreation Commission, Wyoming Department of Agriculture, and the Wyoming State Planning Coordinator's Office, addresses access to public land.

Memoranda and Agreements	Year	Description
Memorandum of Agreement WY-131	—	Memorandum of Agreement between the BLM and the Wyoming Game and Fish Department (WGFD), addresses overall coordination on land and resource management.
Memorandum of Agreement WY930-91-06-38	—	Memorandum of Agreement between the BLM and the Wyoming Board of Land Commissioners, addresses exchange pooling.
Memorandum of Agreement WY930-91-06-39	—	Memorandum of Agreement between the BLM and the Wyoming Board of Land Commissioners, addresses exchange of state land in holdings in wilderness areas.
Memorandum of Understanding WY920-08-07-192	2007	Memorandum of Understanding WY920-08-07-192 between BLM, the Federal Highway Administration (FHWA), and the Wyoming Department of Transportation, addresses each agency's responsibilities in regard to processing Federal-aid highway appropriations. To implement Sections 107(d) and 317 of the Federal Aid Highway Act (23 U.S.C. 107[d] and 317), as amended, the agencies operate under this Memorandum of Understanding (updated in August 2007). All appropriations under the Federal Aid Highway Act are required to be consistent with the referenced Memorandum of Understanding.
Memorandum of Understanding WY920-02-09-108	2002	Between the BLM, the FHWA, and the Wyoming Department of Transportation that defines each agency's responsibilities in regard to processing federal-aid highway appropriations.
Grass Creek Travel Management Area	—	BLM, Wyoming State Board of Land Commissioners, WGFD, LU Sheep Company, Travel Management in Grass Creek area.
Renner, Carter Billy Miles Tensleep Public Access Area	—	BLM, WGFD – Public access.
Medicine Lodge Habitat Management Unit Areas	—	BLM, WGFD – Public Access.
Double H Ranch Access Area	—	BLM, Double H Ranch, WG&F – Public Access.
Nowater OHV Trail System	—	BLM, Wyoming State Trails Program, Worland Chamber of Commerce, Ten Sleep Chamber of Commerce.
Cooperative Management Agreement between BLM, Worland District, LU Sheep Company, WGFD, Wyoming State Board of Land Commissioners	1989	

Memoranda and Agreements	Year	Description
Public Access Area Agreements Between BLM and WGFD	—	Public access area agreements to numerous BLM parcels on South Fork, Shoshone, North Fork Shoshone, Clarks Fork of the Yellowstone River, and Luce and Hogan Reservoirs.
Cooperative Management Agreement between BLM, Worland District, WGFD, Wyoming State Board of Land Commissioners, Double-H Ranch	June 1994	
Assistance agreement KAA990028 – Abandoned Mine Land Reclamation Agreement	—	The Abandoned Mine Land program in Wyoming currently operates pursuant to this assistance agreement between the Wyoming State Office of the BLM and the Wyoming DEQ. It provides for the cooperative effort between the two agencies for a long term relationship to efficiently and economically plan for, and share responsibilities of, effective abandoned mine land reclamation on public lands in Wyoming.
March 1990, an Umbrella Memorandum of Understanding between the WGFD and BLM Wyoming for Management of the Fish and Wildlife Resources on the Public Lands was signed (No Number)	1990	The purpose of the Memorandum of Understanding is to strengthen the cooperative approach to the management of wildlife and wildlife habitat on public land between the two agencies and to encourage them to work together to develop, enhance, maintain, and manage wildlife resources, including planning and sharing data concerning biological resources.
The Paleontological Resources Preservation Act	2009	Recently signed legislation supplements existing laws and guidance regarding paleontological resources on BLM lands (e.g., Federal Land Policy and Management Act, BLM Manual 8270, and BLM Handbook H-8270-1). The Paleontological Resources Preservation Act became law on March 30, 2009, as part of the Omnibus Public Lands Management Act of 2009 (Public Law 111-011). The BLM has followed up with Instruction Memoranda that reinforce policies regarding confidentiality and paleontological collecting in light of the new law (Instruction Memorandum dated June 11, 2012, “Collecting Paleontological Resources Under the Paleontological Resources Preservation Act of 2009” and Instruction Memorandum dated June 11, 2012, “Confidentiality of

Memoranda and Agreements	Year	Description
		Paleontological Locality Information under the Omnibus Public Lands Act of 2009”).
Omnibus Public Lands Management Act	2009	Recently signed legislation supplements existing laws and guidance regarding paleontological resources on BLM lands (e.g., Federal Land Policy and Management Act, BLM Manual 8270, and BLM Handbook H-8270-1). The Paleontological Resources Preservation Act became law on March 30, 2009, as part of the Omnibus Public Lands Management Act of 2009 (Public Law 111-011). The BLM has followed up with Instruction Memoranda that reinforce policies regarding confidentiality and paleontological collecting in light of the new law (Instruction Memorandum dated June 11, 2012, “Collecting Paleontological Resources Under the Paleontological Resources Preservation Act of 2009” and Instruction Memorandum dated June 11, 2012, “Confidentiality of Paleontological Locality Information under the Omnibus Public Lands Act of 2009”).
The Taylor Grazing Act	1934	The principle legislation used to administer livestock grazing on public lands until 1976 when Congress passed the Federal Land Policy and Management Act.

Appendix B. Maps

Maps are included in electronic format. In hardcopy documents, maps can be found on a compact disk (CD) attached to the inside back cover of Volume 2.

The maps provided with this document are for illustrative purposes only and might not accurately reflect all decisions due to the size of the resource area; details can be obscured or not readily apparent, or the size may appear larger on the maps so that the feature stands out when depicted on such a broad scale. The management actions that make up the Lander Proposed Resource Management Plan (RMP) are in all cases the decision and not modified by the manner in which the decision is displayed on the maps.

Map 1. Surface Ownership in the Planning Area

Map 2. Federal Mineral Estate in the Planning Area

Map 3. Dubois Area and General Location Names

Map 4. Physical Resources - Major River Basins

Map 5. Physical Resources - Riparian Areas

Map 6. Physical Resources - Class I Waters

Map 7. Physical Resources - Wind Erosion Potential

Map 8. Physical Resources - Water Erosion Potential

Map 9. Physical Resources - Annual Precipitation

Map 10. Physical Resources - Surface Slope

Map 11. Physical Resources - Soils with Limited Reclamation Potential

Map 12. Physical Resources - Citizen Proposed Wilderness

Map 13. Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative B)

Map 14. Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative D)

Map 15. Mineral Resources - Uranium Mining Projects and Districts

Map 16. Mineral Resources - Geothermal Development Potential

Map 17. Mineral Resources - Conventional Oil and Gas Development Potential

Map 18. Mineral Resources - Salable - Mineral Materials Sand and Gravel Occurrence Potential

Map 19. Mineral Resources - Phosphate Leasing Potential

Map 20. Mineral Resources - Coalbed Natural Gas Development Potential

Map 21. Mineral Resources - Locatable Mineral Withdrawals (Alternative A)

Map 22. Mineral Resources - Locatable Mineral Withdrawals (Alternative B)

Map 23. Mineral Resources - Locatable Mineral Withdrawals (Alternative C)

Map 24. Mineral Resources - Locatable Mineral Withdrawals (Alternative D)

Map 25. Mineral Resources - Geothermal Energy Constraints (Alternative A)

Map 26. Mineral Resources - Geothermal Energy Constraints (Alternative B)

Map 27. Mineral Resources - Geothermal Energy Constraints (Alternative C)

Map 28. Mineral Resources - Geothermal Energy Constraints (Alternative D)

Map 29. Mineral Resources - Oil and Gas Constraints (Alternative A)

Map 30. Mineral Resources - Oil and Gas Constraints (Alternative B)

Map 31. Mineral Resources - Oil and Gas Constraints (Alternative C)

Map 32. Mineral Resources - Oil and Gas Constraints (Alternative D)

Map 33. Mineral Resources - Oil and Gas Fields and Leases

Map 34. Mineral Resources - Salable - Mineral Materials Disposal (Alternative A)

Map 35. Mineral Resources - Salable - Mineral Materials Disposal (Alternative B)

Map 36. Mineral Resources - Salable - Mineral Materials Disposal (Alternative C)

Map 37. Mineral Resources - Salable - Mineral Materials Disposal (Alternative D)

Map 38. Mineral Resources - Phosphate Leasing (Alternative A)

Map 39. Mineral Resources - Phosphate Leasing (Alternative B)

Map 40. Mineral Resources - Phosphate Leasing (Alternative C)

Map 41. Mineral Resources - Phosphate Leasing (Alternative D)

Map 42. Fire Management - Fire Regime Condition Classifications

Map 43. Fire Management - Fire Management Units

**Map 44. Biological Resources - Precipitation Zones for U.S. Department of Agriculture
Natural Resources Conservation Service Ecological Site Descriptions**

Map 45. Biological Resources - Vegetation Communities and Major Land Resource Areas

Map 46. Biological Resources - Invasive Plant Species

Map 47. Biological Resources - Primary Forest Resource Areas

Map 48. Biological Resources - Proper Functioning Condition Streams

Map 49. Biological Resources - Fish-bearing Streams

Map 50. Biological Resources - Bighorn Sheep Crucial Winter Range and Parturition Areas

Map 51. Biological Resources - Elk Winter Ranges and Parturition Areas

Map 52. Biological Resources - Moose Crucial Winter Range

Map 53. Biological Resources - Mule Deer Crucial Winter Range

Map 54. Biological Resources - Pronghorn Crucial Winter Range

**Map 55. Biological Resources - Wyoming Game and Fish Department Bighorn Sheep Herd
Units**

Map 56. Biological Resources - Wyoming Game and Fish Department Elk Herd Units

Map 57. Biological Resources - Wyoming Game and Fish Department Moose Herd Units

Map 58. Biological Resources - Wyoming Game and Fish Department Mule Deer Herd Units

Map 59. Biological Resources - Wyoming Game and Fish Department Pronghorn Herd Units

Map 60. Biological Resources - Big Game Migration Routes and Barriers

Map 61. Biological Resources - Wyoming Game and Fish Department White-tailed Deer Herd Units

Map 62. Biological Resources - Known Raptor Nests

Map 63. Biological Resources - Special Status Species Greater Sage-Grouse (Alternatives A and C)

Map 64. Biological Resources - Special Status Species Greater Sage-Grouse (Alternative B)

Map 65. Biological Resources - Special Status Species Greater Sage-Grouse (Alternative D)

Map 66. Biological Resources - Special Status Species Lynx Analysis Units

Map 67. Biological Resources - Special Status Species Desert Yellowhead Critical Habitat

Map 68. Biological Resources - Wild Horse Herd Management Areas

Map 69. Heritage and Visual Resources - Cultural Resources

Map 70. Heritage and Visual Resources - Potential Fossil Yield Classifications

Map 71. Heritage and Visual Resources - Visual Resource Inventory Distance Mapping Zones

Map 72. Heritage and Visual Resources - Visual Resource Inventory Sensitivity

Map 73. Heritage and Visual Resources - Visual Resource Inventory Scenic Quality

Map 74. Heritage and Visual Resources - New (2009) Visual Resource Inventory Classes

Map 75. Heritage and Visual Resources - Existing (1985) Visual Resource Management Classes (Alternative A)

Map 76. Heritage and Visual Resources - Visual Resource Management Classes (Alternative B)

Map 77. Heritage and Visual Resources - Visual Resource Management Classes (Alternative C)

Map 78. Heritage and Visual Resources - Visual Resource Management Classes (Alternative D)

Map 79. Heritage and Visual Resources - Regional Historic Trails and Early Highway-Intact Portions (Alternatives A, C, and D)

Map 80. Heritage and Visual Resources - Regional Historic Trails and Early Highways (Alternative B)

Map 81. Land Resources - Transportation Features

Map 82. Land Resources - Jeffrey City Area Transportation Features

Map 83. Land Resources - Lander Area Transportation Features

Map 84. Land Resources - Lysite Area Transportation Features

Map 85. Land Resources - Dubois Area Transportation Features

Map 86. Land Resources - 1987 Recreation Opportunity Spectrum

Map 87. Land Resources - Recreation Opportunity Spectrum 2009 Physical Setting

Map 88. Land Resources - Recreation Opportunity Spectrum 2009 Social Setting

Map 89. Land Resources - Recreation Opportunity Spectrum 2009 Operational Setting

Map 90. Land Resources - Recreation Management Areas (Alternative A)

Map 91. Land Resources - Recreation Management Areas (Alternative B)

Map 92. Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative C)

Map 93. Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative D)

Map 94. Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternatives A and D)

Map 95. Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternatives B and C)

Map 96. Land Resources - Wind Energy Potential

Map 97. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative A)

Map 98. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative B)

Map 99. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative C)

Map 100. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative D)

Map 101. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative A)

Map 102. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative B)

Map 103. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative C)

Map 104. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative D)

Map 105. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative A)

Map 106. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative B)

Map 107. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative C)

Map 108. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative D)

Map 109. Land Resources - Trails and Travel Management (Alternative A)

Map 110. Land Resources - Trails and Travel Management (Alternative B)

Map 111. Land Resources - Trails and Travel Management (Alternative C)

Map 112. Land Resources - Trails and Travel Management (Alternative D)

Map 113. Land Resources - Trails and Travel Management Seasonal Limitation to All Travel (Alternative D)

Map 114. Land Resources - Trails and Travel Management Over-Snow Travel (Alternative A)

Map 115. Land Resources - Trails and Travel Management Over-Snow Travel (Alternative B)

Map 116. Land Resources - Trails and Travel Management Over-Snow Travel (Alternative D)

Map 117. Land Resources - Livestock Grazing (Alternatives A and C)

Map 118. Land Resources - Livestock Grazing (Alternative B)

Map 119. Land Resources - Livestock Grazing (Alternative D)

Map 120. Land Resources - Recreation Sites

Map 121. Special Designations - Continental Divide National Scenic Trail

Map 122. Special Designations - National Historic Trails High Potential Segments

Map 123. Special Designations - National Historic Trails with Associated Sites

Map 124. Special Designations - National Historic Trails (Alternative A)

Map 125. Special Designations - National Historic Trails (Alternative B)

Map 126. Special Designations - National Historic Trails (Alternative C)

Map 127. Special Designations - National Trails Management Corridor (Alternative D)

Map 128. Special Designations - Wilderness Study Areas

Map 129. Special Designations - Suitable Wild and Scenic River Segments (Alternatives A, B, and D)

Map 130. Special Designations - Areas of Critical Environmental Concern (Alternative A)

Map 131. Special Designations - Areas of Critical Environmental Concern (Alternative B)

Map 132. Special Designations - Areas of Critical Environmental Concern (Alternative D)

Map 133. Socioeconomic Resources - Tribal Census Tracts in the Wind River Indian Reservation

Map 134. Mineral Resources - Designated Development Area (Alternative D)

Map 135. Mineral Resources - Areas with Master Leasing Plans (Alternative D)

Map 136. Cumulative Impact Analysis Area - Greater Sage-Grouse - Surface Ownership

Map 137. Cumulative Impact Analysis Area - Greater Sage-Grouse - Split Estate

Map 138. Cumulative Impact Analysis Area - Fourth Order Hydrologic Units

Map 139. Cumulative Impact Analysis Area - Wyoming Basin Ecoregion and Continental Divide National Scenic Trail

Map 140. Cumulative Impact Analysis Area - National Historic Trails

Map 141. Land Resources - Lands Proposed for Exchange by Members of the Public

Map 142. Trails and Travel Management - Travel Management Areas

Appendix C. Recreation Management Area Forms

Recreation Program Objectives

This appendix is focused solely on detailing the management of distinct Special Recreation Management Areas (SRMAs). Additional goals, objectives, and management actions for the Distinct Extensive Recreation Management Areas (ERMAs) and the rest of the planning area is detailed in Chapter 2. Table C.1, “Lander Field Office Recreation and Visitor Services Objectives” (p. 1453) below, displays the standard recreation objectives that apply to the entire Lander Field Office regardless of SRMA or ERMA status. Table C.2, “Difference in Recreation Management Areas” (p. 1454) below, displays the difference between SRMAs, Distinct ERMAs, and the rest of the planning area.

Table C.1. Lander Field Office Recreation and Visitor Services Objectives

Lander Field Office Wide Objective(s)
● Resource Protection Objective: Increase awareness, understanding, and a sense of stewardship in recreational activity participants so their conduct safeguards cultural and natural resources as defined by Wyoming Standards for Public Land Health or area-specific (such as Areas of Critical Environmental Concern and Wild and Scenic Rivers) objectives. ● Visitor Health and Safety Objective: Ensure that visitors are not exposed to unhealthy or unsafe human-created conditions (defined by a repeat or recurring incident in the same year, of the same type, in the same location, due to the same cause). ● Use/User Conflict Objective: Achieve a minimum level of conflict between recreation participants and (1) other resource/resource uses sufficient to enable the achievement of identified land use plan goals, objectives, and actions; (2) private land owners sufficient to curb illegal trespass and property damage; and (3) other recreation participants sufficient to maintain a diversity of recreation activity participation. ● Objectives Ensuring Facilitation of Hunting Heritage and Wildlife Conservation. ○ Expand Wildlife-Dependent Recreation opportunities on federal land ○ Improve and enhance access to public lands important for Wildlife-Dependent Recreation opportunities ○ Ensure the enjoyment of Wildlife-Dependent Recreation among various demographic groups ○ Facilitate trophy/high quality hunting opportunities in Wyoming Game and Fish Department hunt units targeted for special management criteria.

Table C.2. Difference in Recreation Management Areas

	SRMA	Distinct ERMA	The Rest of the Lander Field Office
<i>Recreation Opportunity Management</i>	Managed to provide specific opportunities and settings in response to visitor demand.	Managed to provide diverse opportunities, as necessary to achieve planning objectives.	Managed to provide a diversity of recreation opportunities and settings.
<i>Allowable Uses and Management Actions</i>	Allowable uses and management actions must sustain or enhance recreation settings characteristics.	Allowable uses and management actions address recreation-tourism issues, activities, conflicts, and/or particular recreation setting.	Management Actions and allowable uses may be necessary to protect resources or investments.
<i>Management Common to All Areas</i>	All areas are managed to meet statutory requirements to ensure resource protection, human health and safety, and reduce conflict as well as achieve other program planning objectives.		
ERMA Extensive Recreation Management Area SRMA Special Recreation Management Area			

Existing Management (Alternative A)

The 1987 Resource Management Plan (RMP) was drafted under old planning guidance and no longer meets the minimum planning decision requirements directed at planning for recreation and visitor services. Table C.3, “Existing Recreation Management (Alternative A)” (p. 1454) below, outlines the general management direction detailed in the existing plan.

Table C.3. Existing Recreation Management (Alternative A)

Area Name	Area Type	Management Focus (Planning Objective)
National Historic Trail	SRMA	A management plan will provide detailed planning for SRMAs.
Continental Divide National Scenic Trail	SRMA	A management plan will provide detailed planning for SRMAs.
South Pass	SRMA	Management will be oriented toward maintaining recreational opportunities in terms of rustic, open-space settings.
● Green Mountain Management Unit ● Gas Hills Management Unit ○ Lysite Badlands ○ Sweetwater Rocks ○ Copper Mountain ● Beaver Creek Management Unit ○ Government Draw ○ Beaver Rim ● Lander Slope Management Unit	ERMA	Recreation management will emphasize the resolution of user conflicts/competing uses and provide for resource protection.

Area Name	Area Type	Management Focus (Planning Objective)
- East Fork Management Unit - Dubois Management Unit - Warm Springs Canyon		
Red Canyon Management Unit	ERMA	No direction provided.
Whiskey Mountain Management Unit	ERMA	The BLM will cooperate with the WGFD on non-consumptive wildlife visitor use management.
Dubois Badlands	ERMA	The area will be managed in its natural state. Recreation management will emphasize resolving competing uses and providing for resource protection.
BLM Bureau of Land Management ERMA Extensive Recreation Management Area SRMA Special Recreation Management Area WGFD Wyoming Game and Fish Department		

As Table C.3, “Existing Recreation Management (Alternative A)” (p. 1454) demonstrates, historic planning for the recreation resource provided little future direction. This lack of direction resulted in several instances where visitor services and management actions were disjointed and sometimes in direct conflict with one another. For existing management to be in compliance with the new Land Use Planning Guidance, the management direction would need to be substantially overhauled so as to provide a similar level of detail contained under alternatives B and C. Table C.4, “Special Recreation Management Areas” (p. 1455) and Table C.5, “Distinct Extensive Recreation Management Areas” (p. 1456) below, display the recreation management areas for the various alternatives.

Table C.4. Special Recreation Management Areas

Area Name	Alternative A	Alternative B	Alternative C	Alternative D
CDNST Destination SRMA - Alkali Basin RMZ - Sweetwater Mining RMZ	SRMA (See Table C.3, “Existing Recreation Management (Alternative A)” (p. 1454))	SRMA	See CDNST ERMA	Same as Alternative B
National Trails Undeveloped SRMA	SRMA (See Table C.3, “Existing Recreation Management (Alternative A)” (p. 1454))	SRMA	See NHT and CDNST ERMA	Same as Alternative B (fewer acres)
Dubois Millsite Community SRMA	Planning area wide ERMA	SRMA	SRMA	Same as Alternative B
Lander Community SRMA - Johnny Behind The Rocks RMZ - Sinks Canyon RMZ - The Bus @ Baldwin Creek RMZ	Planning area wide ERMA	SRMA	Planning area wide ERMA	Same as Alternative B (fewer acres)

Area Name	Alternative A	Alternative B	Alternative C	Alternative D
NHTs Destination SRMA • NHTs Auto Tour Route RMZ • NHTs Group Use RMZ	SRMA (see Table C.3, “Existing Recreation Management (Alternative A)” (p. 1454))	SRMA	See NHT ERMA	SRMA
Sweetwater Canyon Undeveloped SRMA	Planning area wide ERMA	SRMA	Distinct ERMA	SRMA
Sweetwater Rocks Undeveloped SRMA	Distinct ERMA	SRMA	Distinct ERMA	SRMA (fewer acres than Alternative B)
CDNST Continental Divide National Scenic Trail ERMA Extensive Recreation Management Area NHT National Historic Trail RMZ Recreation Management Zone SRMA Special Recreation Management Area				

Table C.5. Distinct Extensive Recreation Management Areas

Area	Alternative A	Alternative B	Alternative C	Alternative D
Castle Gardens ERMA Copper Mountains WSA Dubois Badlands WSA	Distinct ERMA	Distinct ERMA	Distinct ERMA	No Recreation Management Area
Beaver Creek Nordic Ski Area	Planning area wide ERMA	Distinct ERMA	Distinct ERMA	Distinct ERMA
Coalmine/Government Draw	Distinct ERMA	Distinct ERMA	R&PP Lease	No Lease, No Recreation Management Area
Green Mountain ERMA and ACEC Lander Slope/Red Canyon ACECs Whiskey Mountain/Eastfork ACECs	Distinct ERMA	Distinct ERMA	Distinct ERMA	Same as Alternative C
Muskrat Basin ERMA Agate Flats ERMA	Planning area wide ERMA	Distinct ERMA	Distinct ERMA	No Recreation Management Area
NHTs ERMA (¼ mile on either side of the Trail not contained within a SRMA)	SRMA (see Table C.4, “Special Recreation Management Areas” (p. 1455))	Distinct ERMA (Portions of the trail) (more acres than Alternative C)	Distinct ERMA (entire trail) (fewer acres than Alternative B)	Same as Alternative B
CDNST ERMA (Trail area not contained within a SRMA)	SRMA (see Table C.4, “Special Recreation Management Areas” (p. 1455))	Distinct ERMA (¼ mile on either side of portions of the trail) (fewer acres than Alternative C)	Distinct ERMA (¼ mile on either side of the entire trail) (more acres than Alternative B)	Same as Alternative B
ACEC Area of Critical Environmental Concern CDNST Continental Divide National Scenic Trail ERMA Extensive Recreation Management Area NHT National Historic Trail R&PP Recreation and Public Purposes SRMA Special Recreation Management Area WSA Wilderness Study Area				

Continental Divide National Scenic Trails (Alternatives B and D)

Table C.6. Alkali Basin Recreation Management Zone

SUPPORTING INFORMATION
This documents the rationale for consideration of the Special Recreation Management Area (SRMA) in the planning process and, if selected, designation of the SRMA in the record of decision.
This SRMA is necessary to accommodate national visitor demand for destination oriented long distance trail opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers, through community involvement workshops, and through the enabling legislation for the Continental Divide National Scenic Trail (CDNST). The CDNST in the area runs along a high plateau that provides overlook views of the great divide basin, numerous prairie and mountain wildlife species, and is a physically challenging trail. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
Objectives describe the intended recreation activities, experiences and benefits. SRMAs may be subdivided into RMZs with discrete objectives.
Objective Statement: The Alkali Basin RMZ of the CDNST Destination SRMA will be sustained or enhanced for thru-travelers and middle country hunters (fall) to engage in horseback riding, hiking, hunting (fall), and mountain biking, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:
Activities: Horse riding/packing, Hiking/backpacking, and Hunting (fall)
Experiences: Enjoying the sensory experience of a natural landscape, Testing endurance, Escaping everyday responsibilities and, and Being isolated and independent.
Benefits: Enhanced awareness and understanding of nature, Closer relationship with the natural world, Improved opportunity to view wildlife close-up, Improved mental health, Improved physical health, Greater retention of distinctive natural landscape features, and Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical, social and operational recreation setting qualities to be maintained or enhanced.
Physical Characteristics: The CDNST in the area will continue to be on or near motorized routes but at least a ½ mile from improved roads, though they may be in sight. The natural setting of the area may have modifications that would be noticed but not draw the attention of an observer wandering through the area (Visual Resource Management Class II). Facilities and structures in support of recreation and other uses will continue to be rare.
Social Characteristics: Average encounters per day during peak CDNST use season (July-September), will not exceed for three consecutive years, 3 encounters per day at known campsite locations, and 6 encounters per day on travel routes. Usual group size will be small.
Operational Characteristics: 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles, in addition to nonmotorized mechanized use will continue to be allowed when the trail is on existing or open roads so long as the use does not interfere with the nature and purpose of the CDNST. Motorized vehicles are not allowed on areas where the trail travels cross-country off existing roads or where the trail travels along a closed road. Onsite controls and services will continue to be present but subtle. Offsite services and controls will be provided in the minimum amount necessary to reach management objectives.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
Land use plan-level management actions and allowable use decisions for the recreation and visitor services program and other programs necessary to: support the recreation objective, maintain or enhance the desired Recreation Setting Characteristics, address visitor health/safety, mitigate recreation impacts on cultural/natural resources, and reduce use/user conflicts.

Recreation and Visitor Services Program: • Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. • The area will be closed to competitive events. Other Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained. • Continue to enhance the availability of dependable non-potable water sources for trail hikers. • Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. • Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced. • Consider the use of a memorandum of understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area. Other Programs: • Class II Visual Resource, • Additional Allowable Use Decisions for the CDNST are contained in Table 2.33, “7000 Special Designations (SD) – Congressionally Designated Trails” (p. 191).
IMPLEMENTATION DECISIONS Actions to achieve or implement land use plan decisions. If implementation decisions are included in the land use planning document they must have site-specific environmental analysis and be clearly distinguished as appealable decisions. Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Table C.7. Sweetwater Mining Recreation Management Zone

SUPPORTING INFORMATION This Special Recreation Management Area (SRMA) is necessary to accommodate national and regional visitor demand for destination oriented long distance trail and day use trail hiking/learning opportunities in a richly historic area. This demand has been identified by onsite customers, through community involvement workshops, and through the enabling legislation for the Continental Divide National Scenic Trail (CDNST). The CDNST in the area runs through the historic Sweetwater Mining District where historic remains are interpreted and stabilized for public enjoyment. Several existing facilities in the area provide camping, and day use trail/driving for pleasure opportunities. The area also contains a high diversity of vegetation and wildlife, providing additional opportunities for sightseeing and wildlife oriented recreation. SRMA management will sustain and enhance these amenities, as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS Objective Statement: Manage the Sweetwater Mining District RMZ of the CDNST Destination SRMA for day user and CDNST thru-travelers to engage in cultural site visitation, driving for pleasure, photography, horseback riding, hiking, and mountain biking, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below: Activities: Cultural site visitation, Driving for pleasure, Photography, Horse riding/packing, Developed site camping, Hiking/backpacking, and Mountain biking. Experiences: Testing your endurance, Enjoying the closeness of friends and family, Learning more about things here, Feeling good about the way our cultural heritage is being protected, and Developing skills and abilities. Benefits: Improved capacity for outdoor physical activity, Improved mental health, Stronger ties with my family and friends, Greater respect for cultural heritage, Increased appreciation of area’s cultural heritage, Greater opportunity for people with different skills to exercise in the same place, Greater household awareness of and appreciation for our cultural heritage, Greater protection of area historic structures and archeological sites, and Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

Physical Characteristics: The CDNST in the area will continue to be on or near motorized routes but at least a ½ mile from improved roads, though they may be in sight. The natural setting of the area may have modifications that would be noticed but not draw the attention of an observer wandering through the area (Visual Resource Management Class II). Facilities and structures in support of recreation and other uses will continue to be rare along the CDNST. Additional facilities and structures may be added in areas out of sight or away from the CDNST.

Social Characteristics: On the CDNST usually 7-14 encounters per day will occur off travel routes (e.g., staging areas, campgrounds), and 15-29 encounters per day en route. Usual group size is small to moderate. Encounters will largely increase around developed sites and roads adjacent to the CDNST.

Operational Characteristics: 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized use, are allowed in the area. Motorized uses will not be encouraged or facilitated on the CDNST. Motorized or mechanized use will not interfere with the nature and purpose of the CDNST. Motorized vehicles are not allowed off existing roads, on areas where the trail travels cross-country off existing roads, or where the trail travels along a closed road or nonmotorized trail. Onsite controls and services will be present but harmonize with the natural and historic environment.

MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Continue to enhance the availability of dependable non-potable water sources for trail hikers.
- Motorized and mechanized travel in the SRMA is limited to existing roads and trails.
- Work with the local back country horsemen to teach equine Leave No Trace, as well as potentially provide additional horseback facilities (corrals etc.) and trails.
- Investigate opportunities to re-route the CDNST near Phelps-Dodge Bridge, so thru-hikers do not have to parallel the Atlantic City-Three Forks County Road.
- The CDNST through the area will be closed to competitive events, however other Special Recreation Permits will be permitted so long as setting condition and outcome objectives can be maintained.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Work with partners to provide additional interpretation of the historic buildings and other remnants.
- Implement the Miners Delight Interpretation Plan.
- Develop SRMA information and interpretation that connects trail opportunities with developed sites and campgrounds.
- Develop better onsite visitor orientation so visitors to the South Pass State Park are aware of ½ and 1 day CDNST and Volksmarch trail opportunities in the area.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols during the trails high use season (June-September).

Other Programs:

- Class II Visual Resource,
- Additional Allowable Use Decisions for the CDNST are contained in Table 2.33, “7000 Special Designations (SD) – Congressionally Designated Trails” (p. 191).

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Designated Trails Undeveloped Special Recreation Management Area (Alternatives B and D)

Table C.8. Designated Trails Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local and national visitor demand for undeveloped Congressionally Designated Trail opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers, through community involvement workshops, visitor surveys, and through the enabling legislation of the National Historic and Scenic Trails. The area contains 3 Congressionally Designated Trails including: Oregon and California National Historic Trails and the Continental Divide National Scenic Trail (CDNST). The area has abundant prairie wildlife, nearly pristine Wyoming Basin viewshed, and a high probability for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
Objective Statement: The Designated Trails Undeveloped SRMA will be sustained or enhanced for individuals or small groups of historic trail 'rut buffs', CDNST thru-hikers, and middle country hunters (fall season) to engage in cultural site visitation, driving for pleasure, photography, horseback riding, hunting, and hiking so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below: Activities: Cultural site visitation, Driving for pleasure/photography, Horseback riding, Hiking/backpacking, and Hunting. Experiences: Enjoying exploring on my own or in small groups, Enjoying nature, Reflecting on the historical significance of the trail and the people who traveled it, and Feeling good about solitude. Benefits: Better mental health and health maintenance, Greater respect and appreciation for the areas cultural history, Greater appreciation of the outdoors environment, Closer relationship with the natural world, Greater household awareness of and appreciation of our cultural heritage, Protection of cultural sites, Maintenance of distinctive historical recreation setting, and Increased sense of stewardship for the resource.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Characteristics: Majority of the area is on or near 4-wheel drive roads, but at least ½ mile from all improved roads, though they may be in sight. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Trails may exist but do not exceed standard to carry expected use. Facilities and structures are extremely rare. However, nonmotorized trail opportunities will be the focus for visitor services/facilities in this area. Social Characteristics: Usually fewer than 3-6 encounters per day on the Congressionally Designated Trails. Usually group sizes are small in relation to the surrounding area. Operational Characteristics: 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized use, are allowed in the area so long as the use does not interfere with the nature and purpose of the CDNST. Motorized uses will not be encouraged or facilitated in the area. Motorized vehicles are not allowed off existing roads, on areas where the trail travels cross-country off existing roads, or where the trail travels along a closed road or nonmotorized trail. Onsite controls and services present but subtle. Minimum amount necessary to achieve planning objectives.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- The Bureau of Land Management (BLM) and partners will review (using the BLM's contrast rating system) existing facilities and interpretive exhibits to ensure designs harmonize with the characteristic landscape; designs out of character with the landscape will be modified so as not to overpower the landscape.
- Emergency closures will be imposed when necessary to protect the historic trail resource.
- The BLM will not authorize temporary: facilities, campsites, or staging/parking areas to support Special Recreation Permits within this RMZ. Motorized tours will not be authorized in this RMZ.
- In this RMZ, the BLM will authorize special recreation permits for trail oriented nonmotorized group activities consistent with the outcome objective and recreation setting prescriptions above.
- No competitive events will be authorized in this RMZ.
- Additional management actions will be applied as needed to reduce unplanned visitor impacts (vandalism, social trails, and litter etc.). Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all offsite visitor information.
- Some light onsite visitor orientation (kiosk and trail markers) will be developed.
- No new onsite interpretation will be developed on the National Historic Trail in this area.
- Engage local businesses and other partners to ensure promotional material does not over advertise the area.
- Solicit partnerships and cooperative agreements to: Monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols during the trails high use season (June-September).

Other Programs:

- Class II Visual Resource.
- Additional Allowable Use Decisions for the CDNST and the National Historic Trails are contained in Table 2.33, "7000 Special Designations (SD) – Congressionally Designated Trails" (p. 191).

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Dubois Mill Site Special Recreation Management Area (Alternatives B and D)

Table C.9. Dubois Mill Site Recreation Management Zone (Alternatives B and D)

SUPPORTING INFORMATION
This documents the rationale for consideration of the Special Recreation Management Area (SRMA) in the planning process and, if selected, designation of the SRMA in the record of decision.
This SRMA is necessary to accommodate local visitor demand for close to home nonmotorized recreation opportunities; this demand has been identified by onsite customers, through community involvement workshops, and through the Dubois Gateway Plan. The public lands in this area are adjacent to newly acquired lands managed by the town of Dubois as open space and a recreational use area for the citizens. These newly acquired lands currently provide undeveloped nonmotorized access to large blocks of Bureau of Land Management (BLM)-administered land, a Wyoming Game and Fish Department habitat management area, and U.S. Forest Service lands. The public lands in the area contain a multitude of wildlife oriented recreation opportunities as well as several scenic vistas. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
Objectives describe the intended recreation activities, experiences and benefits. SRMAs may be subdivided into RMZs with discrete objectives.

Objective Statement: The Dubois Mill-Site Community SRMA will be sustained or enhanced for nonmotorized recreationists to engage in hiking, walking, horseback riding, wildlife viewing, and hunting so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

Activities: Hiking, Walking, Running, Horseback riding, Wildlife viewing, and Hunting.

Experiences: Escaping everyday responsibilities for a while, Enjoying frequent access to outdoor physical activity in a natural environment, and Enjoying the areas wildlife, scenery, views, and aesthetics.

Benefits: Better mental and physical health, Increased satisfaction with life, Greater cultivation of an outdoor oriented lifestyle, Greater understanding and respect for private property, Heightened sense of community pride and satisfaction, Greater environmental awareness and stewardship, Greater aesthetic appreciation, and Preservation of this special place.

RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

Physical, social and operational recreation setting qualities to be maintained or enhanced.

Physical Characteristics: The area is within ½ mile of the town of Dubois. The natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area. Trails may exist but will not exceed standard and density to carry expected use. Facilities and structures are rare and within close proximity to highway/parking area.

Social Characteristics: Usually 7-14 encounters with other groups per day.

Operational Characteristics: Mountain bikes and other mechanized use, but all use is nonmotorized. Onsite controls and services are present, but harmonize with the natural environment. Offsite services such as an area brochure will be available.

MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Land use plan-level management actions and allowable use decisions for the recreation and visitor services program and other programs necessary to: support the recreation objective, maintain or enhance the desired Recreation Setting Characteristics, address visitor health/safety, mitigate recreation impacts on cultural/natural resources, and reduce use/user conflicts.

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Pursue partnerships with the town of Dubois and other Dubois Gateway Plan partners to ensure continued enforcement of travel management designations.
- Establish light connecting nonmotorized loop trails, as discussed in community project plan.
- Develop partnerships to pursue land acquisitions and easements necessary to maintain characteristic landscape, natural setting, and targeted experiences and benefits.
- Ensure targeted experiences and benefits, as well as recreation setting information is included and explained in all visitor information.
- Promote the RMZ to the Dubois community through partnerships with local community businesses and the town of Dubois.
- Light interpretation may be developed to facilitate targeted outcomes; utilize community members, academic organizations, and community centers to meet needs for higher levels of education and interpretation.
- The BLM will assist the community with project design, technical expertise, and other services in order to help achieve the objectives outlined in the Dubois Gateway Plan document.
- Develop a memorandum of understanding between the BLM, Dubois Gateway Plan members, and the community of Dubois to ensure continued cooperative community stewardship of public lands contained within the RMZ.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols (June-September).

Other Programs:

- Closed to Fluid Mineral Leasing (alternatives B and D)
- Closed to Geothermal Development (alternatives B and D)

- Closed to Geophysical Exploration (alternatives B and D)
- Closed To Mineral Material Sales and Free Use Permits (alternatives B and D)
- New rights-of-ways are excluded (alternatives B and D)
- Renewable Energy Development is excluded (alternatives B and D)
- Petition to withdrawal from entry under the 1872 Mining Law (alternatives B and D)
- The SRMA is managed as a Class II Visual Resource (alternatives B and D)
- Closed to motorized vehicle use (alternatives B and D)

IMPLEMENTATION DECISIONS

Actions to achieve or implement land use plan decisions. If implementation decisions are included in the land use planning document they must have site-specific environmental analysis and be clearly distinguished as appealable decisions.

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Dubois Mill Site Special Recreation Management Area (Alternative C)

Table C.10. Dubois Mill Site Recreation Management Zone (Alternative C)

SUPPORTING INFORMATION
This documents the rationale for consideration of the Special Recreation Management Area (SRMA) in the planning process and, if selected, designation of the SRMA in the record of decision.
Same as alternatives B and D except for the following: SRMA management will sustain and enhance motorized access to the area as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
Objectives describe the intended recreation activities, experiences and benefits. SRMAs may be subdivided into RMZs with discrete objectives.
Objective Statement: The Dubois Mill-Site Community SRMA will be sustained or enhanced for nonmotorized and motorized recreationists to engage in hiking, walking, horseback riding, wildlife viewing, hunting, and motorized trail riding, so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below: Activities: Hiking, Walking, Running, Horseback riding, Wildlife viewing, Hunting, and Motorized trail riding. Experiences: Escaping everyday responsibilities for a while, Developing skills and abilities, Enjoying having access to close to home outdoor amenities, Enjoying risk taking, and Sharing/talking about your equipment with others. Benefits: Better mental and physical health, Increased satisfaction with life, Greater cultivation of an outdoor oriented lifestyle, Improved outdoor recreation skills, Greater sense of adventure, Enhanced sense of freedom, Greater opportunity for people with different skills to exercise in the same place, Improved physical capacity to do my favorite activity, Greater understanding and respect for private property, and Heightened sense of community pride and satisfaction.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical, social and operational recreation setting qualities to be maintained or enhanced.

Physical Characteristics: Within ½ mile of the town of Dubois. Motorized use will be allowed on the designated trail through the area. Natural setting may have modifications that would be noticed, but not draw the attention of an observer wandering through the area. Trails may exist but do not exceed standard and density to carry expected use. Facilities and structures are rare and within close proximity to highway/parking area.

Social Characteristics: Usually 7-14 encounters with other groups per day.

Operational Characteristics: Motorized use will be allowed on the identified trail (existing access road); the area southwest of the existing access road along Jakey's Fork Rim will be closed to motorized vehicle use. Onsite controls and services are present, but harmonize with the natural environment. Offsite services such as an area brochure will be available.

MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Land use plan-level management actions and allowable use decisions for the recreation and visitor services program and other programs necessary to: support the recreation objective, maintain or enhance the desired Recreation Setting Characteristics, address visitor health/safety, mitigate recreation impacts on cultural/natural resources, and reduce use/user conflicts.

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Pursue partnerships with the town of Dubois and other Dubois Gateway Plan partners to ensure continued enforcement of travel management designations.
- Establish light connecting nonmotorized loop trails as discussed in community project plan.
- Work with the state trails program to ensure effective enforcement of motorized travel limitations in the area.
- Motorized seasonal closures will be implemented with gates at the best available location for enforcement and to ensure control of motorized use.
- The area will be closed to over snow travel.
- Develop partnerships to pursue land acquisitions and easements necessary to maintain characteristic landscape, natural setting, and targeted experiences and benefits.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Promote the RMZ to the Dubois community through partnerships with local community businesses and the town of Dubois.
- Light interpretation may be developed to facilitate targeted outcomes; utilize community members, academic organizations, and community centers to meet needs for higher levels of education and interpretation.
- The BLM will assist the community with project design, technical expertise, and other services, in order to help achieve the objectives outlined in the Dubois Gateway Plan document.
- Develop a memorandum of understanding between the Bureau of Land Management, Dubois Gateway Plan members, and the community of Dubois to ensure continued cooperative community stewardship of public lands contained within the RMZ.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols (June-September).

IMPLEMENTATION DECISIONS

Actions to achieve or implement land use plan decisions. If implementation decisions are included in the land use planning document they must have site-specific environmental analysis and be clearly distinguished as appealable decisions.

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Lander Community Special Recreation Management Area (Alternatives B and D)

Table C.11. Johnny Behind the Rocks Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for close to home nonmotorized recreation opportunities in the Lander area; this demand has been identified by onsite customers and through community involvement workshops. The public lands in this area are located within a 15 minute drive of the town of Lander. The area currently provides a limited amount of nonmotorized trail opportunities, with diverse and appealing topography. The public lands in the area also contain a multitude of wildlife oriented recreation opportunities as well as several scenic vistas including a prairie waterfall. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
Objective Statement: The Johnny Behind the Rocks RMZ of the Lander Community SRMA will be sustained or enhanced for nonmotorized recreationists to engage in horseback riding, hiking, trail running, wildlife viewing, and mountain biking so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below: Activities: Horseback riding, Trail running, Mountain biking, Hiking, and Wildlife viewing. Experiences: Enjoying the sensory experience of a natural landscape, Enjoying exercise and physical fitness, Developing skills and abilities, Enjoying having access to close to home outdoor amenities, and Feeling that this community is a special place to live. Benefits: Improved mental and physical health, Greater connection to nature, Improved opportunity to view wildlife close up, Greater sense of place, Improved outdoor recreation skills, Heightened sense of satisfaction with our community, and Reduced adverse human impacts such as litter, vegetative trampling, and unplanned trails.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Characteristics: Majority of the area is on or near improved country roads, but at least ½ mile from any highways, except in the area directly adjacent to Highway 287. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Facility and trail development will focus on sufficient densities and developments to provide for a full day (6 to 8 hours or up to 40 miles of trail) of use. Facilities and structures will continue to be rare and co-located within close proximity to highway/parking area. Social Characteristics: Usually 3-6 encounters per day off travel routes and 7-15 encounters per day on travel routes. Usual group size is small. Operational Characteristics: Excluding county roads, adjacent highway, the Blue Ridge Road, and livestock permittee access to range improvements; the area will be managed for mountain bikes and non motorized use. Mechanized trail building will be approved as needed to support the identified outcome objective. Onsite controls and services are present, but harmonize with the natural environment.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement closures to motorized vehicle use; utilize administrative access agreements to allow for the maintenance of range improvements.
- New trails will be identified in a master trails plan developed through implementation-level decision making.
- Pursue a land trade and access agreements for parcels in and adjacent to this RMZ.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all offsite visitor information.
- Engage local sporting good businesses and other partners in the development and distribution of a brochure and/or area guide book.
- Some light onsite visitor orientation (kiosk and trail markers) will be developed.
- This RMZ will be managed in a custodial fashion, until which time that a 'friends group' or local club demonstrates a willingness to be involved in the management and stewardship of the site.
- A memorandum of understanding (MOU) will be developed between the Bureau of Land Management (BLM) and pertinent partners such as livestock grazing permittees, local sporting good retailers, and an established friends group or club. The MOU will assign responsibility for the stewardship and development of the site and related amenities; the majority of the cost and labor responsibilities associated with initial investments and maintenance of the identified trails and related amenities will be born upon the established friends group or club.
- The BLM and other partners will provide matching contributions when funding and labor pool allows.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols May-November.

Other Programs:

- No Surface Occupancy for Oil and Gas Development (alternatives B and D)
- Closed to Geothermal Development (alternatives B and D)
- Closed to Geophysical Exploration (alternatives B and D)
- Closed To Material Sales and Free Use Permits (alternatives B and D)
- Closed to sand and gravel disposal (alternatives B and D)
- New rights-of-ways are excluded (alternatives B and D)
- Renewable Energy Development is excluded (alternatives B and D)
- Closed to salable materials (alternatives B and D)
- Petition to withdrawal from entry under the 1872 Mining Law (alternatives B and D)
- The SRMA is managed as a Class II Visual Resource (alternatives B and D)
- Closed to motorized vehicle use (alternatives B and D)

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Table C.12. Sinks Canyon Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for close to home nonmotorized muscle powered recreation opportunities in the Lander area; this demand has been identified by onsite customers and through community involvement workshops. The area currently provides a limited amount of nonmotorized trail opportunities, and world renowned climbing opportunities. Adjacent to Wyoming State Parks and U.S. Forest Service (USFS) lands, provide additional day hiking and overnight camping opportunities. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE OBJECTIVE(S) DECISIONS

The Sinks Canyon Climbing area of the Lander Valley Community SRMA will be sustained or enhanced for muscle-powered recreationists to engage in climbing and hiking so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes below:

Activities: Climbing, and Hiking.

Experiences: Enjoying risk taking adventure, Developing skills and abilities, Enjoying meeting new people, Enjoying teaching others about the outdoors, Feeling that this community is a special place to live, and Feeling good about how this attraction is being used and enjoyed.

Benefits: Improved mental and physical health, Improved skills for outdoor enjoyment, Improved leadership abilities, Improved teamwork and cooperation, Better sense of place, Heightened sense of satisfaction with our community, Increased local tourism revenue, and Greater value-added local services/industry.

RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

Physical Characteristics: Majority of the area is on or near improved country roads, but at least ½ mile from any highways, except in the area directly adjacent to Highway 287. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Trails may exist but do not exceed standard and density to carry expected use. Facilities and structures are rare and isolated.

Social Characteristics: People seem to be everywhere, but human contact remains intermittent.

Operational Characteristics: Excluding county roads, adjacent highway, adjacent United States Forest Service (USFS) and private roads; motorized use will not be allowed on Bureau of Land Management (BLM)-administered lands. Onsite controls and services are present, but harmonize with the natural environment. Majority of services are provided by the Wyoming State Parks and USFS.

MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement closures to mechanized and motorized travel (Alternative B only).
- Mechanized and motorized travel limited to designated roads and trails (alternatives A and C).
- Work with local climbing community and adjacent land management agencies to maintain this area.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners in the development and distribution of a brochure and/or area guide book.
- Some onsite visitor orientation (kiosk and trail markers) will be developed.
- A memorandum of understanding will be developed between the BLM and pertinent partners such as local sporting goods retailers, Wyoming State Parks, the National Outdoor Leadership School, and an established friends group or club.
- The BLM and other partners will provide matching contributions when funding and labor pool allows.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols.

Other Programs:

- No Surface Occupancy for Oil and Gas Development (alternatives A, B, and D)
- Closed to Geothermal Development (alternatives A, B, and D)
- Closed to Geophysical Exploration (alternatives A, B, and D)
- Closed To Material Sales and Free Use Permits (alternatives A, B, and D)
- New rights-of-ways are excluded (alternatives A, B, and D)
- Renewable Energy Development is excluded (alternatives A, B, and D)
- Petition to withdrawal from entry under the 1872 Mining Law (Alternative B)
- The SRMA is managed as a Class II Visual Resource (alternatives A, B, and D)
- Mineral entry requires a Plan of Operations (alternatives A and D)
- Closed to motorized vehicle use (alternatives B and D)
- Motorized use limited to designated roads (Alternative A)
- Mechanized use limited to designated roads and trails (Alternative B)

IMPLEMENTATION DECISIONS
Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Table C.13. The Bus @ Baldwin Creek Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for close to home nonmotorized recreation opportunities in the Lander area; this demand has been identified by onsite customers and through community involvement workshops. The public lands in this area are located within walking and pedal biking distance from the town of Lander. The area currently provides a limited amount of nonmotorized trail opportunities, with diverse and appealing topography, and some slick rock formations. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
The Bus @ Baldwin Creek RMZ of the Lander Valley Community SRMA will be sustained or enhanced for nonmotorized recreationists to engage in horseback riding, hiking, trail running, and mountain biking, so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:
Activities: Horseback riding, Trail running, Mountain biking, and Hiking.
Experiences: Enjoying having easy access to natural landscapes, Enjoying exercise and physical fitness, Enjoying closeness of friends and family, Enjoying having access to close to home outdoor amenities, and Feeling that this community is a special place to live.
Benefits: Improved mental and physical health, Greater connection to nature, Greater sense of place, Stronger ties with family and friends, Heightened sense of satisfaction with our community, and Reduced adverse human impacts such as litter, vegetative trampling, and unplanned trails.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Characteristics: Majority of the area is on or near improved country roads, but at least ½ mile from any highways. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Trails may exist but do not exceed standard and density to carry expected use. Facilities and structures are rare and isolated.
Social Characteristics: Usually 3-6 encounters per day off travel routes and 7-15 encounters per day on travel routes. Usually group size is small.
Operational Characteristics: Excluding county roads, adjacent housing development access roads, and livestock permittee access to range improvements; the area will be managed for nonmotorized use. Onsite controls and services are present, but harmonize with the natural environment.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
Recreation and Visitor Services Program:
• Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions. • Implement closures to motorized vehicle use; utilize administrative access agreements to allow for the maintenance of range improvements. • Mechanized use will be limited to designated roads and trails; these trails will be identified through the environmental assessment process in consideration of recommendations from partners such as the state land board, the grazing permittees, an established friends group or club, and other stakeholders or members of the public. • Facility and trail development will focus on sufficient densities and developments to provide for a ¼ day (2-4 hours) of use. • Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information. • Engage local sporting good businesses and other partners in the development and distribution of a brochure and/or area guide book. • Some onsite visitor orientation (kiosk and trail markers) will be developed.

- This RMZ will be managed in a custodial fashion, until which time that a ‘friends group’ or local club demonstrates a willingness to be involved in the management and stewardship of the site.
- A memorandum of understanding (MOU) will be developed between the Bureau of Land Management (BLM) and pertinent partners such as the Wyoming State Land Board, livestock grazing permittees, local sporting good retailers, and an established friends group or club.
- The MOU will assign responsibility for the stewardship and development of the site and related amenities; the majority of cost and labor responsibilities associated with initial investments and maintenance of the identified trails and related amenities will be born upon the established friends group or club.
- The BLM and other partners will provide matching contributions when funding and labor pool allows.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols May-November.

Other Programs:

- No Surface Occupancy for Oil and Gas Development (alternatives A, B, and D)
- Closed to Geothermal Development (alternatives A, B, and D)
- Closed to Geophysical Exploration (alternatives A, B, and D)
- Closed To Material Sales and Free Use Permits (alternatives A, B, and D)
- New rights-of-ways are excluded (alternatives B and D)
- Co-locate new rights-of-way whenever possible (Alternative A)
- Renewable Energy Development is excluded (alternatives B and D)
- Petition to withdrawal from entry under the 1872 Mining Law (Alternative B)
- Mineral entry requires a Plan of Operations (alternatives A and D)
- Closed to motorized vehicle use (alternatives B and D)
- Motorized use limited to designated roads (alternatives A and C)
- Mechanized use limited to designated roads and trails (Alternative B)

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

National Historic Trails Destination Special Recreation Management Area (Alternatives B and D)

Table C.14. National Historic Trails Auto Tour Route Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate regional visitor demand for destination oriented Congressionally Designated Trail opportunities in a safe and facility rich environment; this demand has been identified by onsite customers, through community involvement workshops, visitor surveys, and through the enabling legislation of the National Historic Trails. The area contains four Congressionally Designated Trails including: Oregon, Mormon Pioneer, Pony Express, and California National Historic Trails. The area is currently used for intensive motorized oriented interpretation/wayside exhibits and therefore has the infrastructure and administrative support to accommodate this demand. SRMA management will maintain and enhance these amenities.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS

The Auto Tour Route RMZ will be sustained or enhanced for highway travelers to engage in historic site visitation/learning, teaching history, photography, and driving for pleasure so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

Activities: Cultural site visitation, Learning cultural heritage, Teaching cultural heritage, Photography, and Driving for pleasure.

Experiences: Enjoying the closeness of friends and family, Learning more about the cultural heritage here, Having others nearby who could help you if needed, and Sharing Wyoming's cultural heritage with new people.

Benefits: Enjoying easy access to cultural and historic sites, Stronger ties with family and friends, Increased appreciation of the areas cultural history, Greater household awareness of and appreciation of our cultural heritage, Greater protection of area historic structures and archeological sites, and Sustainability of community's cultural heritage, Increased local tax revenue from visitors.

RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

Physical Characteristics: Majority of the area is on or near primary highways, but still within a rural area. Natural setting may have modifications that range from being easily noticed to strongly dominant to observers. These alterations would remain visually subordinate from sensitive travel routes and use areas.

Paved, improved, and/or primitive roads/highways as well as nonmotorized trails dominate the landscape. Facilities and structures are readily apparent and may range from scattered to small dominant clusters.

Social Characteristics: People seem to be everywhere, but human contact remains intermittent.

Operational Characteristics: Ordinary highway auto and truck traffic is characteristic. Controls and services obvious and numerous. Largely harmonize with the man-made environment.

MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Work with partners and other agencies to continue maintenance of existing sites.
- Work with partner entities and the Wyoming State Historic Preservation Office to sustainably develop areas where new sites are needed to deliver targeted outcomes.
- The Bureau of Land Management (BLM) and partners will review (using the BLM's contrast rating system) existing facilities and interpretive exhibits to ensure designs harmonize with the characteristic landscape; designs out of character with the landscape will be modified so as not to overpower the landscape.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Utilize promotion to focus the majority of trail orientated users into this RMZ.
- Partner with education institution or local museum to develop an interpretive plan to ensure existing interpretation is accurate and delivers a consistent message.
- Coordinate with the National Park Service (NPS) to continue publishing "National Historic Trails Auto Tour Route Interpretive Guide Across Wyoming."
- Utilize promotion to tie this RMZ in with campground facilities in the Green Mountain Extensive Recreation Management Area; as well as available amenities in the Fremont County area.
- Ensure promotion of the area reaches interested user segments by piggyback marketing the RMZ with NPS marketing for Yellowstone National Park.
- Partner with National Historic Trails Center and other local museums to develop displays to demonstrate to potential visitors the opportunities that are available within the RMZ and similar management RMZs within the BLM Casper Field Office.
- The BLM will focus motorized trail orientated special recreation permits and trail interpretation in this RMZ.
- Additional administrative actions will be applied as needed to reduce unplanned visitor impacts (vandalism, social trails, litter etc.).
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies), monitor recreation setting condition through onsite patrols June-September.

Other Programs:

- The SRMA will be managed as a Class II Visual Resource.
- Additional Allowable Use Decisions for the National Historic and Scenic Trails are contained in Table 2.33, “7000 Special Designations (SD) – Congressionally Designated Trails” (p. 191).

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Table C.15. Group Use Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate regional visitor demand for destination oriented Congressionally Designated Trail reenactment opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers, through community involvement workshops, visitor surveys, and through the enabling legislation of the National Historic Trails. The area contains four Congressionally Designated Trails including: Oregon, Mormon Pioneer, Pony Express, and California National Historic Trails. The area is currently used for intensive nonmotorized reenactments and therefore has the infrastructure and administrative support to accommodate this demand. SRMA management will maintain and enhance these amenities.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
The Group Reenactment RMZ of the National Historic Trails Destination SRMA will be sustained or enhanced for organized groups and other trail enthusiasts to engage in physically demanding cultural site visitation/learning, photography, and historic reenactments, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below: Activities: Cultural site visitation, Learning cultural heritage, Teaching cultural heritage, Photography, and Historic reenactment. Experiences: Develop personal and spiritual values, Reflect on personal values, Gaining an experience I can look back on, and Teach and learn about history here. Benefits: Increased opportunities for youth, Greater spiritual growth, Greater appreciation of cultural histories, Increased understanding of history, Stronger ties with family and friends, Greater household awareness of and appreciation of our cultural heritage, Protection of cultural sites, Maintenance of distinctive historical recreation setting, and Reduced human impacts such as: litter, vegetation trampling, and unplanned trails.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Characteristics: The majority of this route is on or near 4-wheel drive roads, but at least ½ mile from all improved roads, though they may be in sight. Natural setting may have subtle modifications that would be noticed, but not draw the attention of an observer wandering through the area. Primitive motorized routes and nonmotorized trails may exist, facilities and structures are rare and often accessible via unimproved routes. Social Characteristics: Average group size and encounters per day are detailed in the 2005 Finding of No Significant Impact/Decision Record for Handcart Trekking. Operational Characteristics: 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized use when the trail is on existing roads. Motorized vehicles are not allowed on Rocky Ridge. Vehicle use on the National Historic Trail in support of Special Recreation Permits will be limited. Onsite controls and services are low; primarily offsite. Minimum amount necessary to achieve planning objectives.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Permanently close trail section over Rocky Ridge to motorized use.
- Motorized and mechanized travel in the remainder of the SRMA will be limited to existing roads and trails.
- The Bureau of Land Management (BLM) and partners (State Historic Preservation Office and National Park Service) will review (using the BLM's contrast rating system) interpretive exhibits to ensure designs harmonize with the characteristic landscape; designs out of character with the landscape will be modified so as not to overpower the landscape.
- Group use in the area is directed and managed through the 2005 Finding of No Significant Impact/Decision Record for Handcart Trekking.
- No competitive events will be authorized in this RMZ.
- Additional administrative actions will be applied as needed to reduce unplanned visitor impacts (vandalism, social trails, litter etc.).
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Utilize promotion to educate users on the physically demanding nature of this RMZ.
- Partner with education institution or local museum to develop an interpretive plan to ensure existing interpretation is accurate and delivers a consistent message.
- Review all interpretation to ensure all site-specific stories are told (Oregon Trail, Pony Express, etc.).
- Provide replacement/offsite interpretation opportunities for visitors physically unable to access motorized vehicle closure of Rocky Ridge, this site may be an interpretation panel or set of panels overlooking Rocky Ridge in close proximity to an improved motorized route.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies), monitor recreation setting condition through onsite patrols June-September.
- With stakeholder involvement, apply Limits of Acceptable Change to ensure protection of the Historic Trail Resource. Limits of Acceptable Change focuses on a cycle of designing-implementing-monitoring-evaluating-adjusting actions to respond to future recreation issues and the results of monitoring.

Other Programs:

- The SRMA will be managed as a Class II Visual Resource.
- Additional Allowable Use Decisions for the National Historic and Scenic Trails are contained in Table 2.33, "7000 Special Designations (SD) – Congressionally Designated Trails" (p. 191).

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Sweetwater Canyon Undeveloped Special Recreation Management Area (Alternatives B and D)

Table C.16. Sweetwater Canyon Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for undeveloped/back country opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers and through community involvement workshops. The canyon waterway is a designated Wilderness Study Area (WSA) and considered for inclusion as a Wild and Scenic River. The area also provides spectacular scenic canyon walls, numerous wildlife species, high quality trout fishing, and opportunities for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS

The Sweetwater Canyon Undeveloped SRMA will be sustained or enhanced for back country enthusiasts to engage in hiking, backpacking, fishing, horseback riding, hunting, and wildlife viewing so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

Activities: Hiking/backpacking, Horseback riding, Hunting, Fishing, and Wildlife viewing.

Experiences: Enjoying the sensory experience of a natural landscape, Feeling good about solitude, Being isolated and independent, and Enjoying an escape from crowds of people.

Benefits: Enhanced awareness and understanding of nature, Improved appreciation of nature, Greater connection to nature, Improved opportunity to view wildlife close up, Better understanding of wildlife's contribution to my quality of life, Greater sense of place, Reduced human impacts such as litter, vegetative trampling, and unplanned trails, Increased awareness and protection of natural landscapes, Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits, and Maintenance of community's distinctive recreation tourism market.

RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

Physical Characteristics: Implement motorized vehicle closures to enhance back country setting. Essentially an unmodified natural environment. Evidence of humans is unnoticed by an observer wandering through the area. Trails may exist but do not exceed standard to carry expected use. Facility and structures are extremely rare, and are located in disturbed (e.g., roaded or front country) areas.

Social Characteristics: Usually 3-6 encounters per day off travel routes (e.g., campsites) and 7-15 encounters per day on travel routes. Usual group size is small.

Operational Characteristics: Access to this area utilizes routes identified as open for 4-wheel drive vehicles, all-terrain vehicles, or dirt bikes, in addition to nonmotorized mechanized routes. A large portion of this area (WSA and inaccessible portions) does not provide for any motorized or mechanized use. Onsite controls and services are low; primarily offsite. Minimum amount necessary to achieve planning objectives.

MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement route closures within the WSA to motorized and mechanized vehicles.
-
- The WSA will be closed to organized group and competitive event Special Recreation Permits.
- Other Special Recreation Permits will be limited as necessary to reach and maintain desired future setting condition
- A foot/horseback trail may eventually need to be developed or identified (from existing trails within the area) to ensure resource protection. Additional trails may also be added to connect the main trail to additionally identified access points.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners to ensure promotional material does not over advertise the area.
- Some onsite visitor orientation (kiosk and signs) may be developed.
- Consider the use of a memorandum of understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance this areas unique natural setting.
- Work with the Wyoming Game and Fish Department and other interested entities to maintain and enhance terrestrial and aquatic habitat in the area.
- Solicit partnerships to ensure adequate maintenance of the areas signs and fences.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols.

Other Programs:

- The WSA is managed under BLM Manual 6330, *Management of Wilderness Study Areas*
- The WSA is managed as a Class I Visual Resource (all alternatives)
- Closed to Livestock Grazing (Alternative B)
- Closed to Motorized and Mechanized Travel (Alternative B)

*Appendix C Recreation Management Area Forms
Sweetwater Canyon Undeveloped Special Recreation
Management Area (Alternatives B and D)*

IMPLEMENTATION DECISIONS
Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

Sweetwater Rocks Undeveloped Special Recreation Management Area (Alternatives B and D)

Table C.17. Sweetwater Rocks Recreation Management Zone

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for undeveloped/back country opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers and through community involvement workshops. The Sweetwater Rocks contain 4 designated Wilderness Study Area (WSA). The area also provides spectacular scenic granite formations, numerous wildlife species, high quality climbing, and opportunities for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
The Sweetwater Rocks Undeveloped SRMA will be sustained or enhanced for back country enthusiasts to engage in hiking, backpacking, climbing, horseback riding, hunting, and wildlife viewing, so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes below:
Activities: Climbing, Hiking/backpacking, Horseback riding, Hunting, and Wildlife viewing.
Experiences: Developing skills and abilities, Enjoying having access to hands on environmental learning, Enjoying the sensory experience of a natural landscape, Feeling good about solitude, being isolated and independent, and Enjoying teaching others about the outdoors.
Benefits: Improved leadership abilities, Improved outdoor knowledge and self confidence, Enhanced awareness and understanding of nature, Improved appreciation of nature, Greater connection to nature, Improved opportunity to view wildlife close up, Greater respect for private property and local lifestyles, Greater sense of place, Improved outdoor recreation skills, Reduced human impacts such as litter, vegetative trampling, and unplanned trails, Improved respect for privately owned lands, Increased awareness and protection of natural landscapes, Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits, Maintenance of community's distinctive recreation tourism market, and Greater value added service industry.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
Physical Characteristics: Implement motorized vehicle closures to enhance back country setting. Essentially an unmodified natural environment. Evidence of humans is unnoticed by an observer wandering through the area. Trails may exist but do not exceed standard to carry expected use. Facility and structures are extremely rare, and are located in disturbed (e.g., roaded or front country) areas.
Social Characteristics: Usually 3-6 encounters per day off travel routes (e.g., campsites) and 7-15 encounters per day on travel routes. Usual group size is small.
Operational Characteristics: Access to this area utilizes routes identified as open for 4-wheel drive vehicles, all-terrain vehicles, or dirt bikes, in addition to nonmotorized mechanized routes. A large portion of this area (WSAs and inaccessible portions) do not allow for any mechanized use. Onsite controls and services are low; primarily offsite. Minimum amount necessary to achieve planning objectives.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement route closures within the WSA to motorized and mechanized vehicles
- The Bureau of Land Management (BLM) will work with local landowners, the Access Fund, Friends of Sweetwater Rocks, local sporting goods retailers, and the National Outdoor Leadership School to pursue land trades, acquisitions or easement in and around this RMZ to facilitate better nonmotorized access.
- Partners will also emphasized the importance of: getting landowner permission before crossing any and all private lands, abiding by Wyoming State land restrictions on overnight camping, and increasing understanding of land ownership patterns in the area.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners to ensure promotional material does not over advertise the area.
- Some onsite visitor orientation (kiosk and signs) may be developed.
- A memorandum of understanding (MOU) will be developed between the BLM and willing/pertinent partners such livestock grazing permittees, local sporting good retailers, the friends of Sweetwater Rocks, the National Outdoor Leadership School, the Wyoming State Land Board, the Access Fund, the Nature Conservancy, and private landowners.
- The MOU will emphasize the desires to maintain this areas unique natural setting while also ensuring protection of private property rights. The BLM will work cooperatively with all partners to pursue improved nonmotorized access.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols.

Other Programs:

- All WSAs are managed consistent with BLM Manual 6330, *Management of Wilderness Study Areas*
- Manage as a Class 1 Visual Resource
- Closed to motorized and mechanized vehicles in the WSA (Alternative B)
- Detailed management of the area outside of the WSA is detailed in Table 2.32, “6000 Land Resources (LR) – Recreation” (p. 178).

IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

This page intentionally
left blank

Appendix D. Reclamation Objectives and Standards

Reclamation will be required for any surface-disturbing activity occurring on public lands. A reclamation plan appropriate in detail and complexity and tailored to a specific surface-disturbing activity will be required for this activity. This appendix details the reclamation objectives and standards necessary to achieve a timely and proper recovery according to management objects of the disturbed site and is consistent with the Wyoming Reclamation Policy.

The reclamation plan will provide comprehensive as well as detailed site-specific reclamation procedures, methods and actions to successfully meet the objectives and standards for any surface disturbance. The reclamation plan will also include sufficient monitoring requirements and reports to ensure reclamation success has been accomplished. Site-specific reclamation plans will identify the dominant Ecological Site Descriptions, referenced plant communities, and soil map units. The approved reclamation plan must adhere to federal, state and local requirements, which can be used by regulatory agencies in their oversight roles to ensure that the reclamation measures are implemented, are appropriate for the site, meet area resource objectives (such as for wildlife, including greater sage-grouse), and are ecologically functional.

Limited Reclamation Potential (LRP) areas as identified in the LRP Map (Map 11) will require site-specific measures in the reclamation plan and will address the critical characteristics associated with these sites. These critical characteristics include but are not limited to soil erosivity, chemical and physical soil restrictive characteristics, steep slopes, and inadequate affective precipitation.

Project level reclamation objectives and standards will be established prior to disturbance and must be consistent with the objective set forth. The objectives and standards may be modified by the Authorized Officer if site-specific situations are deemed necessary to meet the overall land management objectives. To ensure objectives are being met, they will identify metrics, with triggers such as plant composition, percent cover, or other site-specific factors. Reclamation objectives are as follows:

- The objective of interim reclamation in the Designated Development Areas (DDAs) is to rehabilitate disturbed sites during the interim phase of development to achieve landscape continuity, minimize non-designated invasive species, and stabilize the soil. Interim reclamation will emphasize native plant species and will be designed to minimize re-disturbance during final reclamation activities and to initiate and accelerate ecological succession.
- Nonnative plants are permissible only as an approved short-term and non-persistent alternative to native plant materials. Nonnatives will not hybridize, displace, or offer long-term competition to the endemic plants, and are designed to aid in the reestablishment of native plant communities.
- The objective of interim reclamation in non-DDAs is to rehabilitate disturbed sites during the interim phase of development to achieve landscape continuity, minimize non-designated invasive species, and stabilize the soil and to promote a diversified plant community with the end result of accelerating the vegetative successional process to meet wildlife habitat goals. Interim reclamation will emphasize native plant species and will be designed to minimize

re-disturbance during final reclamation activities and to initiate and accelerate ecological succession.

- The objective of final reclamation in DDAs is to rehabilitate disturbed sites to achieve landscape continuity, minimize non-designated invasive species, and provide for a stabilized ecologically diverse plant community. Final reclamation is successful when a state of ecological progressive succession is achieved which can eventually advance to full ecosystem restoration.
- The objective of final reclamation in the non-DDAs is to reclaim disturbed sites to achieve landscape continuity, minimize non-designated invasive species, and provide for a stabilized ecologically diverse plant community, which will support approximately similar composition and density of organisms that were originally present. Final reclamation is successful when a state of ecological progressive succession is achieved which can eventually advance to full ecosystem restoration.
- During predisturbance onsite, the Natural Resources Conservation Service Ecological Site Descriptions will be determined, and the operator may explain why a Vegetation Reference Area might be more appropriate for use than the Ecological Site Descriptions, and whether a return to baseline condition is appropriate. The reclamation standard to be applied in determining if interim or final reclamation has been achieved will be part of the National Environmental Policy Act analysis of the action, and the Vegetation Reference Area will be part of at least one alternative analyzed, if requested by the operator.

Interim Reclamation Standards for Designated Development Areas	
Reclamation will be considered successful 3 years after seeding if the following criteria are met:	
Site Characteristics	Standards
Percent Ground Cover	80 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	• At least 65 percent total plant species must be from major grasses, forbs and/or shrubs listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seeding mix • No greater than 15 percent of the total reclaimed disturbance will be composed of non-designated invasive species • No greater than 35 percent of a 500 square foot contiguous area within a reclaimed disturbance will be composed of non-designated invasive species • No designated federal and state invasive plant species present
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: • Soil Surface Structure and Soil Organic Matter content • Average Percent of Litter Cover and Depth • Expected Annual Production • Functional/Structural Groups
BLM Bureau of Land Management NRCS Natural Resources Conservation Service	

Interim Reclamation Standards for non-Designated Development Areas	
Reclamation will be considered successful 5 years after seeding if the following criteria are met:	
Site Characteristics	Standards
Percent Ground Cover	At least 90 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	• At least 75 percent total plant species must be from major grasses, forbs and shrubs listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seed mix • At least 5 percent of the total plant species must be woody plants as listed in the Ecological Site Desired Plant Community • At least 5 percent of the total plant species must be forbs as listed in the Ecological Site Desired Plant Community • No greater than 15 percent of the total reclaimed disturbance will be composed of non-designated invasive species • No greater than 35 percent of a 500 square foot contiguous area within a reclaimed disturbance will be composed of non-designated invasive species • No designated federal and state invasive plant species present
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: • Soil Surface Structure and Soil Organic Matter content • Average Percent of Litter Cover and Depth • Expected Annual Production • Functional/Structural Groups
BLM Bureau of Land Management NRCS Natural Resources Conservation Service	

Final Reclamation Standards for Designated Development Areas	
Reclamation will be considered successful after receipt of project abandonment if the following criteria are met:	
Site Characteristics	Standards
Percent Ground Cover	90 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	• At least 80 percent total plant species must be from major grasses, forbs and/or shrubs listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seeding mix • At least 5 percent of the total plant species must be woody plants as listed in the Ecological Site Desired Plant Community • At least 5 percent of the total plant species must be forbs as listed in the Ecological Site Desired Plant Community • No greater than 10 percent of the total reclaimed disturbance will be composed of non-designated invasive species • No greater than 25 percent of a 500 square foot contiguous area within a reclaimed disturbance will be composed of non-designated invasive species • No designated federal and state invasive plant species present
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: • Soil Surface Structure and Soil Organic Matter content • Average Percent of Litter Cover and Depth • Expected Annual Production • Functional/Structural Groups
BLM Bureau of Land Management NRCS Natural Resources Conservation Service	

Final Reclamation Standards for non-Designated Development Areas	
Reclamation will be considered successful after receipt of project abandonment if the following criteria are met:	
Site Characteristics	Standards
Percent Ground Cover	100 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	• At least 85 percent of total plant species must be from dominate grasses, forbs and woody plants listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seed mix • All major grasses must be present • Major woody plant species will meet minimum percentage and/or total woody plants present will meet minimum percentage of growth form characteristics listed in the Ecological Site Desired Plant Community. • At least 3 of the listed forb must be present and at least 5 percent of the total plant species must be forbs as listed in the Ecological Site Desired Plant Community • No greater than 5 percent of the total reclaimed disturbance will be composed of non-designated invasive species • No greater than 15 percent of a 500 square foot contiguous area within a reclaimed disturbance will be composed of non-designated invasive species • No designated federal and state invasive plant species present
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: • Soil Surface Structure and Soil Organic Matter content • Average Percent of Litter Cover and Depth • Expected Annual Production • Functional/Structural Groups
BLM Bureau of Land Management NRCS Natural Resources Conservation Service	

Monitoring of reclaimed areas will be required and will ensure reclamation standards have been met. Reclaimed areas will be monitored annually by project proponent or BLM personnel if designated in the reclamation plan. Reclamation monitoring protocol will be included in the reclamation plan as approved by BLM.

Reclamation monitoring will be documented in an annual reclamation report submitted to the Authorized Officer by December 31 of each year after one full growing season following seeding. The report will document all aspects of the following:

- The 10 requirements of the Wyoming Reclamation Plan;
- The requirements of the Resource Management Plan reclamation objectives and standards;
- Requirements of the Onshore Oil and Gas Orders;
- Identify whether the reclamation objectives and standards are likely to be achieved in the near future without additional actions; and
- Identify actions that have been or will be taken to meet the objectives and standards.

The report will also include acreage figures for the following:

- Initial disturbed acres;
- Successful Interim Reclaimed Acres; and/or
- Successful Final Reclaimed Acres.

Annual reports will not be submitted for approval by the Authorized Officer as having fully met interim or final reclamation standards. Any time 15 percent or more of an interim reclaimed area is re-disturbed, monitoring will be reinitiated. Actions will be taken to ensure that reclamation

standards are met as quickly as reasonably practical. The Authorized Officer will be notified in a separate document by the project proponent when the reclamation operations have been completed that indicate the site meets reclamation standards and is ready for final inspection.

This page intentionally
left blank

Appendix E. Exception, Modification, and Waiver Criteria, Avoidance Criteria, and Special Management for Designated Corridors

E.1. Introduction

This appendix addresses the procedure for providing exceptions, modifications, and waivers of stipulations or Conditions of Approval (COAs) placed on oil and gas leases and other surface disturbance and disruptive activity authorizations, and avoidance criteria for rights-of-way (ROWs), to protect resource values identified in Chapter 3. These values generally include wildlife, soil, water, recreation, visual, and cultural resources. Criteria applicable to designated corridors are provided.

Oil and Gas

The Bureau of Land Management (BLM) may apply stipulations or COAs identified in the Standard Oil and Gas Stipulations (Appendix N (p. 1601)) and the Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities (Appendix M (p. 1595)). Oil and gas leases will have applicable stipulations attached at the leasing stage. For surface-disturbing and disruptive activities occurring within Designated Development Areas (DDAs), stipulations will be reviewed during the National Environmental Policy Act (NEPA) process and will not be applied unless required to follow federal laws and policies or the BLM identifies a site-specific real-time need for the stipulation. Review of requests for exception within DDAs will be expedited. Refer to Appendix I (p. 1535) for the application of stipulations or COAs inside and outside of DDAs.

The three types of surface stipulations the BLM applies are (1) no surface occupancy (NSO), (2) timing limitation stipulation (TLS), and (3) controlled surface use (CSU). The surface stipulations are defined below.

- **No Surface Occupancy:** Areas closed to placement of surface facilities such as roads, oil and gas wells, and other facilities. This stipulation may be applied to oil and gas leases only before a lease is issued.
- **Timing Limitation Stipulation:** Areas closed to construction and development activities during identified timeframes. The alternatives vary in the application of TLSs to maintenance activities, including associated vehicle travel, during the closed period unless otherwise specified in the stipulation.
- **Controlled Surface Use:** Areas where surface uses are subject to specified controls or constraints.

The BLM cannot apply an NSO stipulation after oil and gas lease issuance, but can apply TLS and CSU restrictions as COAs after the oil and gas lease has been issued.

An applicant can request an exception, modification, or waiver of a NSO, TLS, or CSU stipulation or a COA. This document identifies the criteria that the BLM would utilize in making the

*Appendix E Exception, Modification, and Waiver
Criteria, Avoidance Criteria, and Special
Management for Designated Corridors*

determination to except, modify, or waive the stipulation or COA. The Resource Management Plan (RMP) serves as the vehicle for providing analysis of the conditions under which waivers, exceptions, or modifications of lease stipulations or COAs may be granted.

A request for exception must be initiated in writing before the time that the work was originally proposed to conclude. The unpredictability of weather, animal movement and condition, etc., precludes analysis of requests related to wildlife far in advance of the time periods in question. However, where possible, the applicant should seek the exception at least two-weeks in advance. Analyses of a request include review of potential mitigation measures and alternatives (e.g., traffic restrictions, alternative scheduling, and staged activity). The request is considered as a unique action and is analyzed and documented individually for RMP and NEPA compliance.

Exception requests will not be granted for stipulations or operating standards designed to protect threatened and endangered species, unless the BLM consults with the U.S. Fish and Wildlife Service (USFWS) and reinitiates consultation, if appropriate.

E.2. Exceptions, Modifications, and Waivers

An applicant may request an exception, modification, or waiver of a stipulation or restriction included in a lease or applied as a COA, as defined below.

- **Exception:** A one-time exemption to a lease stipulation or COA determined on a case-by-case basis.
- **Modification:** A change to the provisions of a lease stipulation, either temporarily or for the term of the lease.
- **Waiver:** A permanent exemption to a lease stipulation.

The person requesting the exception, modification, or waiver is encouraged to submit information that might assist the authorized official in making a decision. The Authorized Officer reviews information submitted in support of the request and other pertinent information. The Authorized Officer may modify, waive, or grant an exception to a stipulation if:

- The action is consistent with federal laws.
- The action is consistent with the RMP.
- The management objectives that led the BLM to require the lease stipulation can be met without restricting operations in the manner provided for by the stipulation given changes in the condition.
- The action and the impacts that would result are acceptable to the Authorized Officer based on a review of the environmental consequences.

E.3. Standard Exception

An exception may be granted by the Authorized Officer if it can be demonstrated that the ground-disturbing activity/lease stipulation would not cause adverse impacts to the targeted resource, condition, or public interest as defined by RMP objectives, standards, or conditions and:

1. is intended to improve the targeted resource, condition, or public interest (e.g., vegetation treatment in a NSO area to improve wildlife habitat, trail construction in a NSO/CSU area for a Special Recreation Management Area (SRMA) to improve recreational opportunities), or

2. the ground-disturbing activity (mentioned above), by its nature, must be done within the targeted NSO/CSU area (e.g., spring development within a NSO area for riparian-wetland vegetation, installation of brook trout stream barrier in a NSO area for cutthroat trout, or short duration road maintenance).

In situations where a ground-disturbing activity/lease stipulation is excepted, the activity could be subject to additional COAs, reclamation measures, or best management practices. Measures applied will be based on the nature, extent, and values potentially affected by the ground-disturbing activity. Excepted ground-disturbing activities/lease stipulations are given on a one-time case-by-case basis and would not necessarily constitute subsequent approvals.

E.4. Resource Specific Exceptions

E.4.1. Wildlife

Activities within the planning area are managed with stipulations or COAs to protect important times of the year and habitats for wildlife. A NSO or CSU stipulation may be placed on oil and gas leases to protect greater sage-grouse breeding areas or habitat for other special status species from surface-disturbing activities. TLSs or COAs may be used to protect wintering or birthing big game, nesting greater sage-grouse, raptor, mountain plovers, or spawning trout. Application of TLSs to maintenance and operation of a developed project varies by alternative. Protective wildlife seasonal restrictions are developed consistent with statewide dates and in coordination with the Wyoming Game and Fish Department (WGFD) and/or the USFWS.

The BLM may grant exceptions to seasonal restrictions if the BLM determines that granting an exception would not jeopardize the wildlife population being protected. The BLM uses a set of factors when considering a request for an exception. The professional judgment of the BLM and the wildlife agencies play a key part in the BLM's decisions on whether to grant exceptions. No clear-cut formula exists.

The following section describes some of the factors considered by the BLM when determining whether a request for an exception to wildlife seasonal stipulations or COAs should be granted.

1. Resource Concern
 - Animal presence or absence
 - Additional or new resource concerns
 - Potential for increased wildlife accidents or poaching
2. Animal Conditions
 - Physical condition of individual animals (e.g., fat reserves)
 - Local animal population condition (animal density)
 - Potential for additive mortality
 - Likelihood of introduction or increased incidence of disease
 - Likelihood of decreased recruitment/natality
3. Climate/Weather
 - Snow conditions (depth, crusting, and longevity)
 - Current and historic local precipitation patterns
 - Current and historical seasonal weather patterns
 - Recent and current wind-chill factors (indication of animals' energy use)

*Appendix E Exception, Modification, and Waiver
Criteria, Avoidance Criteria, and Special
Management for Designated Corridors
Resource Specific Exceptions*

- Duration of condition
 - Short- and long-range forecasts
4. Habitat Condition and Availability
 - Water and forage condition (availability, quality, and quantity)
 - Competition (interspecific, intraspecific)
 - Animal use of available forage
 - Suitable and ample forage immediately available and accessible
 5. Spatial Considerations
 - Migration/travel corridors
 - Winter range, foraging, parturition or breeding
 - Topography (plains vs. mountains)
 - Topographic/geographic limitations (barriers)
 - Presence of thermal cover (e.g., protection from wind)
 - Proportion of range impacted
 - Juxtaposition and density of other activities/disturbances in the vicinity
 - Cumulative impacts
 6. Timing
 - When proposed activity would occur in the stipulation period
 - Kind and duration of potentially disruptive activity
 - Likelihood of animals habituating to the proposed activity

E.4.2. Cultural Resources

The areas around and including special Sacred, Spiritual and/or Traditional Cultural Properties such as Castle Gardens (called “restriction zones”) are managed with surface occupancy and disturbance stipulations which vary by alternative. The BLM may grant exceptions to these stipulations subject to Standard Protocol and National Historic Preservation Act (NHPA) measures. The BLM would consult with affected tribes to ascertain their opinion on the proposal. The BLM would follow the tribes’ opinion regarding restriction zone activities in all but the most extraordinary circumstances.

E.4.3. Oil and Gas Actions

Title 43 **Code of Federal Regulations** (CFR) 3101.1-4 establishes procedures for granting modifications or waivers to oil and gas lease stipulations, as stated below:

A stipulation included in an oil and gas lease shall be subject to modification or waiver only if the Authorized Officer determines that the factors leading to its inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified or if proposed operations would not cause unacceptable impacts. If the Authorized Officer has determined, prior to lease issuance, that a stipulation involves an issue of major concern to the public, modification or waiver of the stipulation shall be subject to public review for at least a 30-day period. In such cases, the stipulation shall indicate that public review is required before modification or waiver. If subsequent to lease issuance the Authorized Officer determines that a modification or waiver of a lease term

or stipulation is substantial, the modification or waiver shall be subject to public review for at least a 30-day period.

The modification or waiver of an oil and gas lease stipulation implies that the sensitive resource for which the protective measure was considered is in some way not present in the area or in some way no longer in need of the protective measure. In either case, consideration of a modification or waiver of a lease stipulation would require environmental analysis and may result in an amendment to the land use plan.

E.5. Procedures for Exceptions

Requests for exceptions may, in general, be made at any time. In the case of seasonal restrictions for the benefit of wildlife, the request should be made within 2 weeks of conducting the proposed work. The unpredictability of weather, animal movement and condition, precludes analysis of requests related to wildlife concerns far in advance of the time periods in question. The request is considered as a unique action and is analyzed and documented individually for RMP and NEPA compliance. The request must include the following information:

WHY the public land user needs the exception. Include the reason(s) why the action could not be completed within the original stipulation period, any evidence of why the action would not adversely affect the resource or species being protected, or any other information (additional mitigation measures or alternatives) that would help the BLM (and WGFD or USFWS) in reviewing the request.

WHO is filing the exception request. This must include the company name, the name of the contact person, and the address, telephone number, e-mail address (if available), and fax number of the contact person.

WHAT is being requested. This must include a detailed description of the activity including types of equipment or vehicles required and the number of trips expected. Please include the name and/or number of the authorization (i.e., application for permit to drill, sundry, ROW) and the affected stipulation/restriction.

WHERE the activity would take place. This must include the legal description of the activity, the location of the access roads and pipelines, and a map clearly depicting these areas. Proponent prepared Geographic Information System layers meeting BLM requirements will expedite the processing.

WHEN the activity would occur. This must include the start date, end date, and time of day/night when activities would occur.

Requests must be made in writing and hard copy delivered to the Lander Field Manager at the physical address of the office. When time is of the essence, the process may be initiated by fax or electronic delivery of a scanned copy but the original must be received by the Lander Field Office within 3 working days. No exception, waiver, or modification will be issued until the hard copy request is received.

BLM may consider verbal requests for and grant verbal approvals of exceptions in DDAs. However, the operator must submit a written notice within 7 days after the verbal request. A verbal request is considered a unique action and should be used only if serious economic or public health and safety problems could result from denial of the request.

*Appendix E Exception, Modification, and Waiver
Criteria, Avoidance Criteria, and Special
Management for Designated Corridors
Procedures for Exceptions*

Exceptions will not be granted for stipulations or COAs resulting from Section 7 consultation regarding the Endangered Species Act (ESA) with the USFWS for listed species unless a biological assessment (BA) is completed and reinitiation of Section 7 consultation occurs. This process, depending on the potential impacts and whether incidental take is involved, typically requires 3 to 6 months for completion. The operator or lease holder is responsible for the BA, which must be satisfactorily completed in accordance with the requirements of the BLM.

E.6. Rights-of-Way

Vegetation Criteria Considered for Projects Proposed in Right-of-Way Avoidance Areas

Projects proposed for construction in avoidance areas will be considered on a case-by-case basis and must incorporate site-specific mitigation measures aimed at addressing resource concerns on the site. Exceptions may be granted in avoidance areas if the following criteria are met (this list is not all-inclusive):

- ROW proposals that are co-located with existing disturbances where little to no vegetation disturbance is anticipated.
- Slopes of less than 8 percent or, pitch grades above 8 percent of less than 300 feet. Projects that will be constructed on slopes (including pitch grades) in excess of 8 percent must be accompanied by specific stabilization measures for these grades incorporated into the project reclamation plan prior to approval. The use of cover crops is acceptable for stabilization provided that the species utilized meets the Wyoming Reclamation Policy and will ultimately result in compliance with the Reclamation Objectives and Standards identified in Appendix D (p. 1477) of the RMP.
- Soil depths of less than 20 inches to the restrictive layer may be considered on a case-by-case basis contingent on the slope, soil chemistry, and erosion potential being adequate to support successful reclamation on the site.
- Soils with low to moderate wind and water erosion potential may be considered. Projects proposed on soils with high wind and water erosion potential may only be considered where topography and cover are adequate to support successful reclamation on the site.
- Prior to ROW approval, the proposed site must be inventoried for the presence of threatened, endangered, and special status plant species. Where populations of threatened, endangered, and special status plant species will be adversely impacted, the ROW proposal shall be denied.
- Prior to ROW approval, the proposed site must be inventoried for the presence of invasive, noxious, and nonnative species.
- All invasive plant species must be treated (chemical, biological, mechanical) prior to disturbance of site.
- Invasive and nonnative species identified in concentration of less than 5 percent of the total vegetation within the disturbance footprint or less than 15 percent within a 500 square foot area may be considered. Projects proposed in populations exceeding these limitations shall be denied.
- Invasive species management plans must be incorporated into the reclamation plan, and all invasive and nonnative species must be treated (chemical, biological, mechanical) prior to disturbance of the site.
- Construction that will occur in areas dominated by invasive nonnative species (INNS) shall have vehicle wash stations established at the site (two wash stations for linear features at the beginning of the infestation and at the end). All vehicles entering and exiting the site must be washed prior to continuing construction

- ROW proposals within 500 feet of riparian-wetland areas shall be denied unless they are determined to be unavoidable and impacts can be sufficiently mitigated.

Wild Horse Criteria

- As new project developments are considered, a careful evaluation must take place to determine if wild horse displacement will increase, and if the displacement will be short or long term. Long-term displacement could lead to changes in use patterns, herd dynamics, and unforeseeable environmental influences to the herd.
- Proposed range improvements and other surface-disturbing and disruptive activities will be subject to reclamation standards and mitigation requirements established under Appendix D (p. 1477) and Appendix M (p. 1595) of the Lander RMP.
- If new fencing projects are being proposed in Herd Management Areas (HMAs) and ROW avoidance areas, careful evaluation must take place to determine the direct, indirect, and cumulative impacts to wild horse herds in HMAs. New fencing must show a neutral or beneficial impact for wild horses. Mitigation, such as the construction of “let-down” fences instead of permanent fencing, often reduces the risk of wild horses not being able to migrate from one part of the HMA to another.
- Proposals for the construction of new water developments in HMAs must analyze all impacts to horses. While the construction of new water developments can be beneficial, careful evaluation must be made to ensure they do not create unintended consequences, such as leading horses outside the boundaries of their HMA or impacting wildlife crucial winter range.
- All vegetation manipulation and land treatment proposals in ROW avoidance areas, including prescribed burns, will be analyzed to ensure proper rest and reclamation success are achieved after project implementation. Ensure that all protective fencing or other infrastructure installed to protect treatment area(s) is compatible with wild horse use and movement.
- Ensure that any new developments in ROW avoidance areas preserve and maintain a healthy and viable wild horse population that will survive and be successful in the HMA during poor years when elements of the habitat are limiting due to severe winter conditions, drought, or other uncontrollable and unforeseeable environmental influences to the herd.

Wildlife Criteria Considered

The BLM will use the following questions and/or criteria for wildlife and fish resources, including species listed as endangered, threatened, proposed, or candidate under the ESA, or listed on the Wyoming BLM Sensitive Species List, when addressing proposals for projects in ROW avoidance areas. Proposals will be considered on a case-by-case basis. In project-level environmental impact statements and environment assessments, require, on a case-by-case basis, the development of a wildlife resource monitoring and mitigation plan to address potential impacts from ROW authorizations on wildlife populations and/or habitat.

- Is there existing disturbance in the project area? If yes, what kinds of disturbance and what is the affected acreage? What is the expected number of acres of disturbance that would be added to the existing disturbance total?
- Is there habitat for ESA or BLM Sensitive Species listed in the project area? If threatened and endangered species are present, the project will not be authorized. If BLM Sensitive Species are present, how many acres of this habitat are present in the surrounding area and how many acres would be impacted by the project?
- Does the area contain habitats critical in supporting and/or maintaining regionally important wildlife populations (big game crucial winter range, breeding/birthing/parturition habitat,

*Appendix E Exception, Modification, and Waiver
Criteria, Avoidance Criteria, and Special
Management for Designated Corridors
Rights-of-Way*

and greater sage-grouse winter concentration areas)? If yes, what type of habitat would the project be in and for what species?

- Can the project be conducted and/or constructed entirely outside critical periods for wildlife (breeding, nesting, parturition, and winter)?
- Can the project be co-located entirely within existing disturbance? If no, how many acres of new disturbance would occur and how many acres of existing disturbance are in the project area?
- For projects that are not co-located, will the project result in short-term or long-term loss of habitat?
- Will the project lead to degradation of adjacent habitat from migration of surface disturbance, access to new area, weeds, etc.?
- Will the project cause wildlife to avoid the area? Will the project result in a short-term or long-term disruption to wildlife? What is the project life?
- Will the project lead to continued disruption to wildlife from site visitation and/or maintenance activities?
- Will the location of the project result in functional loss of habitat due to fragmentation?
- Will authorizing the project lead to additional requests for projects in the same area?
- Are there hazards to wildlife associated with proposed project infrastructure?
- Does the project proponent identify adequate reclamation methods and timeframes?
- Does negating and/or minimizing impacts to wildlife cause impacts to other resources identified as needing the area designated as an “avoidance area”?

Bison Basin Designated Corridor Criteria

- Beaver Rim Area of Critical Environmental Concern (ACEC) is excluded.
- Plant: Critical Yermo habitat is excluded.
- Wildlife: Aggressive and accelerated reclamation plans for disturbances, including utilizing native plant tubelings to simulate predisturbance conditions.
- Visual Resource Management (VRM): Meet all VRM class objectives.
- VRM: Within view of the Continental Divide National Scenic Trail and the Sixth Crossing Visitors’ Center, keep all new surface disturbances within the existing county road disturbance, keep all aboveground pipeline facilities out of view, and minimize use of pipeline markers and adjust placement to protect resource values.
- Cultural Resources: Within view of the National Historic Trails, keep all surface disturbance within existing county road disturbance, minimize the use of pipeline markers, and keep all aboveground pipeline facilities out of view.

Appendix F. Lander Air Resources Management Plan

F.1. Purpose

The purpose of this air resources management plan is to address air quality issues identified by the Bureau of Land Management (BLM) in its analysis of potential impacts to air quality resources for the Lander Field Office Resource Management Plan (RMP). This plan outlines the specific requirements for managing air resources and authorizing activities that have the potential to adversely impact air resources within the Lander Field Office planning area. The plan also outlines specific requirements for proponents of projects that have the potential to generate air emissions and adversely impact air resources within the planning area.

F.2. Air Quality Issues

The BLM based its identification of air quality issues on the following information:

- The air emissions inventory compiled for the planning area which estimated potential emissions of air pollutants for maximum allowable development and authorizations under each alternative
- Existing air monitoring data from the South Pass Special Purpose Monitor (SPM) site, Lander State and Local Air Monitoring Station (SLAMS), the South Pass City and Sinks Canyon National Atmospheric Deposition Program (NADP) sites, and the Bridger and North Absaroka Interagency Monitoring of Protected Visual Environments (IMPROVE) sites.
- The Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas (BLM 2009c), Mineral Occurrence and Development Potential Report (BLM 2009b), and potential levels and location of development identified in Chapter 4 of the RMP.

F.2.1. Magnitude of Emissions

An air emissions inventory was compiled for the planning area to determine the relative magnitude of total air pollutant emissions and to compare emissions between alternatives. Emissions were calculated using conservative assumptions about the likelihood of potential activities occurring under each alternative that result in maximum air emissions being estimated. For example, air emissions from oil and gas activities assume that all of the potential development identified in the RFD will occur. The RFD is based upon known geologic conditions, current development technology, and industry-provided data about future planned development. Future pricing and economic or technical viability of geologic plays were not taken into account. Air emissions from non-oil and gas mineral development, such as uranium mining, were calculated assuming maximum development scenarios even though these activities are vulnerable to economic variability. Assumptions regarding the use of air emission control technologies were also very conservative. For example, air emissions from drilling activities assume a mixture of Tier 1 – Tier 3 diesel engines. However, it is likely that significant improvement in emissions could be realized over the life of the plan through the use of alternative drilling technologies.

As a result, the compiled air emissions inventory represents the emissions of air pollutants based on best available but very speculative information for future development projections. It is very likely that the emissions inventory over-estimates projected future emissions due to the

conservative assumptions used. However, it is valid for contrasting the impact of management actions and strategies on air resources among alternatives. It is also useful for identifying those activities that are likely to be major contributors to increased air emissions and developing management actions to minimize their impact to air resources.

Despite the limitations of the air emissions inventory it supports two major conclusions:

1. there is not a substantial difference in total air emissions among alternatives (Table 4.1, “Estimated Annual Emissions Summary for BLM Activities in the Lander Planning Area” (p. 594)), and
2. for the management activities analyzed, oil and gas development activities are the major contributor to total air emissions and non-oil and gas mineral development activities (mining) are the major contributor to particulate matter emissions.

The reason there is not a substantial difference in total air emissions among alternatives is the result of several factors:

- The oil and gas development in the planning area is primarily in tightly-focused discrete areas that have relatively few conflicts with other resource uses. The constraints placed on oil and gas development under all alternatives to protect other resources do not vary greatly, therefore, the projected emissions do not vary greatly.
- Under Alternative B, the most restrictive alternative, a substantial portion of the oil and gas RFD is assumed to be developed.
- Under all alternatives, existing sources of emissions are assumed to continue to comprise a substantial portion of total projected emissions.

While the BLM has discretion to make allocative decisions in these areas under any alternative, due to the high percentage of existing leases in areas with potential oil and gas development (approximately 93 percent) the ability to implement substantial restrictions on development is primarily limited to mitigation measures that can be applied during project approval. Such restrictions include cooperative development of project-specific measures to minimize impacts to air resources as outlined in this plan.

F.2.2. Pollutants of Concern

Air monitoring data from the South Pass **SPM site** located on the south western edge of the planning area measured ozone (O₃) concentrations above the National Ambient Air Quality Standards (NAAQS) during the 2008-2010 time period. Seven exceedances of the 8-hour O₃ standard above 75 parts per billion (ppb) were recorded in 2009 while one hour values at or above 75 ppb were recorded twice in 2008 and once in 2010. The South Pass monitor was the only monitor measuring O₃ within the planning area during the 2008-2010 period. It is difficult to determine if O₃ concentrations above the NAAQS are occurring throughout the planning area or if the high concentrations are unique to the South Pass area because of its proximity to and downwind location from the Upper Green River Valley (a proposed O₃ non-attainment area). The Wyoming Department of Environmental Quality (DEQ) Air Quality Division has determined that three stratospheric intrusions caused three periods in February through March 2009 where O₃ exceedances occurred at the South Pass, Wyoming, monitor. The emissions inventory compiled for each alternative shows that estimated emissions from BLM authorized activities such as oil and gas development have the potential to cause or contribute to increased levels of O₃ which may result in exceedances of the O₃ standard due to increased emissions of O₃ forming precursors. Therefore, the BLM has identified O₃ and the precursors, nitrogen oxides (NO_x) and

volatile organic compounds (VOCs), as pollutants of concern to be addressed through specific management actions described in this plan.

Air monitoring data from the residential SLAMs monitor located in the town of Lander shows that the 98th percentile of 24-hour average concentrations for particulate matter less than 2.5 microns in diameter (PM_{2.5}) averaged over the three year period 2008-2010 is approximately 30 micrograms per cubic meter (ug/m³) or 87 percent of the NAAQS. However, the annual average of PM_{2.5} concentrations at the same site over the same time period is approximately 8.4 ug/m³ or 56 percent of the NAAQS. It is likely that the short term high concentrations in PM_{2.5} are due to wintertime woodstove use and natural events such as wildfires or high wind events having a localized impact in the town of Lander. It is difficult to fully support this conclusion due to a lack of PM_{2.5} monitoring data in the planning area. The emissions inventory compiled for each alternative shows that estimated emissions from BLM authorized activities such as mining and vegetation management through prescribed fire may have the potential to cause or contribute to short term localized increases in levels of PM_{2.5}. Therefore, BLM has identified PM_{2.5} as a pollutant of concern to be addressed through specific management actions described in this plan.

Representative air monitoring data for hazardous air pollutants (HAPs) is not available for the planning area, however increases in estimated emissions of a subset of these pollutants was shown through the compilation of the emissions inventory for each alternative. Specifically, emissions of benzene, toluene, ethyl benzene, xylenes, n-hexane, and formaldehyde were estimated to increase due primarily to development of oil and gas resources. Emissions of these pollutants from leaks, venting, internal combustion, and flaring associated with BLM authorized oil and gas development have the potential to result in short term, near-field increases in concentrations of these pollutants. Therefore, BLM has identified this subset of HAPs as pollutants of concern to be addressed through specific management actions described in this plan.

F.2.3. Air Emission Generating Activities

Air emissions were estimated for 11 different categories of activities that BLM authorizes, allows, or performs and that have the potential to emit regulated air pollutants. The estimated emissions, based on the maximum development potential under each alternative were used to identify activities that have the potential to contribute to increases in concentrations of regulated air pollutants and to determine those activities that warrant specific management strategies for minimizing air quality impacts.

Under each alternative, oil and gas development activities were identified as the major contributor to increases in emissions of NO_x, VOC, and HAPs. Non-oil and gas mineral development activities, specifically sand and gravel mining and processing, and other solid minerals mining were identified as the major contributor to increases in particulate matter emissions.

F.2.4. Geographic Areas of High Potential for Development

The Mineral Occurrence and Development Potential Report and the RFD Scenario for Oil and Gas identified geographic areas of high, moderate, and low development potential for conventional oil and gas, coalbed natural gas (CBNG), and locatable and salable minerals.

One area was identified within the planning area as high potential for conventional oil and gas development and is located in the northeast corner of the planning area surrounding the

town of Lysite. This area is comprised of the existing and proposed expansion of the Gun Barrel, Madden Deep, Ironhorse oil and gas development units. Areas of moderate potential for oil and gas development have been identified in the central portion of the planning area surrounding the Beavercreek unit and in the southern portion of the planning area overlapping the Fremont-Sweetwater county border (Map 17). Moderate potential for CBNG development has been identified in these same two areas (Map 20).

Under **Alternative D (Proposed RMP)**, the Lander Field Office identified Designated Development Areas (Map 134) based on locations of high and moderate potential oil and gas development and a need to protect other resources. The intention of these Designated Development Areas is to maximize potential oil and gas development in defined locations while minimizing impacts to other natural resources across the planning area. The locations of these Designated Development Areas provide the following benefits to air resources:

- Encourages future oil and gas development in areas of existing development thereby reducing impacts to air from new construction, new production facilities, and new compression sources that would be required in undeveloped fields,
- Encourages future oil and gas development in areas located downwind of and over 50 kilometers (31 miles) from the nearest federally designated Class I area,
- Downwind impacts from the Designated Development Areas are not likely to impact Class I or sensitive Class II areas, major population centers,
- Encourages future oil and gas development in geographic areas of relatively flat terrain with minor shallow basins and relatively consistent west-southwesterly winds thereby minimizing potential for stagnation and cold pooling that can lead to increased O₃ formation,
- Encourages future oil and gas development in areas a considerable distance from major population centers,
- Excludes oil and gas development in the Dubois area, an area of air quality sensitivity due to its proximity to federally designated Class I and identified sensitive Class II areas.

Geographic areas of high, moderate, and low potential for locatable minerals (specifically uranium, phosphate, bentonite, and gold) and salable minerals (specifically sand and gravel) were identified within the planning area. The Lander Field office has also identified specific areas that would be closed to mineral materials disposal (Map 37), and locatable mineral withdrawals (Map 24) within each of the alternatives. When these restrictions are considered in concert with the geologic locations of non-oil and gas minerals, likely locations for non-oil and gas minerals development are constrained to areas located primarily in the central and southern portions of the planning area. These potential areas of development are located in geographic areas of relatively flat terrain with minor shallow basins and relatively consistent west-southwesterly winds. Because particulate matter emissions are the primary pollutant of concern associated with non-oil and gas minerals development there is a potential for high winds in these areas to contribute to short term increases in fugitive dust emissions from storage piles, wind erosion, and construction activities. However, the likely locations for development are not located near population centers, but are located downwind from Class I and sensitive Class II areas. Table F.1, **“Class I and Class II Areas in the Vicinity of the Planning Area”** (p. 1495), displays Class I and II areas in the vicinity of the planning area.

Table F.1. Class I and Class II Areas in the Vicinity of the Planning Area

Area Type	Area Name	Closest Distance to the Lander Planning Area (miles)	Direction from the Lander Planning Area	Clean Air Act Status of the Area
National Park	Grand Teton National Park	20	West	Class I
	Yellowstone National Park	25	West	Class I
Recreation Area	Bighorn Canyon National Recreation Area	90	North	Class II
Wilderness Area	Cloud Peak Wilderness Area	60	Northeast	Class II
	North Absaroka Wilderness Area	80	Northwest	Class I
	Washakie Wilderness Area	40	Northwest	Class I
	Fitzpatrick Wilderness Area	In	N/A	Class I
	Popo Agie Wilderness Area	In	N/A	Class II
	Bridger Wilderness Area	Adjacent	West	Class I
	Teton Wilderness Area	30	Northwest	Class II
National Forest	Bighorn National Forest	60	Northeast	Class II
	Thunder Basin National Grassland	90	East	Class II
Source: NPS 2006				
N/A Not Applicable				

F.2.5. Summary of Air Quality Issues

- Recent measurements at an air monitoring station in the planning area show that measured ambient concentrations of O₃ have, on several occasions, exceeded the current O₃ NAAQS of 75 ppb.
- The emissions inventory showed potentially significant increases in estimated emissions of O₃ forming pollutants (NO_x and VOCs) which could result in increased concentrations of O₃ if oil and gas resources are authorized and developed to the full potential evaluated under each alternative. In addition, potential increases in HAP and PM_{2.5} emissions and corresponding short term increases in ambient concentrations could result if all activities are authorized and developed to the full potential evaluated under each alternative.
- The air analysis for the RMP showed that oil and gas development activities have the potential to be the major contributor to estimated NO_x, VOC, and HAP emissions. Non-oil and gas mineral development activities (i.e., sand and gravel extraction, bentonite, uranium, and gold mining) have the potential to be the major contributor to estimated PM_{2.5} emissions.
- The geographic areas identified as having high potential for oil and gas or non-oil and gas minerals development are located in areas that are unlikely to impact Class I or sensitive Class II areas or major population centers.

F.3. Field Office Air Resource Management Requirements

The Lander Field Office has the responsibility to implement the decisions of the RMP in a manner that protects air quality while recognizing valid and existing leasing rights. Within the planning area, most areas with high and moderate oil and gas development potential are already leased. While the BLM has limited ability to alter the conditions of existing leases, it can require specific actions and measures necessary to protect air quality in response to identified or anticipated adverse impacts at the project level stage.

Development and implementation of appropriate protection measures is most effective at the project approval stage, because the proposed action has been defined and impacts to air quality are better able to be identified through National Environmental Policy Act analysis. As part of the project approval process the BLM will identify project-specific measures in response to identified impacts to air resources, as outlined in this air resources management plan.

F.3.1. Authorization of Air Emission Generating Activities

F.3.1.1 BLM has the authority and responsibility under Federal Land Policy and Management Act to manage public lands in a manner that will protect the quality of air and atmospheric values. Therefore, BLM may manage the pace, place, density, and intensity of leasing and development to meet air quality goals.

F.3.1.2 BLM will, prior to authorization of any activity that has the potential to emit any regulated air pollutant, consider the magnitude of potential air emissions from the project or activity, existing air quality conditions, geographic location, and issues identified during project scoping to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the project. This analysis may include; obtaining additional air monitoring data, air dispersion modeling, photochemical grid modeling, and/or mitigation measures in addition to any applicable regulatory emission limits and standards.

F.3.1.3 BLM will require project proponents to comply with the requirements under Section F.4 of this plan. BLM will review any project specific emissions inventory submitted as required under Section F.4.1 to determine its completeness and accuracy.

F.3.1.4 In areas where Wyoming DEQ approved (or equivalent) air monitoring data shows that ambient air concentrations of a regulated pollutant are at or above 85 percent of the applicable NAAQS or Wyoming Ambient Air Quality Standard (WAAQS), BLM will require the proponent for any project that has the potential to emit the pollutant or precursors to the pollutant to comply with (a) or (b) below:

- a. Demonstrate that the project will result in no net increase in annual emissions of the pollutant for the life of the project (e.g., through the application of emission control technologies, offsets, or other air emission reducing strategies); or,
- b. Demonstrate that the project will not cause or contribute to a violation of the ambient air quality standard through a quantitative air quality analysis (e.g., air dispersion modeling, photochemical grid modeling or an equivalent level of analysis).

F.3.1.5 Ambient air monitoring data in the planning area shows that existing concentrations of O₃ are at a level of concern to the BLM and the emissions inventory for the Lander RMP shows that oil and gas development activities have the potential to be a major contributor to O₃ forming

pollutant emissions. Therefore, the requirements of F.3.1.4 apply and project proponents for oil and gas development activities within the planning area must comply with (a) or (b) below:

- a. Demonstrate that the project will result in no net increase in annual emissions of NO_x and VOCs for the life of the project (e.g., through the application of emission control technologies, offsets, or other air emission reducing strategies); or,
- b. Demonstrate that the project will not cause or contribute to a violation of the ambient air quality standard for O₃ through a quantitative air quality analysis (to include photochemical grid modeling or an equivalent level of analysis).

F.3.1.6 Ambient monitoring data within the planning area shows that existing concentrations of PM_{2.5} are at a level of concern to the BLM and the emissions inventory for the Lander RMP shows that non-mineral development and prescribed fire activities have the potential to contribute to increases in PM_{2.5} ambient concentrations. Therefore, prior to BLM approval of a project that is likely to contribute to short term increases in PM_{2.5} ambient concentrations, BLM will require any non-oil and gas mineral development project proponent to:

- a. demonstrate that it has applied for and obtained any required air permit from Wyoming DEQ,
- b. demonstrate that the project will not cause or contribute to a violation of the applicable ambient air quality standard and,
- c. provide a plan for controlling and minimizing fugitive dust emissions.

Prescribed fire projects will be required to minimize impacts to air quality, and will comply with local and state smoke management plans and regulations.

F.3.2. Monitoring

As part of a comprehensive air management plan for the planning area, BLM commits to the following measures with regards to ambient air monitoring:

- BLM will work cooperatively with Wyoming DEQ to determine the best mechanism to submit, track, and approve project specific pre-construction monitoring or monitoring data required in a project specific record of decision (ROD),
- BLM will work cooperatively with Wyoming DEQ to share data collected from the existing BLM-operated Wyoming Air Resource Monitoring System (WARMS) network and to support Wyoming DEQ's air monitoring network through siting, operation, and funding of additional monitoring sites,
- BLM will continue to fund and operate the NADP monitoring site at Sinks Canyon.
- BLM may require project proponents to conduct pre-construction and/or project air monitoring as described in Section F.4.2.

F.3.3. Modeling

BLM recognizes that air dispersion and photochemical grid models are useful tools for predicting project specific impacts to air quality, predicting the potential effectiveness of control measures and strategies, and for predicting trends in regional concentrations of some air pollutants. As part of a comprehensive air management plan for the planning area, BLM commits to the following with regards to air quality modeling:

- BLM will require project specific air quality modeling as outlined in Section F.4.
- BLM will ensure that project specific modeling is carried out in accordance with Environmental Protection Agency modeling guidelines and in cooperation with the air quality interagency review team.

- BLM will support and participate in regional modeling efforts through multi-state and/or multi-agency organizations such as Western Governor's Association – Western Regional Air Partnership, the Federal Leadership Forum, and Wyoming DEQ's Ozone Technical Forum and Resource Directory.
- Require modeling that assesses impacts to air quality and/or air-quality related values if a proposed action meets at least one of the following conditions in each category:
 - Emissions/Impacts: The proposed action is anticipated to cause a substantial increase in emissions based on the emissions inventory, or will materially contribute to potential adverse cumulative air quality impacts as determined under the National Environmental Policy Act.
 - Geographic Location: The proposed action is in
 - Proximity to a Class I or sensitive Class II Area; or
 - A Non-Attainment or Maintenance Area; or
 - An area expected to exceed the NAAQS or Prevention of Significant Deterioration increment based on
 - Monitored or previously modeled values for the area;
 - Proximity to designated Non-Attainment or Maintenance Areas; or
 - Emissions for the proposed action based on the Emissions Inventory

F.3.4. Mitigation

BLM recognizes that many of the activities that it authorizes, permits, or allows generate air pollutant emissions that have the potential to adversely impact air quality. The primary mechanism to reduce air quality impacts is to reduce emissions (mitigation). As part of this comprehensive air management plan for the planning area, BLM commits to the following with regards to reducing emissions:

- BLM will require project proponents to include measures for reducing air pollutant emissions in project proposals and Plans of Development as described in Section F.4,
- BLM will require additional air emission control measures and strategies within its regulatory authority and in consultation with Wyoming DEQ and other federal agencies when appropriate if an operator's proposed or committed measures are insufficient to achieve air quality goals,
- BLM will ensure that air pollution control measures and strategies (both operator committed and required mitigation) are enforceable by including specific conditions in a ROD.

F.4. Project Specific Requirements

BLM has identified activities and pollutants of concern for the planning area and this section contains specific requirements for project proponents. Mineral development activities, specifically oil and gas development and mining, have been identified as having the potential to contribute to increases in ambient concentrations of O₃, HAPs and PM_{2.5}. Proponents of mineral development projects must comply with Section F.4.1 and Section F.4.4.1 at a minimum. In addition, project proponents for other activities may be required to comply with Section F.4 as determined by BLM taking into account existing air quality conditions and availability of representative air monitoring data, magnitude of estimated project emissions, meteorologic and geographic conditions in the vicinity of the project, and the current state of air pollution control technology.

F.4.1. Emissions Inventory

The proponent of a mineral development project will provide the BLM an emissions inventory that quantifies emissions of regulated air pollutants from all sources related to the proposed project, including fugitive emissions and greenhouse gas emissions, estimated for each year for the life of the project. BLM will use this estimated emissions inventory to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the proposed project.

The BLM may require an emissions inventory for other actions depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.2. Monitoring

F.4.2.1 The proponent of a mineral development project that has the potential to emit more than 100 tons per year of any criteria air pollutant must provide a minimum of one year of baseline ambient air monitoring data for any pollutant(s) of concern as determined by BLM, if no representative air monitoring data are being collected within 50 kilometer of the project area, or existing ambient air monitoring data are insufficient, incomplete, or does not meet minimum air monitoring standards set by Wyoming DEQ. If BLM determines that baseline monitoring is required, this pre-analysis data must meet DEQ air monitoring standards, be obtained from a site within 50 kilometer of project boundary, and cover the year immediately prior to the submittal. This requirement may be waived where the life of the project is less than one year.

F.4.2.2 The BLM may require monitoring for the life of the mineral development project depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.2.3 The BLM may require project proponents of other air emission generating projects to conduct baseline or life of project air monitoring depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.3. Modeling

F.4.3.1 The proponent of a mineral development project that has the potential to emit more than 100 tons per year of any criteria pollutant will be required to conduct air quality modeling for any pollutant(s) of concern, as determined by BLM, unless the project proponent can demonstrate that the project will result in no net increase in emissions of the pollutant(s) of concern. BLM, in cooperation with the interagency review team, will determine the parameters for the modeling analysis through the development of a project specific modeling protocol.

F.4.3.2 BLM may require air quality modeling for other air emission generating projects or for projects, actions, or management activities with estimated emissions below the threshold listed in F.4.3.1 if other criteria that warrant an air dispersion or photochemical modeling analysis are identified for purposes of analyzing project direct, indirect or cumulative impacts to air quality. Such criteria may include the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.4. Mitigation

F.4.4.1 The proponent of a mineral development project will be required to minimize air pollutant emissions by complying with all applicable state and federal regulations (including application of Best Available Control Technology) and may be required to apply additional mitigation including but not limited to best management practices and other control technologies or strategies identified by the BLM or Wyoming DEQ in accordance with delegated regulatory authority.

F.4.4.2 The proponent of a mineral development project that has the potential to emit any regulated air pollutant will be required to provide a detailed description of operator committed measures to reduce project related air pollutant emissions including greenhouse gases and fugitive dust. Project proponents for oil and gas development projects should refer to Table U.5, “Emission Reduction Strategies for Oil and Gas Development” (p. 1662) included in Appendix U (p. 1651) of the RMP (and in Table F.2, “Emission Reduction Strategies for Oil and Gas Development” (p. 1501), below) as a reference for potential control technologies and strategies. The list is not intended to preclude the use of other effective air pollution control technologies that may be proposed.

F.4.4.3 BLM may require the proponent of other air emission generating projects to comply with F.4.4.1 and F.4.4.2 based on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.4.4 BLM may require project proponents to submit a contingency plan that provides for reduced operations in the event of an air quality episode. Specific operations and pollutants to be addressed in the contingency plan will be determined by BLM on a case-by-case basis taking into account existing air quality and pollutants emitted by the project.

Table F.2. Emission Reduction Strategies for Oil and Gas Development

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Control Strategies for Drilling and Compression			
Directional Drilling	Reduces construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and CO ₂ and nitrogen flux). Reduces habitat fragmentation	Could result in higher air impacts in one area with longer sustained drilling times.	Depends on geological strata
Improved engine technology (Tier 2 or better) for diesel drill rig engines	Reduced NO _x , PM, CO, and VOC emissions	—	Dependent on availability of technology from engine manufacturers
Selective Catalytic Reduction (SCR) for drill rig engines and/or compressors	NO _x emissions reduction and decreased formation of visibility impairing compounds. NO _x control efficiency of 95 percent achieved on drill rig engines. NO _x emission rate of 0.1 grams per horsepower hour achieved for compressors	Potential NH ₃ emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste.	Not applicable to 2-stroke engines
Non-selective catalytic reduction (NSCR) for drill rig engines and/or compressors	NO _x emissions reduction and decreased formation of visibility impairing compounds. NO _x control efficiency of 80-90 percent achieved for drill rig engines. NO _x emission rate of 0.7 grams per horsepower hour achieved for compressor engines greater than 100 horsepower.	Regeneration/disposal of catalysts can produce hazardous waste.	Not applicable to lean burn or 2-stroke engines
Natural Gas fired drill rig engines	NO _x emissions reduction and decreased formation of visibility impairing compounds	—	Requires onsite processing of field gas.
Electrification of drill rig engines and/or compressors	Decreased emissions at the source. Transfers emissions to more efficiently controlled source (EGU)	Displaces emissions to EGU.	Depends on availability of power and transmission lines
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines.	Reduced NO _x , PM, CO, and VOC emissions	—	Dependent on availability of technology from engine manufacturers

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Green (also known as closed loop or flareless) completions	Reduction in VOC and CH ₄ emissions. Reduces or eliminate flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere.	Temporary increase in truck traffic and associated emissions.	Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Availability of sales line. Green completion permits required by Wyoming BACT in some areas
Green workovers	Same as above.	Same as above.	Same as above.
Minimize or eliminate venting and/or use closed loop process where possible during "blow downs"	Same as above.	–	Best Management Practices required by Wyoming BACT
Reclaim/remediate existing open pits, no new open pits	Reduces VOC and GHG emissions. Reduces potential for soil and water contamination. Reduces odors.	May increase truck traffic and associated emissions.	Requires tank and/or pipeline infrastructure.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source.	Displaces emissions to EGU	Depends on availability of power and transmission lines
Wind (or other renewable) generated power for compressors	Low or no emissions.	May require construction of infrastructure. Visual impacts. Potential wildlife impacts.	Depends on availability of power and transmission lines
Control Strategies Utilizing Centralized Systems			
Centralization (or consolidation) of gas processing facilities (separation, dehydration, sweetening, etc.)	Reduces vehicle miles traveled (truck traffic) and associated emissions. Reduced VOC and GHG emissions from individual dehy/separator units.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure.
Liquids Gathering systems (for condensate and produced water)	Reduces vehicle miles traveled and associated emissions. Reduced VOC and GHG emissions from tanks, truck loading/unloading, and multiple production facilities.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure.
Water and/or fracturing liquids delivery system	Reduced long term truck traffic and associated emissions.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure. Not feasible for some terrain.
Control Strategies for Tanks, Separators, and Dehydrators			
Eliminate use of open top tanks	Reduced VOC and GHG emissions.	–	Required by Wyoming BACT for produced water tanks in some areas.

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.	Reduces VOC and GHG emissions.	Pressure build up on older tanks can lead to uncontrolled rupture.	98 percent VOC control if ≥ 10 TPY required statewide by Wyoming BACT
Capture and control of produced water tank emissions.	Reduces VOC and GHG emissions.	—	98 percent VOC control and no open top tanks required by Wyoming DEQ in some areas
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion.	Reduces VOC, HAP, and GHG emissions.	—	Still vent condensers required and 98 percent VOC control if ≥ 8 TPY required statewide and in CDA by Wyoming BACT. All dehy emissions controlled at 98 percent in JPAD (no 8 TPY threshold)
Control Strategies for Misc. Fugitive VOC Emissions			
Install and maintain low VOC emitting seals, valves, hatches on production equipment.	Reduces VOC and GHG emissions.	—	—
Initiate an equipment leak detection and repair program (including use of FLIR cameras, grab samples, organic vapor detection devices, visual inspection, etc.)	Reduction in VOC and GHG emissions.	—	—
Install or convert gas operated pneumatic devices to electric, solar, or instrument (or compressed) air driven devices/controllers.	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	—
Use "low" or "no bleed" gas operated pneumatic devices/controllers.	Reduces VOC and GHG emissions.	—	or closed loop required statewide by Wyoming BACT
Use closed loop system or thermal combustion for gas operated pneumatic pump emissions.	Reduces VOC and GHG emissions.	—	Required statewide by Wyoming BACT (98 percent VOC control or closed loop)
Install or convert gas operated pneumatic pumps to electric, solar, or instrument (or compressed) air driven pumps.	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	Required statewide by Wyoming BACT if no thermal combustion used.
Install vapor recovery on truck loading/unloading operations at tanks.	Reduces emissions of VOC and GHG emissions.	Pressure build up on older tanks can lead to uncontrolled rupture.	Wyoming BACT analysis required if VOC ≥ 8 TPY or HAP ≥ 5 TPY.
Control Strategies for Fugitive Dust and Vehicle Emissions			
Unpaved surface treatments including watering, chemical suppressants, and gravel.	20 percent - 80 percent control of fugitive dust (particulates) from vehicle traffic.	Potential impacts to water and vegetation from runoff of suppressants.	—

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Use remote telemetry and automation of wellhead equipment.	Reduces vehicle traffic and associated emissions.	—	—
Speed limit control and enforcement on unpaved roads.	Reduction of fugitive dust emissions.	—	—
Reduce commuter vehicle trips through car pools, commuter vans or buses, innovative work schedules, or work camps.	Reduced combustion emissions, reduced fugitive dust emissions, reduced O ₃ formation, reduced impacts to visibility.	—	—
Miscellaneous Control Strategies			
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates.	—	Fuel not readily available in some areas.
Reduce unnecessary vehicle idling.	Reduced combustion emissions, reduced O ₃ formation, reduced impacts to visibility, reduced fuel consumption.	—	—
Reduced pace of (phased) development.	Peak emissions of all pollutants reduced.	Emissions generated at a lower rate but for a longer period. LOP, duration of impacts is longer.	May not be economically viable or feasible if multiple mineral interests.
CO ₂ Carbon Dioxide DEQ Department of Environmental Quality NO _x Nitrogen Oxides O ₃ ozone CO Carbon Monoxide EGU Electric Generating Unit VOC Volatile Organic Compound CH ₄ Methane		NH ₃ Ammonia BACT Best Available Control Technology GHG Greenhouse Gas HAP Hazardous Air Pollutant LOP life of plan TPY Tons per year JPAD Joint Precision Airdrop System FLIR Forward Looking Infrared	

Appendix G. Example Detailed, Multi-phased, Reclamation Plan

Continental Divide-Creston Natural Gas Project **Environmental Impact Statement (EIS)** Reclamation Goal Statement

Encourage informed decisions to minimize initial disturbance and return disturbance as quickly and effectively as possible to pre-disturbance conditions. Identify important characteristics of revegetation for evaluation of interim reclamation that serve as criteria for rollover and that are indicative that revegetation is moving toward successful reclamation.

A. Development of a comprehensive reclamation plan

I. Conduct a pre-disturbance inventory of proposed disturbance and reference areas

Pre-disturbance inventories are used for two main purposes. The first is to use site-specific information to develop a reclamation plan, including treatment of soils and identification of appropriate species to include in the seed mix and the site's ability to serve as a source of seed prior to disturbance. The second purpose is to identify any issues, such as saline soils, steep topography, or invasive species that will impact successful interim and/or final reclamation.

II. Describe landscape features and climate

1. Climate and physical characteristics of the site are important factors to consider in development of a reclamation plan, particularly in identifying possible problems. For example, a site on a south-facing slope may suggest that more drought tolerant plants should be selected than if the site is on a north-facing slope. Topography (slope and aspect), climate (including postulated microclimate), and parent materials (geological substrates) are considerations in site selection and reclamation plan development.
2. Steep topography: Steep slopes that would result in site instability should be avoided. If the slope is greater than 25 percent, the **Bureau of Land Management (BLM)** may advise the site be relocated.
3. Poor or erodible parent materials, or a rocky surface or, marine shales, clay/siltstone, or selenium bearing geological substrates at the surface may result in difficult reclamation conditions and should be avoided. If such areas are planned to be disturbed by the Operator, all possible resources will need to be employed by the BLM to ensure successful reclamation.
4. Available climate information, including precipitation patterns and growing season relative to the site planned for disturbance, will be addressed by the Operator in the site-specific reclamation plan in the Application for Permit to Drill (APD) approved by the BLM.

III. Suitable soil inventory

- a. Soil characteristics may strongly influence reclamation efforts. Fundamental characterization of soils ahead of disturbance can identify potential problems, so they can be addressed during disturbance, soil stockpiling and reclamation, instead of waiting for reclamation failure.
- b. The phrase “suitable soil” is used mainly because of confusion over the definition of topsoil. Soil depth, pH, electrical conductivity, texture, surface features (e.g. barren, rocky, crusty, plant litter), and organic matter content are characteristics that may be used to determine if a soil is suitable. Other information may be needed. See: “Successful restoration of severely disturbed lands: Overview of critical components,” B-1202, (and available for free at <http://ces.uwyo.edu/PUBS/B1202.pdf>).
- c. Soil characteristics that can signal a high probability of reclamation problems include: pH, electrical conductivity, soil texture, surface/subsurface features, sodium adsorption ratio, calcium carbonate content, soil compaction and saturation percentage and the below listed characteristics will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
 1. Soils with pH 7.8 and higher progressively become less suitable for reclamation and will be addressed by the Operator in the site-specific reclamation in the APD approved by the BLM.
 2. An electrical conductivity of soil greater than eight (8) dS/m and any increase in salt content of the soil above .5 dS/m will progressively negatively affect the establishment and growth of plants. Soils exhibiting these characteristics will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
 3. Soils with textures representing clay, sand or loamy sand will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
 4. Surface and subsurface soil in and through the root zone dominated by coarse material greater than 2 mm in diameter and greater than 40 percent in the soil profile to be stockpiled may signify reclamation difficulties and will be considered in the site-specific reclamation plan in the APD by the BLM and Operator.
 5. Sodium adsorption ratio is a key diagnostic soil trait that may be determined for soils to be disturbed and placed in the suitable soil stockpile; and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
 6. Calcium carbonate content (percent lime) will control the amount of plant available phosphorus and will determined in the site-specific reclamation plan in the APD by the Operator and approved by the BLM.
 7. The soil saturation percentage will control the ability for plants to germinate and survive after reclamation actions have been taken by the Operator

and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

IV. Vegetation inventory

- a. Gathering vegetation data before a site has been cleared for drilling documents pre-disturbance site conditions and in turn guides management decisions regarding what species could be expected to successfully revegetate a site to match its existing or potential state. Seed mixes should be based on desired vegetation that has historically grown on-site and that has been shown to be successful in previous trials. Return of cover should be gauged by comparison with actual pre-disturbance site conditions and/or reference areas.
- b. Vegetation characteristics that would signal a high probability of reclamation problems:
 1. The presence of Halophytes: e.g., Saltbush
 2. The presence of Alkali Halophytes: e.g., Greasewood, Halogeton
 3. The presence of Noxious and Invasive Species: e.g., Cheatgrass, Russian thistle, Russian knapweed, Alyssum, Canada thistle.
- c. The methodologies to be used to determine the information for the vegetation inventory will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
 1. BLM guidelines for vegetation sampling: Sampling Vegetation Attributes, Interagency Technical Reference (1996) Revised in 1997 and 1999. BLM/RS/ST-96/002+1730. 171 pages. URL for Sampling Vegetation Attributes: <http://www.blm.gov/nstc/library/pdf/samplveg.pdf>. All BLM technical references: <http://www.blm.gov/nstc/library/techref.htm>.

V. Select a reference area

- a. A reference area is a land unit which is representative, in terms of physiography, soils, vegetation and land use history, of an area to be affected by resource extraction. Reclaimed areas are compared to reference areas to determine successful interim and final reclamation.
- b. In Wyoming, a site can have multiple ecological communities surrounding it (e.g. dunes, alkali flats, and sagebrush). Ecological variation at a given site can make it difficult to evaluate which adjacent area should serve as a reference. The most accurate way to choose a reference area is to perform pre-disturbance monitoring and identify the dominant community on or adjacent to a site before construction begins. This measure ensures that initial efforts to establish vegetation are consistent with species that naturally occur at that location. A reference area located adjacent to the construction site, with similar soils, vegetation, and aspect of the area to be disturbed will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

B. Invasive plant management plan for construction and reclamation activities

Disturbed sites can provide ideal opportunities for invasive plant species to propagate. Invasive plants can be transferred to the disturbed site from adjoining areas and out-compete desired vegetation during reclamation and/or spread to new areas. The best approach to combat invasive species is to use careful suitable soil handling and an appropriate seed mix. Pre-disturbance planning, including early weed management for invasive species is vital to reduce costs and ensure successful reclamation.

- a. Assess for noxious and invasive weed species before initiating surface disturbing activities, during disturbance, during interim and final reclamation, and after reclamation is completed.
- b. Web address for the Wyoming Weed and Pest Council: <http://www.wyoweed.org/>
- c. Apply weed control treatments
- d. Monitor weedy plant species at least annually to evaluate success of weed control treatments and determine if continued weed control is necessary.

C. Develop a reclamation plan

Reclamation planning provides a detailed strategy for returning a disturbed site back to a functioning pre-disturbance condition. Reclamation planning also may minimize costs and greatly improves chances of successful interim and final reclamation. The reclamation plan will be made part of the APD by the Operator and BLM.

I. Site preparation, storm water, surface stability, and soil management for interim reclamation

- a. Site preparation activities readies a site for revegetation activities and in general include replacement of stockpiled suitable and unsuitable soils, reestablishing a stable subsurface environment, recontouring (reconstruction of landscape), incorporation of soil amendments and primary tillage/ripping to relieve soil compaction prior to spreading suitable soil and secondary tillage using a parabolic plow just prior to seeding.
- b. Soil Management includes the handling and management of stockpiled soil on the site in a way that minimizes loss from erosion and best preserves its ability to support a productive plant community, the soil biota and their habitat as well as its physical and chemical properties.
- c. A Construction Stormwater Permit from the Wyoming Department of Environmental Quality (DEQ) is required any time a project results in clearing, grading, or otherwise disturbing one or more acres. The disturbed area does not need to be contiguous. The permit is required for surface disturbances associated with construction of the project, access roads, construction of wetland mitigation sites, borrow and stockpiling areas, equipment staging and maintenance areas and any other disturbed areas associated with construction. A general permit has been established for this purpose and either the Operator or general contractor is

responsible for filing a Notice of Intent (NOI) and complying with the provisions of the general permit.

- d. A reclamation plan should include a description of how the Operator will achieve the following for surface stability:
 1. Redistribute soil materials in a manner to optimize revegetation potential.
 2. Relieve compaction of the redistributed soil (suitable and unsuitable) to an appropriate depth (18-24 inches) just prior to seeding to accommodate desired plant species germination and sustained growth.
 3. Prepare the seedbed, optimize roughness, furrow on contour to prevailing wind or pit, description of technology to be used, establish surface conditions that would enhance development of diverse, stable, self-generating plant communities, and description of erosion control to be maintained on the site.
 4. reestablish slope stability and surface stability.
 5. Reconstruct the landscape to the approximate original contour or a contour consistent with the land use plan.
 6. Maximize geomorphic stability and topographic diversity of the reclaimed topography.
 7. Eliminate high walls, cut slopes, and/or topographic depressions on site, unless otherwise approved.
 8. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
 9. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.
 10. Minimize wind, sheet and rill erosion on/or adjacent to the reclaimed area.
 11. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area. Site selection is the favorable method to avoid these issues.
 12. Protect seed and seedling establishment (e.g., erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.).

II. Recommendations for suitable soil stockpiling to maintain soil quality

Suitable soil for reclamation will be stockpiled on the site for use in future site reclamation and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

III. Describe soil amendments

- a. Soil amendment(s) may be used in reclamation if the soil is lacking the necessary chemical, biological, physical and /or organic materials to support sustaining growth of suitable plant materials. The soil type, soil characteristics (see A., ii. b), geographic location, along with soil mapping resources available should provide the information necessary to define the soil amendment.
- b. The Operator should state what applying soil amendments is intended to accomplish. Soil amendment plans should be provided, including what amendments will be applied, method of application, timing relative to other reclamation activities (i.e. stockpiling, seeding, ripping).
- c. The soil type is defined by the soil samples obtained prior to or in some cases after disturbance takes place. Soil amendments must be scientifically calculated based on the soil characteristics (see A., ii. b) so as to provide the most cost efficient and best assurances for successful reclamation.
- d. Soil amendments include but are not limited to the following: Weed free grass hay, weed free wood chips or other weed free cellulosic materials, gypsum, elemental sulfur, and fertilizer.

IV. Describe seeding methods

- a. Different plant species may require different conditions (e.g. seeding depth, seed scarification, mixing, and timing) for optimal germination success. Seeding methods should match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species.
- b. The Operator will describe when seeding will occur and specify the methods they will use for seeding, including differential handling for different species (e.g. broadcast vs. drilling vs. Imprinting), and seeding depth in the site-specific reclamation plan of the APD. Re-seeding may need to occur if invasive and/or noxious weeds prevent establishment of the seed mix. See Appendix A below for references.

V. Seed mixes

1. The need to provide multifunctional and sustainable seed mixes for interim and final reclamation and soil stability is driven by a desire to increase potential for successful and timely re-vegetation and site stability. Plant diversity and habitat functionality are directly impacted by the seed choices applied to an area slated to be reclaimed or restored. To maintain as much stability and ecological function this section makes recommendations to specifically aid an operator's selection process. Please see Appendix A for references.
 1. Select site-appropriate, adapted native plant materials based on the pre-disturbance plant community composition, site characteristics, and ecological setting. Seeds may be obtained from commercial sources of

certified weed-free seed mixes. Alternatively, local collections may be used provided they are collected in an area without weedy species.

2. Perennial naturalized species may be used when attempts to reclaim using native plants have not succeeded for a minimum of 2 full growing seasons. Reclamation should succeed using native species if soils are properly managed, precipitation is not limiting, seed mixes are carefully selected and seeded areas protected from grazing.
3. Based upon site-specific conditions, a decision may be made to use non-natives sooner than identified above and will be used in only unique conditions defined in the site-specific reclamation plan in the APD.

VI. Describe if and how irrigation techniques will be used in the reclamation plan

- a. Revegetation success is highly dependent on timing and amounts of precipitation. However, variable weather in Wyoming can limit or delay successful germination and establishment of plants. Irrigation can supplement natural precipitation to insure success of newly seeded site during the initial growth period of the plant. However, overuse of irrigation may result in plants that are dependent on supplemental water, therefore irrigation practices must be used carefully and conservatively.
- b. Supplemental irrigation should be scientifically determined and applied.
- c. Both soil and water samples should be tested before application and said water source should meet appropriate limits for sodium adsorption ratio and EC. Special consideration of soil chemistry and amendments will be a determining factor for the use of the source water.
- d. Water must be utilized from permitted sources and should be permitted for such purposes. Produced water from sources, i.e. “coal bed natural gas wells” must adhere to discharge permits and be recognized by the Wyoming DEQ. Water utilized from sub surface water wells must be permitted and in good standing with State Engineers Office.
- e. Irrigation can be cost prohibitive and should not be a requirement for reclamation but used as a tool to enhance vegetative growth.

VI- Describe best management practices

I.

Best Management Practices (BMPs) are techniques that can be applied to surface disturbance and reclamation actions to aid in reclamation success. Identify the appropriate BMPs during planning and they can guide the surface disturbance and reclamation process. Additionally, documenting BMPs provides opportunities to evaluate for success, so BMPs can be modified for future use in similar conditions. Please see Appendix A for BLM recommendations.

VI- Description of monitoring and reporting protocols for reclamation

II. rollover

- a. Site Monitoring is conducted to observe and keep track of environmental conditions on the reclaimed site. Specifically, monitoring is done to document proper development of the reseeded plant community, soil stability and proper ecosystem function. Continued characterization after disturbance and during interim reclamation is appropriate for monitoring site maturation and stability, particularly when problematic soil conditions or invasive weeds are identified.
- b. Vegetative monitoring and disturbed site evaluation for any component of the reclamation plan applicable to the APD shall take place at intervals agreed to by the BLM and the Operator with input by any entity who utilizes the surface estate (i.e. grazing permittee) of the disturbed site. Generally, the intervals for monitoring and reporting will be set annually by the BLM unless otherwise documented in the site-specific reclamation plan for the APD. The Interim Reclamation Objective (IRO) achievement by the Operator will reduce the mandatory monitoring and reporting described in the reclamation plan to a time period agreed to by the Operator and BLM and will be added to the site-specific reclamation plan by the BLM. Once the disturbed site achieves the IRO, the site will be subject to all applicable requirements of the reclamation plan until a time that the Final Reclamation Objective (FRO) is achieved by the Operator and approved by the BLM. Once the BLM has accepted the site for IRO status the BLM will also notify the Operator of the resulting acreage gained for reclamation rollover.
- c. The IRO is to reconstruct and revegetate the portion of the disturbed land unused for long term production and establish the vegetative cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual and forage loss during the life of the well and/or facilities.
- d. The long-term FRO is to return the land to a condition that which existed prior to disturbance with allowances for an improved and/or stable ecological condition, if possible. This includes reconstruction of the landform to its original state along with reestablishment of a stable vegetative community, hydrologic systems, visual resources, and wildlife habitats. To ensure that the FRO will be achieved and maintained through human and natural processes, actions will be taken to ensure standards are met for site stability, visual quality, hydrological functioning, and vegetative productivity beyond the end of the life of the well or facilities.
- e. Monitoring should be designed and implemented by the Operator to document continuing successful interim reclamation for reclamation rollover using methodologies approved by BLM.
 1. Once the IRO is achieved and reclamation rollover granted by BLM, the Operator will continue to monitor the condition of the reclamation, document that the revegetation continues to meet IRO, and that the revegetation trajectory is toward achievement of FROs as defined in the site-specific reclamation plan approved by BLM.
 2. Identify potential problems and determine appropriate mitigation measures with the implementation of adaptive management.

- f. The required elements of monitoring to assess IRO and FRO will be identified and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM. Please see Appendix A for additional information.

D. Indicators for successful achievement for the IRO resulting in reclamation rollover

I. Beginning Monitoring

Monitoring should begin the first growing season. Evaluation is possible after a minimum of two full growing seasons.

II. Irrigation and monitoring

If irrigation is used initially, then the reclamation may be evaluated for interim reclamation success two (2) full growing seasons after irrigation ceases to assure that the plant community can survive without supplemental water.

III. The IRO reclamation rollover criteria is as depicted in the Rawlins Field Office Resource Management Plan (RMP) vs alternative criteria if this process is followed

The Current Rawlins Field Office RMP states “Criteria based on predisturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition (The vegetation will consist of species included in the seed mix and/or occurring in the surrounding natural vegetation or as deemed desirable by BLM in review and approval of the reclamation plan. No single species will account for more than 30 percent total vegetative composition unless it is evident at higher levels in the adjacent landscape. Vegetation canopy cover production and species diversity shall approximate the surrounding undisturbed area) or –

- Eighty percent of predisturbance ground cover and ninety percent dominate species.

Should this pre-disturbance protocol be followed, it is our recommendation to provide an alternative to the above language and have revegetation cover be 70 percent of reference area cover to meet interim criteria. All of this 70 percent must be desirable perennial species as represented by the seed mix. Items D, I, ii and iv through ix would also need to be followed to interim reclamation criteria.

IV. Monitoring results must be from a standardized cover/species protocol finalized by BLM

V. Noxious weeds

No noxious weeds will be allowed.

VI. Invasive weeds

Invasive weed species cover no greater than adjacent invasive species cover. All other undesirable perennial or annual plants as defined in the site-specific APD shall be continually controlled or eradicated on the original disturbed area.

VI- Undesirable/annual plants

I.

For purposes of successful IRO achievement, the amount of undesirable perennial or annual plant species shall be as represented in the site-specific reclamation plan and determined by vegetative monitoring of the disturbed area and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

VI- Vegetative trending

II.

If vegetative trending is not positive within 3 full growing seasons without irrigation or 2 years after irrigation, the BLM and Operator will determine through adaptive management the needs for the disturbed site.

IX. Erosion

Erosion features equal to or less than surrounding area.

E. The monitoring data reporting required of the Operator as specified in the Rawlins RMP (with some additions to clarify and flow with document-original language in Appendix 36 of the Rawlins RMP)

Reclamation Monitoring Reporting Data required to be obtained and filed by the Operator.

General
WYW# (Oil and Gas Lease or Right-of-Way (ROW))
Project Name:
Project Type (e.g. Well, Access Road, Pipeline, Facility, Wind)
Qtr/Qtr Sec, T, R, County, State
Disturbance
Disturbance Dates
Start-End
Reclamation Type (Interim/Final)
Reclamation
Earthwork Contractor Name
Earthwork Completion Date
Soil Preparation Ripping Depth (prior to re-spreading suitable soil)
Area (Acres or Square Feet)
Seeding Contractor Name
Seeding Date
Seedbed/Compaction Release Preparation Methods (Describe -Rip, Disc, Harrow, Parabolic, Depths)
Seeding
Seeding Method (Drill, Broadcast, Imprint, Depths)
Copy of Seed Tag (Species %, Purity %, Germination %)
Actual Seeding Rate (Lbs/Acre of each species)
Area Seeded (Acres or Square Feet)
Soil Amendments Used (Describe)
Other
Mulching/Erosion Netting/Tackifier used – yes/no and describe
Fenced Location yes/no
Snow Fencing yes/no
Weeds

Type(s) of Weed Treated - List Weed Contractor Name Contractor License # Weed Treatment Date Weed Treatment Type (Chemical, Mechanical) Chemicals Used and Rates Applied Area Treated (Acres or Square Feet) (GIS Extent and Location)
Inspection
Inspector's Name, Company, ID Inspection Date Time after Seeding (which Growing season) Seedlings/Square Feet Growing Percent and Extent of Bare Soil (Describe) Percent Ground Cover (Describe) Percent Desirable Species (Describe) Percent Noxious/Invasive Weeds (Describe) Erosion Features Present? (Describe) Evidence of Livestock Grazing (Describe) Reclamation Successful (Yes/No)
Reporting
Completed Spreadsheet or Database as defined by BLM GIS Layer With Attribute Table With Site Data as Detailed Detail Disturbance Extent and Location Permanent Photo Reference Point -Describe
Monitoring
Reference Photos Close-Up Photos Reseeding yes/no
Future Management Prescription
Weed Control Needed - yes/no and explanation Erosion control Needed - yes/no and explanation Grazing/Predation Issues - yes/no and explanation Other Cultural or Mechanical Needs - yes/no and explanation Record - yes/no and explanation
BLM Bureau of Land Management GIS Geographic Information Systems NRCS Natural Resources Conservation Service USDA U.S. Department of Agriculture USFS U.S. Forest Service VRM Visual Resource Management

Appendix A

A. Suggestions on Stockpiling Suitable and Unsuitable Soils to Maintain Soil Quality

Stockpiled topsoil should not be piled too deeply or too shallow. The taller or deeper the piles, the more soil is buried under large amounts of pressure resulting in compaction. Soil buried deep in the pile also has little exposure to oxygen resulting in anaerobiosis; deeply buried soil also has no organic matter input. Both of these problems reduce soil quality.

Shallow or small topsoil stockpiles have large footprints on the land surface with the disadvantage of covering greater areas of undisturbed soil which will, in turn, require revegetation, resulting in a greater overall amount of disturbed soil. Smaller or shallow stockpiles also have a greater surface area per amount of soil stored which increases

exposure of the stockpiled soil to wind and water erosion. The surface of soil stockpiles should always be vegetated to minimize erosion losses.

1. Salvaged stockpiles of suitable soil should be no deeper than 4 meters (13 feet) and should be less where possible.
2. Stockpile slopes should not exceed 5:1 angles (20 percent slopes) to allow for seeding and minimize erosion.
3. Suitable Soil stockpiles should be located in areas to prevent their disturbance and contamination by well pad activities. They should not be placed in streambeds or ephemeral drainages where they may be washed away. They should be protected from wind erosion.
4. A perimeter ditch/berm should be constructed around the stockpile for topsoil conservation and sediment control.
5. All suitable soil stockpiles should be seeded with native cool season grass to provide cover and protect them from water and wind erosion. Before seeding, the stockpile may be scarified along contours to minimize wind and water erosion.
6. If soil horizons or layers are to be stratified during soil salvage (stripping) operations, soil maps should be made of the well pad area to identify depths of soil horizons and surface slope. The pad area to be cleared of soils should then be divided into strips the size of the blades or equipment being used for soil removal. The depth of soil removal from each swath should be clearly marked so that equipment operators are removing a uniform layer from each strip. After the topsoil is removed from the area in this manner, the subsoil can then be removed in the same fashion, strip by strip, each strip at a uniform depth.

B. Suggestions on Supplemental Irrigation

Supplemental irrigation should be scientifically determined and applied in the initial four to six week period of growth of the seedling plants and then ended. Such determination could be the application of an amount of irrigation water equivalent to the average or average plus 25 percent of the precipitation expected during a given interval.

C. Suggestions on Vegetation and Soil Monitoring

Examples of monitoring components are listed below:

1. Reference: <http://agriculture.wy.gov/forms/natres/rangelandmonitoring.pdf>
2. Operators should use the same locations and methods used at baseline for repeat photography. Additional locations may be selected to document progress of reclaimed area to demonstrate interim and final reclamation success, and to monitor any identified problems such as erosional features. The site should be photographed once every year normally at the same time period, from the same locations and direction so that photographs are repeated through time. Photographs should be taken during the growing season.

3. Weed assessment: Disturbed and reclaimed areas should be evaluated for noxious and invasive weeds at least annually. Weed control should be promptly implemented by the Operator once weed species and infestations are identified. Weed control applied at planned chemical rates at times the weed is emerging can have positive impacts in minimizing weed growth through-out the year as well as promoting the growth of grass species. The timing of the control should be determined by the growth habits of the weed species and when they are most effectively assessed. If weeds persist, reseeding the site could be considered as well as the species of grass, forb or shrub.
4. Erosion control/soil stability: The reclaimed area should be evaluated for any signs of erosion problems annually and when the site is subject to erosional events. Identified erosion features should be monitored using repeat photography. Absence of erosion features is a positive indication that the soil is stabilizing.
5. Cover and composition data should be used to document that the plant community continues to trend toward the requirements to achieve interim and final reclamation success. The data should be used to evaluate if species composition and cover are increasing. These factors should be considered relative to the number of species in the seed mix, the selected reference area, and offsite responses to seasonal growing conditions.
6. Plant community cover and composition measurements: The Operator should start collecting cover and composition data beginning in the first (1st) growing season after disturbance. Data should be collected using repeatable methods approved by the appropriate regulatory authority (BLM) and should be the same methods that were used to describe vegetation for baseline (or reference area). The same methods should be used each time the vegetation is monitored.
7. Soils should be monitored if reclamation problems suggest that soils might be the problem. Such problems include but are not limited to salt crusts, clay crusts, wind and/or water erosion and rapid changes in pH (up or down) Recommended soil monitoring would include sampling soils and analysis of soil characteristics as described in the Development of a comprehensive plan section.

D. Web Links

Equipment
Equipment — http://www.reveg-catalog.tamu.edu
Equipment — http://www.nsl.fs.fed.us/great_basin_native_plants.html
Mats — www.newparkmats.com
Electric fence — www.hcam.net
SpiderPlow — www.spiderplowinternational.com
Truax — http://www.truaxcomp.com/
Government

2006 Gold Book — http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html BLM engineering drawings, roads & fences — http://www.blm.gov/nstc/eng/draw.html BLM VRM — http://www.blm.gov/nstc/VRM/ BLM NSTC — http://www.blm.gov/nstc/ EPA — http://www.epa.gov/owow/nps/ and http://www.blm.gov/bmp/ New Onshore Order #1, May 7-07 — http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/07-934.pdf Wyoming BLM requirements — http://www.wy.blm.gov/minerals/og/ Wyoming Climate Atlas — http://www.wrds.uwyo.edu/sco/climate_office.html Wyoming DEQ — http://deq.state.wy.us/wqd/watershed/nps/npspg.htm NRCS fotog — http://efotg.nrcs.usda.gov/treemenuFS.aspx
Journals
American Society of Mining and Reclamation — http://dept.ca.uky.edu/asmr/W/ Global Restoration Network — www.globalrestorationnetwork.org Journal Range Management archives — http://jrm.library.arizona.edu/jrm/ National Roadside Vegetation Management Association — http://www.nrvma.org Society for Ecological Restoration (SER) — http://www.ser.org/ USFS Rocky Mountain Research Station publications — http://www.treeseearch.fs.fed.us/pubs/rmrs/ Wyoming Native Plant Society — http://uwadmnweb.uwyo.edu/wyndd/wnps/plant_id.htm
Maps/GIS
Topo & aerial photos — http://geonames.usgs.gov/pls/gnispublic/f?p=171:1:6176131719238320356 NRCS National Water and Climate Center — http://www.wcc.nrcs.usda.gov/wcc.html Water Erosion Prediction project — http://octagon.nserl.purdue.edu/weppV1/ Wyoming Geographic Information Science Center — http://www.wygisc.uwyo.edu/
Mycorrhizae
http://mycorrhiza.ag.utk.edu/default.html http://invam.caf.wvu.edu/index.html http://www.ars.usda.gov/is/pr/2003/030205.htm
Oil/Gas
Completion and workover wastes — http://www.epa.gov/epaoswer/other/oil/w&c.pdf Dust suppression — http://www.oznet.ksu.edu/Stevenson/Dust%20Manual%20%20102704.pdf Hydraulic Fracturing (Fracking or Frac Job) — http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf http://www.epa.gov/safewater/uic/cbmstudy/pdfs/completestudy/ch4_6-8-04.pdf National LTAP & TTAP Rural Roads — http://www.ltapt2.org/resources/ruralresources.php Oil & Gas Production wastes — http://www.epa.gov/epaoswer/other/oil/oil-gas.pdf Power lines — http://www.aplic.org/ Produced water — http://www.iogcc.state.ok.us/PDFS/2006-Produced-Water-Guidebook.pdf The T ² /LTAP Center University of Wyoming — http://www.weng.uwyo.edu/wyt2/ Western Governors CBM BMPs — http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf Wyoming Oil and Gas Commission requirements — http://wogcc.state.wy.us/
Restoration Handbooks
Bags Quiet Presence NRCS — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html Dryland pastures — http://www.montana.edu/wwwpb/pubs/eb19.pdf Handbook of Western Reclamation Techniques — http://cbmcc.org/intro06.pdf Restoring Western Ranges and Wild lands — http://www.fs.fed.us/rm/pubs/rmrs_gtr136.html Solid Minerals reclamation handbook — http://www.blm.gov/nhp/efoia/wo/fy01/ib2001-081attach.pdf
Scientific Literature

An Introduction to using native plants in Restoration — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html Geology and Plant life — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html Managing Arid and semi-arid watersheds — http://www.wy.blm.gov/botany/wyspecies.htm http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oil.html Revegetation Abstracts — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html Sagebrush — http://sagemap.wr.usgs.gov/sage_grouse_documents.htm Salt tolerant plants — http://www.ussl.ars.usda.gov/pls/caliche/Halophyte.query USDA Plant database — http://plants.usda.gov/ Wyoming Natural Diversity Database — http://uwadmnweb.uwyo.edu/wyndd/ Wyoming Plant Materials Technical notes — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html Wyoming Reclamation and Restoration Center — http://uwadmnweb.uwyo.edu/WRRC/
Seed Sources
Guidebook to Great Basin seeds — http://www.id.blm.gov/techbulbs/05_04/entiredoc.pdf http://www.graniteseed.com/ http://uwacadweb.uwyo.edu/seedlab/default.htm http://www.winddriverseed.com/ http://www.pawneebuttesseed.com/ http://www.westernnativeseed.com/ http://www.avseeds.com/company.cfm native@rmnativeplants.com www.graniteseed.com Native Plant Propagation Protocols — http://www.nativeplants.for.uidaho.edu/network Native Seed Network — http://www.nativeseednetwork.org/index Oregon state Seed Lab - quality testing of native seed — www.seedlab.oscs.oregonstate.edu Seed testing protocols — http://www.aosaseed.com/reference.htm
Snow Fence
http://www.snow-snake.com/
Soil
Glossary of Soil Science Terms — https://www.soils.org/sssagloss/?check NRCS Web Soil Survey — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html http://www.nrcs.usda.gov/ http://soils.usda.gov/sqi/concepts/soil_biology/index.html NRCS Soil Quality Publications — http://www.wy.nrcs.usda.gov/Plant/tech_notices.html Soil series name search — http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi
Weeds
Halogeton — http://64.233.161.104/search?q=cache:jIdL39NFvUEJ:wfr.usgs.gov/pubs/journalpdf/dudabiolfertilsoils.pdf+halogeton+competition&hl=en Weed Science Society of America — http://www.wssa.net TNC Invasive species (weeds) — http://tncweeds.ucdavis.edu/control.html
Wildlife
Important Wildlife Habitats — http://gf.state.wy.us/downloads/pdf/og.pdf Sage grouse range wide forum links: http://sagegrouse.ecr.gov/?link=110 Recommendations for Development of Oil and Gas Resources within Crucial and Important Habitats — http://gf.state.wy.us/downloads/doc/O&G%20Recommendations%20April%202010%20with%20changes%20identified.pdf

E. Participants

BLM

- Adrienne Pilmanis
- Bill Lanning
- Eldon Allison
- Rebecca Sprugin
- Skip Stonesifer
- Tom Lahti

BLM Contractor

- Steve Moore

BP America Production Company

- Gary Austin

Coalition of Local Governments

- David Allison
- Jean Dickinson
- Mary Thoman
- Tim Morrison

CSR

- Steven Paulsen

Department of Agriculture

- Chris Wichmann

Wyoming DEQ

- Carol Bilbrough
- Mark Conrad

Devon

- Bill Skelton
- Craig Goodrich
- Dru Bower Moore
- Nick Agopian
- Randy Bolles

Wyoming Governor's Planning Office

- Steve Furtney

Wyoming Game and Fish Department

- Mary Flanderka

UW Reclamation and Restoration Center

- Peter D. Stahl
- Stephen Williams

Appendix H. Required Design Features and Best Management Practices

Adverse environmental impacts associated with development can be avoided, reduced, or mitigated through the project's design and implementation. In order to provide regulatory certainty that the measures will be incorporated, they must be required of every project. The National Technical Team (NTT) report identified management actions and practices that would reduce adverse impacts to greater sage-grouse if mandated to development throughout either Core Area (priority habitat) or occupied greater sage-grouse habitat or general habitat areas. Some of these practices are incorporated in Alternative D as being universally appropriate. The ones that could be analyzed on a planning area-wide basis have been made a part of the management actions and in this appendix as Required Design Features.

Other environmental protection measures could not be analyzed in a resource area-wide Environmental Impact Statement (EIS) because their appropriateness depends upon site-specific issues such as proximity to the boundary of Core Area or non-crucial habitat or engineering or physical limitations such as an oil and gas producing zone being too close to the surface to be recoverable through directional drilling. These best management practices (BMPs) are required to be considered in a site-specific project's design to reduce, prevent, or avoid adverse environmental or social impacts. These practices are analyzed to help ensure that development is conducted in an environmentally responsible manner. Some BMPs are as simple as choosing a paint color that helps oil and natural gas equipment blend with the natural surroundings, turning development less visible. Other BMPs may reduce the amount of vegetation lost to development, improve the speed of re-growth of desirable vegetation, or may reduce the amount of wildlife disturbance in important habitats. Public land users are encouraged to review these practices, incorporate them where appropriate, or develop better methods for achieving the same goal. However, the Bureau of Land Management (BLM) may also require their incorporation into the design features of the project as a Condition of Approval (COA). Only when the design feature is part of the BLM authorization as a COA, should the National Environmental Policy Act (NEPA) analysis of the project analyze the beneficial impacts of the design feature. If the practice is only voluntary or suggested, the BLM lacks the authority to require its implementation, so the project should be analyzed as if the practice will not occur. The BLM authorization will make clear whether the BMP is mandatory (attached as a COA) or merely encouraged.

NEPA analysis that concludes that BMPs should not be attached as mandatory COAs needs to clearly explain why with relation to site-specific factors. The purpose of this section is not to select certain practices or designs and require that only those be used. It is not possible to evaluate all the known practices and make determinations as to which are best, particularly without a specific project in a specific location. BMPs should be matched and adapted to meet the site-specific requirements of the management action, project and local environment. No one management practice is best suited to every site or situation, or will remain the most optimal practice over time. BMPs must be adaptive and monitored regularly to evaluate effectiveness.

As discussed more fully in the *Special Status Species-Wildlife* section, protections for the greater sage-grouse are an important focal point in the preparation of the Resource Management Plan (RMP), in part because of the importance of the Lander habitat for the survival and recovery of the species. Accordingly, a special section of BMPs identifies management that should be considered in both greater sage-grouse Core Area and general greater sage-grouse habitat. It

is expected that these BMPs will change over time as monitoring and further study develop improved greater sage-grouse protections.

Required Design Features

The following design approaches are required for all projects unless the proponent establishes that due to site limitations or engineering considerations, the design approaches are infeasible. Economic considerations such as increased costs do not render a design infeasible.

Greater Sage-Grouse Protection Required Design Features for All Projects:

The following measures, and others as they are identified, will be required for all BLM-authorized development. As appropriate, they may be required as part of the design of the project or as a mandatory COA. Other greater sage-grouse protections are identified below as BMPs which will be evaluated on a site-specific basis for inclusion as a mandatory COA.

General:

- In applying protections for greater sage-grouse protections, all projects must evaluate (1) whether the conservation measure is reasonable (see 43 Code of Federal Regulations [CFR] 3101.1-2 for the definition of “reasonable” for fluid mineral leases) and consistent with valid existing rights, and (2) whether the action is in conformance with the RMP. Each conservation measure will be evaluated on a site-specific basis for likely effectiveness on a cost-benefit basis.
- In Core Area, where development would result in the long-term loss of greater sage-grouse habitat, identify effective mitigation that will be applied for a sufficient term as to constitute replacement habitat. Example: Purchase private land and mineral rights in the priority area and deed to the United States, or obtain a conservation easement in perpetuity. Consider compensatory mitigation and monitoring of significant direct, indirect, and cumulative impacts on, and loss of habitat for greater sage-grouse.
- When additional mitigation is necessary, conduct it in Core Area in the same greater sage-grouse population area. If Core Area does not provide appropriate mitigation, conduct offsite mitigation in general greater sage-grouse habitat with the ability to increase greater sage-grouse populations.
- Designate a qualified biologist who will be responsible for overseeing compliance with all design features related to the protection of ecological resources throughout all project phases, particularly in areas requiring avoidance or containing concentrated greater sage-grouse populations. This person shall be approved by the BLM.

Facilities and Surface Disturbance:

- Give overall consideration to minimizing the adverse impact to greater sage-grouse through a project design that avoids, minimizes, reduces, rectifies, and/or adequately compensates for direct and indirect impacts to greater sage-grouse habitat or use. Apply a phased development approach with concurrent interim reclamation. Locate and design individual project facilities to minimize disruption of animal movement patterns and connectivity of habitats.
- Subject to topographic and other environmental constraints, require development for a project wholly or partially in Core Area to be placed in the area least harmful to greater sage-grouse based on vegetation, topography, or other habitat features.
- Co-locate new development (facilities, pipelines, etc.) in existing disturbances or in areas where reclamation success has not been fully achieved unless the proponent establishes that this is technically unfeasible. Cluster disturbances, operations (hydraulic fracture stimulation,

liquids gathering, etc.), and facilities. Co-locate powerlines, flowlines, and small pipelines under or immediately adjacent to existing roads. Design or site permanent structures to minimize impacts to greater sage-grouse, with emphasis on locating and operating facilities that create movement (e.g., pump jacks) or attract frequent human use and vehicular traffic (e.g., fluid storage tanks) in a manner to minimize disturbance of greater sage-grouse or interference with habitat use.

- Locate new compressor stations outside priority habitats and require a design that reduces noise directed toward priority habitat unless the proponent can establish that this requirement would preclude development of the lease.
- Properly contain and promptly remove refuse to avoid attracting predators.
- Use mats for drilling activities where topography permits to reduce vegetation disturbance, and as temporary roads between closely spaced wells to reduce soil compaction and maintain soil structure to increase likelihood of vegetation reestablishment.
- Restrict the construction of tall facilities, distribution powerlines, fences, and other infrastructure to the minimum number and amount needed. Place facilities such as tanks, which could serve as greater sage-grouse predator perches, outside of Core Area unless the proponent establishes that this technically is unfeasible. Equip tanks and other aboveground facilities with structures or devices that discourage nesting of ravens and raptors.
- Site and/or minimize linear features to reduce disturbance and fragmentation of greater sage-grouse habitats.
- Install greater sage-grouse safe fences around sumps, pits, and other trenching.
- Evaluate whether the benefits to greater sage-grouse from burying powerlines would outweigh the potential loss of habitat from the disturbance associated with burying the line, considering the potential threat from invasive nonnative species (INNS), low reclamation potential, and other factors. If the benefits outweigh potential adverse impacts, require that the powerlines be buried unless the applicant establishes that burying the lines is not technically feasible.
- Use remote monitoring techniques for production facilities, where applicable, and develop a plan to reduce vehicular traffic and human presence.
- Properly contain and promptly remove refuse to avoid attracting predators.
- Cover all fluid-containing pits and open tanks with netting (maximum 1.5-inch mesh size).
- Locate all residential development for employees and contractors ("man camps") outside of Core Area.

Reclamation:

- Where native shrubs located on lands proposed to be disturbed are unique and desirable for interim and final reclamation purposes, and the seed supply for these desirable brush species is not commercially available, seeds will be collected from the area and stored using the procedures of the Seeds of Success program. Seedlings or plugs of common dominant species will be propagated, preferably locally, in preparation for use in portions of area to be reclaimed to expedite vegetation recovery.
- Maximize the area of interim reclamation on long-term access roads and well pads, including reshaping, topsoiling, and revegetating cut-and-fill slopes.
- Identify areas of sustainable plant communities and populations appropriate for the project as sources for native plant material and manage for use in reclamation and restoration work. Prioritize native seed allocation for use in priority greater sage-grouse habitat in years when preferred native seed is in short supply.
- Utilize enhanced reclamation if needed to support more rapid interim and final reclamation including irrigation, mulching, soil amendments, and erosion blankets.

- When reseeding, use appropriate seed mixes and consider the use of appropriate subspecies of sagebrush seed. Continue to evaluate seed mixtures over time, considering potential changes in climate (Miller et al. 2011) when proposing seedings using native plants. Consider seed collections from the warmer component within a species' current range for selection of native seed (Kramer and Havens 2009).
- Include reclamation or post-fire restoration objectives requiring that greater sage-grouse habitat needs are adequately addressed, and monitoring protocol to verify that the objectives are accomplished. Include greater sage-grouse habitat parameters as defined by Connelly et al. (2000), Hagen et al. (2007), or if available, state greater sage-grouse conservation plans and appropriate local information in habitat restoration objectives. Make maintaining these objectives in priority greater sage-grouse habitat areas a high restoration priority.
- Identify and work with partners to increase native seed availability and work with plant material centers to develop new plant materials, especially the forbs needed to restore greater sage-grouse habitat.
- Choose native plant seeds for vegetation treatments based on availability, adaptation (site potential), probability for success, and the vegetation management objectives for the area covered by the treatment. Prioritize native seed allocation for use in Core Area in years when preferred native seed is in short supply.
- Make reestablishment of sagebrush and desirable understory plant cover (relative to ecological site potential) a high priority for restoration efforts. Write specific vegetation objectives to reestablish sagebrush cover and desirable understory cover.
- Implement interim reclamation as soon as feasible for all disturbed soils to the side of roadways and other long-term disturbances, reducing the disturbance to the smallest area possible.
- Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community.
- Maximize the area of interim reclamation on long-term access roads and well pads, including reshaping, topsoiling, and revegetating cut-and-fill slopes.

Impoundment Pond Design:

- Identify permanent ponds so as to reduce the number of newly flooded sites, which have high productivity for mosquitoes. Avoid flooding flat terrain or low-lying areas.
- Design impoundment ponds to reduce attraction to breeding mosquitoes while considering attraction to other vectors of diseases such as blue tongue disease. Design parameters should include steepness of sides, avoidance of shallows less than 2 feet (60 centimeters), and reduction of rooted vegetation (both aquatic and uplands).
- Separate inflow and outflow areas to produce open water; avoid creating wetlands.
- Avoid down slope seepage or overflow (including from natural drainage). Line constructed ponds as necessary to avoid seepage. Prevent shallow surface inflow and accumulation of sediment that promotes aquatic vegetation through piping discharge into open water and lining channels.
- Line the overflow spillway with crushed rock, and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation.
- Fence pond sites to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure, and create hoof print pockets of water that are attractive to breeding mosquitoes.

Roads:

- Locate roads to avoid important habitats for greater sage-grouse and other wildlife. Construct, improve, and maintain access roads to minimize potential wildlife/vehicle collisions and facilitate wildlife movement through the project area.
- Apply dust abatement on roads, well pads, and other surface disturbances. Use of dust abatement with limited adverse impacts to vegetation, cultural resources, water quality, and other resources.
- When responding to a request for a road, develop a transportation plan on a landscape scale so as to consider all parties who will be authorized to use the road.
- Limit route construction to realignments of existing designated routes if that realignment has a minimal impact on greater sage-grouse habitat, eliminates the need to construct a new road, or is necessary for motorist safety.
- Identify measures to reduce the use of motorized vehicles to reduce adverse impacts to wildlife.
- Design roads to minimize total disturbance to the smallest amount possible and to the lowest standard while meeting road objectives or purpose including safety. Establish speed limits that will reduce vehicle speed to reduce greater sage-grouse mortality.
- If road crossings of linear water features (such as ephemeral, intermittent, and perennial streams) cannot be avoided, construct crossings to minimize impacts to the riparian-wetlands habitat. Usually this will mean crossing the feature at right angles. Temporary, portable bridges should be considered.
- Limit the use of new roads associated with development including not making it part of the public road network or implementing seasonal closures. Restrict motorized vehicle use to authorized users using signage, gates, and other devices.
- Establish slow speed limits on BLM-administered roads or design roads for slower vehicle speeds to reduce greater sage-grouse mortality and other wildlife conflicts.
- During travel management implementation, close and rehabilitate duplicate roads and rights-of-way (ROWs) no longer being utilized. When restoring original landform and establishing desirable vegetation, use appropriate seed mixtures or transplants as provided above and in Appendix D (p. 1477). Identify roads where the risk of vehicle or human-caused wildfires and the spread of invasive species into greater sage-grouse habitats could be minimized by planting perennial vegetation (e.g., green-strips) paralleling road ROWs (this BMP could be applied to BLM linear ROW authorizations).

Fire:

- Locate wildfire suppression facilities (i.e., base camps, spike camps, drop points, staging areas, and heli-bases) in areas where physical disturbance to greater sage-grouse habitat can be minimized. These include disturbed areas, grasslands, near roads/trails, or in other areas where there is existing disturbance or minimal sagebrush cover.
- Develop state-specific greater sage-grouse reference information and resource materials containing maps, a list of resource advisors, contact information, local guidance, and other relevant information. Provide localized maps to dispatch offices and extended attack incident commanders for use in prioritizing wildfire suppression resources and designing suppression tactics.
- Where applicable, utilize retardant and mechanized equipment to minimize burned acreage in Core Area during an extended attack.
- As safety allows, conduct mop-up where the black adjoins unburned islands, dog legs, or other habitat features to minimize sagebrush loss.
- Minimize unnecessary cross-country vehicle travel during fire operations in greater sage-grouse habitat.

- Prior to the fire season, provide greater sage-grouse training to resource advisors.
- Vegetation treatment: Power-wash all vehicles and equipment involved in vegetation treatment activities prior to entering the area to minimize the introduction of undesirable and/or invasive plant species.

Vegetation Treatment and Fuels Management:

- Design vegetation treatments in areas of high wildfire frequency to facilitate firefighter and public safety; reduce the risk of extreme fire behavior; and reduce the risk and rate of fire spread to greater sage-grouse habitats while facilitating the restoration of key habitats.
- Design fuels treatment objectives to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns that most benefit greater sage-grouse habitat.
- Provide training to fuels treatment personnel on greater sage-grouse biology, habitat requirements, and identification of areas utilized locally.
- Use fire prescriptions that minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of hydrophobicity).
- Incorporate roads and natural fuel breaks into fuel-break design.
- Power wash all vehicles and equipment involved in fuels management activities prior to entering the area to minimize the introduction of undesirable and/or invasive plant species.
- Outside of priority habitat, give priority for implementing sagebrush restoration projects that are adjacent to priority habitat.
- As funding and logistics permit, restore habitat to a species composition characterized by perennial grasses, forbs, and shrubs.
- Do not reduce sagebrush canopy cover to less than 15 percent within a treatment polygon unless a vegetation management objective requires additional reduction in sagebrush cover to meet strategic protection of priority greater sage-grouse habitat and conserve habitat quality for the species.
- Ensure proposed sagebrush treatments are planned with interdisciplinary input from BLM and state wildlife agency biologists, and that treatment acreage is conservative in the context of surrounding greater sage-grouse seasonal habitats and landscape.
- In suitable greater sage-grouse habitat, the priority for vegetation treatments are those that conserve, enhance, or restore greater sage-grouse habitat, reduce fuels at strategic locations to minimize the size of wildfires and to limit loss of greater sage-grouse habitat. Remove conifers where they have encroached upon greater sage-grouse habitat. Reduce the density of conifers that have encroached into, but do not yet dominate, sagebrush plant communities.
- Minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable plant species and reduce risk of hydrophobicity). Incorporate vegetation treatment standard operating procedures, such as those outlined in the 17 Western States Vegetation Programmatic EIS (PEIS), into treatments (BLM 2007c).
- Ensure that treatments are configured in a manner (e.g., strips) that promotes use by greater sage-grouse.
- Reestablish appropriate sagebrush species/subspecies and important understory plants relative to site potential. Identify priority plant species and collect seed of understory plants and sagebrush subspecies important to greater sage-grouse. Establish seed harvest areas that are managed for seed production and are a priority for protection from outside disturbances.
- Design vegetation treatments in greater sage-grouse habitats to strategically reduce wildfire threats in the greatest area. This could involve spatially arranging new vegetation treatments with past treatments, vegetation with fire-resistant serial stages, natural barriers, and roads to

constrain fire spread and growth. This could require vegetation treatments to be implemented in a more linear versus block design.

- Remove standing and encroaching trees within at least 100 meters of occupied greater sage-grouse leks and other habitats (e.g., nesting, wintering, and brood-rearing) to reduce the availability of perch sites for avian predators.
- Protect wildland areas from wildfire originating on private lands, infrastructure corridors, and recreation areas.
- Strategically place and maintain pretreated strips/areas (e.g., mowing, prescribed fire, herbicide application, and strictly managed grazed strips) to aid in controlling wildfire should wildfire occur near key habitats or important restoration areas (such as where investments in restoration have already been made).

Mineral Development:

- Give overall consideration to impacts to greater sage-grouse in applying technically feasible COAs. Selection and application of these measures shall be based on current science and research on the effects to important breeding, nesting, brood-rearing, and wintering areas. The Plan of Development or Plan of Operations, as applicable, shall address, at a minimum, the anticipated noise, density and amount of disturbance, mechanical movement (e.g., pump jacks), permanent and temporary facilities, traffic, phases of development over time, offsite mitigation, and expected periods of use associated with the proposed project. The NEPA analysis and authorization should identify seasonal habitats or typical project features related to potential greater sage-grouse impacts, such as drill mats that are not made a part of the COA, based on site-specific or project-specific considerations and the explanation of why these protections were not included.
- Where feasible, co-locate new development (facilities, pipelines, etc.) in existing disturbances. Cluster disturbances, operations (hydraulic fracture stimulation, liquids gathering, etc.), and facilities. Use drilling techniques to reduce surface disturbance in relation to the number of wells, where feasible. Place liquid-gathering facilities and compressor stations outside Core Area, unless the proponent can establish that this requirement would preclude development of the lease. Identify measures to reduce traffic in Core Area.
- To ensure comprehensive planning relative to greater sage-grouse conflicts, complete Master Development Plans or Plans of Development during planning and review of projects involving multiple proposed disturbances in Core Area.
- In Core Area, require closed-loop systems for drilling operations, with no reserve pits unless technically unfeasible.
- Require noise shields or other noise abatement devices when drilling during the lek, nesting, brood-rearing, and wintering seasons. Locate new compressor stations outside of Core Area if feasible, and require a design directed toward priority habitat that reduces noise.

Miscellaneous:

- Identify areas where acquisitions (including subsurface mineral rights) or conservation easements, would benefit greater sage-grouse habitat. Apply acquisition and disposal criteria from Appendix R (p. 1623).

Best Management Practices

The following sources contain information regarding the development and implementation of BMPs. These references are not to be considered as exclusive sources of information; rather, they should be used as a starting point when evaluating specific BMPs during project design and implementation.

Bureau of Land Management Best Management Practices Resources

BLM BMPs: This website provides an introduction to BLM BMPs with links to BLM contacts, specific resources, and other BMP links, and other resources related to BLM BMPs.

<http://www.blm.gov/bmp/>

See also <http://www.oilandgasbmps.org/>

General Information for Oil and Gas BMPs: This resource provides general information regarding BLM BMPs for oil and gas development. A sample of BMPs are provided with a brief description of types of BMPs and terminology.

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/general_information.html

BMP Frequently Asked Questions: The link below provides responses to frequently asked questions regarding BLM BMPs.

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/frequently_asked_questions.html

BMP Technical Information: The slide shows at the link below provide a detailed look at a menu of possible oil and natural gas development BMPs. These slide shows are only a starting point and are not intended to serve as a comprehensive list of BMPs.

<http://www.blm.gov/nhp/efoia/wo/fy05/im2005-069.htm>

Oil and Gas Exploration – The Gold Book: The publication *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (commonly referred to as The Gold Book) was developed to assist operators by providing information on the requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on federal lands and on private surface over federal minerals (split-estate). Split-estate surface owners will also find the Gold Book to be a useful reference guide. In 2007, the Gold Book was updated to incorporate changes resulting from the new Onshore Oil and Gas Order No. 1 regulations.

http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html

Visual Resources: There are numerous design techniques that can be used to reduce the visual impacts from surface-disturbing projects. The techniques described here should be used in conjunction with BLM's visual resource contrast rating process wherein both the existing landscape and the proposed development or activity are analyzed for their basic elements of form, line, color, and texture.

http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS/3.html

Renewable Energy Development BMPs: The following resources provide information on BMPs related to renewable energy development.

- *Wind Energy Development PEIS:* The scope of the Wind Energy PEIS analysis includes an assessment of the beneficial and adverse environmental, social, and economic impacts; discussion of relevant mitigation measures to address these impacts; and identification of appropriate, programmatic policies and BMPs to be included in the proposed Wind Energy Development Program.
<http://windeis.anl.gov/documents/fpeis/index.cfm>

- *BLM Instruction Memorandum [IM] 2009-043, Rights-of-Way, Wind Energy:* This IM further clarifies the BLM Wind Energy Development policies and BMPs provided in the Wind Energy Development PEIS.
http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-043.html
- *Record of Decision for the Geothermal Resource Leasing PEIS:* This Record of Decision provides a list of sample BMPs that have been collected from various BLM and United States Forest Service documents addressing geothermal and fluid mineral leasing and development, including RMPs, forest plans, and environmental reports for geothermal leasing and development. The document provides guidance on incorporating BMPs, as appropriate, into the geothermal permit application or as Conditions of Approval.
http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS_REALTY_AND_RESOURCE_PROTECTION/_energy/geothermal_eis/final_programmatic.Par.90935.File.dat/ROD_Geothermal_12-17-08.pdf
- *Solar Energy Development PEIS:* This PEIS was issued July 24, 2012. Its policies and mitigation measures adopted as part of the proposed solar energy deployment program. The Solar Energy Development PEIS identifies for those that work in the solar industry, and stakeholders the best practices for deploying solar energy and ensuring minimal impact to natural and cultural resources on BLM-administered lands or other federal, state, tribal, or private lands.
<http://www.solareis.anl.gov/>

U.S. Environmental Protection Agency (EPA) BMP Resources

Healthy Watersheds: This resource provides conservation approaches and tools designed to ensure healthy watersheds remain intact. The website provides example approaches that are generally site-specific, and watershed managers are encouraged to use the examples as guidance in developing local conservation strategies. The website also supplies outreach strategies to encourage stakeholder engagement in conservation and protection of healthy watersheds.
<http://www.epa.gov/owow/nps/>

Storm Water BMPs: This online menu provides BMPs designed to meet the minimum requirements for six control measures specified by the EPA's Phase II Stormwater Program. The control measures include public education, public involvement, illicit discharge detection and elimination, construction, post-construction, and pollution prevention/good housekeeping. The menu also provides case studies assessing the performance of various storm water BMPs.
<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm>

Pasture, Rangeland, and Grazing Operations BMPs: The link below provides BMPs compiled by the EPA to prevent or reduce pollution associated with livestock grazing. Topics include practices to reduce methane production, managing nonpoint source pollution, controlled grazing, reducing animal feeding operation pollution, and manure management.
<http://www.epa.gov/oecaagct/anprgbmp.html>

U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) BMP Resources

National Conservation Practice Standards: This website provides links for national conservation practices developed by the NRCS on topics such as herbaceous wind barriers, feed management,

forest stand improvement, and irrigation management. The conservation practice standard contains information on why and where the practice is applied, and sets forth the minimum quality criteria that must be met during the application of that practice in order for it to achieve its intended purpose. <http://www.nrcs.usda.gov/Technical/Standards/nhcp.html>

National Range and Pasture Handbook: Developed by NRCS grazing land specialists, this handbook provides a source of expertise to guide cooperators in solving resource problems and in sustaining or improving their grazing lands resources and operations. <http://www.glti.nrcs.usda.gov/technical/publications/nrph.html>

Wyoming Game and Fish Department BMP Resources

Aquatic Invasive Species: This resource provides information about how to recognize aquatic invasive species and how to avoid introducing them or spreading them through Wyoming's waters. The website contains links to external resources including a link to waterbodies in the United States currently known to be impacted by zebra and quagga mussels. The website also contains information about how to decontaminate equipment and watercraft suspected of harboring aquatic invasive species. <http://gf.state.wy.us/fish/AIS/index.asp>

Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats: This document provides recommendations for mitigation and management options that development companies and resource agencies can implement to minimize impacts to wildlife from oil and gas development. http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/HABITAT_OILGASRECOMMENDATIONS0000333.pdf

Wildlife Protection Recommendations for Wind Energy Development in Wyoming: This document provides recommendations for BMPs, avoidance, monitoring, research, and mitigation opportunities for developers and resource agencies to minimize impacts to wildlife from wind-energy development. http://gf.state.wy.us/web2011/Departments/Wildlife/pdfs/WINDENERGY_WILDLIFEPROTECTION0000703.pdf

Forestry Best Management Practices

Wyoming Forestry Best Management Practices: This document provides recommendations for protecting water quality and forest soils. Some of the BMPs outlined in this document are listed below. <http://slf-web.state.wy.us/oldsite/forestry/bmp2.aspx>

Road Construction and Maintenance: The need for higher-standard roads can be alleviated through temporary road blockage, locked gate management, and seasonal weather restrictions.

Number of Roads, Existing Roads: Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses to avoid the creation of sediment, change of water temperature, or addition of unwanted nutrients. Use existing roads where practical, unless use of such roads would cause or aggravate an erosion problem. When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces.

Road Design and Implementation: Fit the road to the topography by locating roads on natural benches and following natural contours. Locate roads on stable geology, including well-drained

soils and rock formations that tend to dip into the slope. Avoid slumps and slide-prone areas characterized by steep slopes, toe slopes, natural drainage channels, highly weathered bedrock, clay beds, concave slopes, and hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture-laden or unstable toe slopes, seeps, wetlands, wet meadows and natural drainage channels. Minimize earth-moving activities when soils appear excessively wet.

Drainage: Design roads to minimize disruption of natural drainage patterns. Provide adequate drainage, as part of the construction process, from the surface of all permanent and temporary roads. Design, install, and route road surface drainage features at adequate spacing to control erosion; steeper gradients require more frequent drainage features. Install road-drainage features above stream crossings to route discharge into filtration zones before it enters a stream or surface water. Use outsloped, insloped, or crowned roads and space road-drainage features so peak drainage flow on the road surface or in ditches will not exceed capacity. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at the outlet of drainage features. Cross drains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection. Properly constructed drain drips can be an economical method of road surface drainage. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them. Route road drainage through adequate filtration zones or other sediment settling structures to ensure sediment does not reach surface water.

Runoff/Erosion Control: Stabilize erodible, exposed soils by seeding, compacting, rip-rapping, benching, mulching, or other suitable means prior to seasonal runoff. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes. Keep slope stabilization, erosion, and sediment control work current with road construction. Complete or stabilize road selections within the same operating season. Maintain erosion-control features through periodic inspection and maintenance, including cleaning dips and cross drains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.

Debris and Excess Material Handling: Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid sidecasting and place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road. Minimize sediment production from borrow pits and gravel sources through proper location, development, and reclamation.

Cut and Fill Slopes: This includes: construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment. When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can provide an economical way of disposing of roadway slash. Limit the height, width, and length of “slash filter wind-rows” so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.

Out/In Slopes: Outsloped roads provide a means of dispersing water in a low-energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety can be met. For insloped roads, plan ditch gradients steep enough, generally greater than 2 percent but less than 8 percent, to prevent sediment deposition and ditch erosion. The steeper gradients may be suitable for more stable soils; use the lower gradients for less stable soils. Do not disturb roadside vegetation more than necessary to maintain slope stability and serve traffic needs.

Weather Maintenance: Grade road surfaces only as often as necessary to maintain a stable running surface and adequate surface drainage. Avoid cutting the toe of cut slopes when grading roads, pulling ditches, or plowing snow. When plowing snow, provide breaks in the snow berm to allow road drainage. Consider gates, barricades, or signs to limit use of roads during spring breakup to other wet periods. Avoid using roads during wet periods if such use would likely damage the road drainage features. When access requires crossing moist areas with a poor road base, cross only when the ground is frozen or dry to alleviate a rutted, poorly drained road. Upon completion of seasonal operations, ensure that drainage features are fully functional. The road surface should be crowned, outsloped, insloped, or waterbarred. Remove berms from the outside edge.

Ditch Culverts: For ditch relief culverts, construct catch basins with stable side slopes. Protect the inflow end of cross drain culverts from plugging and armor if in erodible soil. Where possible, install culverts at the gradient of the original ground slope; otherwise armor outlets with rock or anchor downspouts to carry water safely across the fill slope. Skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.

Stream Culverts: When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all intermittent streams that support fish or that provide seasonal fish passage. Ensure fish movement is not impeded by using culverts with a suitable diameter for permanent stream crossings and during peak flows. Maintain a 1-foot minimum cover for culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger culverts to prevent crushing by traffic. Place culverts slightly below normal stream grade to avoid culvert outfall barriers. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage. Install culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible. Consider dewatering stream-crossing sites during culvert installation. This can be done with a temporary diversion channel or a sandbag dam with a pump diversion.

Stream Crossings: Minimize the number of road stream crossings and choose stable stream-crossing sites. Minimize stream-channel disturbances and related sediment problems during necessary construction of road and installation of stream-crossing structures. Whenever possible, retain existing vegetation and organic material around stream crossings. Locate temporary construction bypass roads where the stream course will have minimal disturbance. Design stream crossings for adequate passage of fish (if present) and time construction activities to have minimum impact on water quality and fisheries. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill. Do not place erodible material into stream channels and remove stockpiled material from high-water zones. Abutments and wingwalls should prevent material from spilling into the stream. Avoid unimproved stream crossings. When a culvert or bridge is not feasible, locate drive-through (ford) on a stable, rocky portion of the stream channel, such as a bedrock stream.

Equipment Use: Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen. Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable wet or easily compacted soils.

Hazardous Substances/Weed and Pest Control: Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. Follow all label instructions. Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the state Department of Environmental Quality (DEQ). A Spill Prevention and Countermeasures Plan is required by federal law for storage of more than 1,320 gallons, and state law requires the reporting of spills over 25 gallons.

Integrated Approach: Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventative, and chemical means. To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.

Prescribed Burning and Wildfire Suppression: Protect soil and water from prescribed burning effects by maintaining soil productivity, minimizing erosion, and preventing ash, sediments, nutrients and debris from entering surface water. After an intense wildfire or prescribed burn, emergency rehabilitation may be necessary to minimize the loss of soil, prevent the deterioration of water quality, and to mitigate threats to life and property. Stabilize all areas that have significantly increased erosion potential or drainage patterns altered by suppression activities by installing water bars and other drainage diversions in fire roads, fire lines, and other cleared areas, seeding, planting, and fertilizing to provide vegetative cover, spreading slash or mulch to protect bare soil, repairing road damage, and clearing stream channels of debris deposited by suppression activities and scarification as necessary to encourage percolation on excessively burned soils.

BMPs for Water Resources

BMPs would be appropriate for consideration when proposed activities are within groundwater zones 1-3, surface water zones 1-3, and sensitive aquifer systems identified through the use of the Wyoming Groundwater Vulnerability Assessment Handbook, or similar document updated over time. BMPs to mitigate impacts to water resources include, but are not limited to, the following:

- Use closed-loop drilling systems where technologically feasible.
- Reuse produced water for well completion activities and enhanced oil recovery operations using water.
- Do not use evaporation ponds or reserve pits in proximity to shallow aquifers. Reduce reliance on evaporation ponds in other locations and other forms of surface disposal.
- Line surface impoundment ponds (evaporation ponds or drilling pits) with synthetic liners and subsequently decommission them by removing all contaminants and liners, and reclaiming the area.
- Identify private water supply wells and implement appropriate protection measures for the affected aquifer(s), as necessary to prevent the introduction of contaminants into the well (e.g., site oil and gas wells at a distance necessary to prevent the introduction of contaminants into the drinking water supply well, collect baseline water quality data from the water supply well, etc.).
- Require a monitoring plan that includes collection of baseline and periodic water quality data from potentially affected drinking water supply wells, identification of parameters to monitor, reporting results to the BLM and well owners, and reporting to Wyoming DEQ any

contaminant in groundwater exceeding Wyoming DEQ (or EPA) Class I drinking water standards.

- Review the geology of shallow aquifers to determine well construction requirements, which may include cementing to surface and drilling with a fresh water mud system.
- Require surface casing and cement to a specific formation or depth to protect aquifers at depth that need protection.
- Set surface casing below the lower-most drinking water and set into a confining (e.g., shale) layer.
- Set an intermediate string of casing and cement in the event of deep aquifers.
- Require submittal of a well logging plan and document submittal plan to ensure proper well construction to protect groundwater.
- Review the geology of shallow aquifers in proximity to groundwater development activities to determine potential impacts to flow patterns supporting water elements such as fen, wetlands, springs, seeps, and ponds.
- Because of the age of the well or depth or other factor, require re-completions to comply with state and federal standards for new well construction; analyze cement bond logs associated with any existing well location within ¼-mile of completing a new well or re-completing an existing one; and identify how re-completed wells will be tested and monitored.

BMPs for Greater Sage-Grouse Protections

Knowledge of BMPs for greater sage-grouse protections is an evolving field. As research is done on impacts of various kinds of activities, or the absence thereof, on greater sage-grouse, additional protections will be identified. While some of these will be generic enough to be applied planning area-wide, others will require site-specific analysis to determine if they are appropriate for inclusion as a mandatory COA. This BMP section of this appendix will be supplemented as technology and understanding of greater sage-grouse advance.

Appendix I. Stipulations and Conditions of Approval in Designated Development Areas and in Non-Designated Development Areas

Conditions of Approval (COAs) and/or stipulations will be applied to surface-disturbing activities related to oil and gas and right-of-way (ROW) actions in the Lander Field Office planning area. Applicable wildlife timing limitation stipulation (TLS), controlled surface use (CSU), and site-specific requirements will be included as COAs/stipulations according to federal regulations and policies.

New oil and gas leases will have applicable wildlife TLS and CSU stipulations applied at the leasing stage. For protection of greater sage-grouse, raptors, and other migratory birds protected under the Migratory Bird Treaty Act, the Bureau of Land Management will apply TLS and/or CSU COAs/stipulations for their protection on surface use authorizations within designated development areas (DDAs). The need to apply COAs/stipulations for big game crucial winter range and site-specific requirements in DDAs will be analyzed through the National Environmental Policy Act process. Exceptions to the COAs/stipulations can be requested using the process identified in Appendix E (p. 1483). Emergency and safety situations related to operations and maintenance are exempt from the COAs/stipulations. Notification/reporting to the Authorized Officer for these situations are subject to applicable rules and regulations.

Table I.1. Activities for Oil and Gas and ROW Operations, and Short-Term Operation and Maintenance Activities Subject to COAs/Stipulations

Activities	Entire Lander Field Office
All Preliminary Activities and/or Casual Use as Defined by Regulations	COA/stipulation does not apply
All Site Construction	COA/stipulation applies
All Drilling	COA/stipulation applies
All Completion	COA/stipulation applies
All Surface Facilities Installation Activities	COA/stipulation applies
All Pipeline/Flow Line Installation	COA/stipulation applies
Plug and Abandon Wells	COA/stipulation applies
Reclamation	COA/stipulation applies
New Soil-Disturbing Activities	COA/stipulation applies
Short-Term Well and Oil and Gas-related ROW Maintenance and Miscellaneous Activities	COA/stipulation does not apply
- Well pumper - Inspections - Minor facility repair (1-2 Days) - Spill remediation - Haul condensate and produced water - Snow removal - Weed control - Written order/incident of non-compliance remediation - Production sales and measurements	
COAs Conditions of Approval	
ROW Right-of-way	

Appendix I Stipulations and Conditions of Approval in Designated Development Areas and in Non-Designated Development Areas

Wildlife TLS COAs/stipulations will not apply for long-term maintenance and operation activities within DDAs unless otherwise identified. TLS and site-specific COAs/stipulations will be applied to oil and gas and ROW maintenance and operation activities conducted outside of DDAs where the activity could disturb wildlife during critical times of the year. Identified non-emergency related maintenance and operation activities outside DDAs that could be disruptive to wildlife during the breeding, nesting/birthing, and winter periods would be subject to a TLS COA/stipulation. Table I.2, “Maintenance and Operation Activities for Oil and Gas and ROW Operations Outside DDAs Subject to COAs/Stipulations” (p. 1536), identifies the activities that would be subject to the TLS COA/stipulation.

Table I.2. Maintenance and Operation Activities for Oil and Gas and ROW Operations Outside DDAs Subject to COAs/Stipulations

Activities	Designated Development Areas	Outside of Designated Development Areas
Other Well and Oil and Gas-related ROW Maintenance and Miscellaneous Activities* • Replace and install production facilities • Routine road maintenance • Excavate temporary flare and completion pit • Replace pipelines and flowline within lease/unit • Workover/recompletion/downhole maintenance • General routine maintenance activities within lease/unit	COA/stipulation does not apply	COA/stipulation applies
• Removing or replacing utility poles or facilities • General routine maintenance activities • Restrunging powerlines • Routine communication site maintenance • Repair/replace pipelines	COA/stipulation applied on case-by-case basis	COA/stipulation applies
*Operation and maintenance activities described are not related to emergency and safety situations, but are considered routine actions. COAs Conditions of Approval ROW Right-of-way		

Appendix J. Wyoming Standards for Healthy Rangelands

Introduction

According to the Department of the Interior's final rule for grazing administration, effective August 21, 1995, the Wyoming Bureau of Land Management (BLM) State Director is responsible for the development of standards for healthy rangelands and guidelines for livestock grazing management on 18 million acres of Wyoming's public rangelands. The development and application of these standards and guidelines are to achieve the four fundamentals of rangeland health outlined in the grazing regulations (43 Code of Federal Regulations [CFR] 4180.1). Those four fundamentals are: (1) watersheds are functioning properly; (2) water, nutrients, and energy are cycling properly; (3) water quality meets State standards; and (4) habitat for special status species is protected.

Standards address the health, productivity, and sustainability of the BLM-administered public rangelands and represent the minimum acceptable conditions for the public rangelands. The standards apply to all resource uses on public lands. Their application will be determined as use-specific guidelines are developed. Standards are synonymous with goals and are observed on a landscape scale. They describe healthy rangelands rather than important rangeland by-products. The achievement of a standard is determined by measuring appropriate indicators. An indicator is a component of a system whose characteristics (e.g., presence, absence, quantity, and distribution) can be measured based on sound scientific principles.

Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management practices at the grazing allotment and watershed level. The guidelines in this document apply specifically to livestock grazing management practices on the BLM-administered public lands. These management practices will either maintain existing desirable conditions or move rangelands toward statewide standards within reasonable timeframes. Appropriate guidelines will ensure that the resultant management practices reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. Guidelines, like standards, apply statewide.

Quantifiable resource objectives and specific management practices to achieve the standards will be developed at the BLM Field Office level and will consider all reasonable and practical options available to achieve desired results on a watershed or grazing allotment scale. The objectives shall be reflected in site-specific activity or implementation plans as well as in livestock grazing permits/leases for the public lands. Interdisciplinary activity or implementation plans will be used to maintain or achieve the Wyoming standards for healthy rangelands. These plans may be developed formally or informally through mechanisms available and suited to local needs (such as Coordinated Resource Management [CRM] efforts).

The development and implementation of standards and guidelines will enable on-the-ground management of the public rangelands to maintain a clear and responsible focus on both the health of the land and its dependent natural and human communities. This development and implementation will ensure that any mechanisms currently being employed or that may be developed in the future will maintain a consistent focus on these essential concerns.

These standards and guidelines are compatible with BLM's three-tiered land use planning process. The first tier includes the laws, regulations, and policies governing BLM's administration and management of the public lands and their uses. The previously mentioned fundamentals of rangeland health specified in 43 CFR 4180.1, the requirement for BLM to develop these state (or regional) standards and guidelines, and the standards and guidelines themselves, are part of this first tier. Also part of this first tier are the specific requirements of various federal laws and the objectives of 43 CFR 4100.2 that require BLM to consider the social and economic well-being of the local communities in its management process.

These standards and guidelines will provide for statewide consistency and guidance in the preparation, amendment, and maintenance of BLM land use plans, which represent the second tier of the planning process. The BLM land use plans provide general allocation decisions concerning the kinds of resource and land uses that can occur on the BLM administered public lands, where they can occur, and the types of conditional requirements under which they can occur. In general, the standards will be the basis for development of planning area-specific management objectives concerning rangeland health and productivity, and the guidelines will direct development of livestock grazing management actions to help accomplish those objectives.

The third tier of the BLM planning process, activity or implementation planning, is directed by the applicable land use plan and, therefore, by the standards and guidelines. The standards and guidelines, as BLM statewide policy, will also directly guide development of the site-specific objectives and the methods and practices used to implement the land use plan decisions.

Activity or implementation plans contain objectives which describe the site-specific conditions desired. Grazing permits/leases for the public lands contain terms and conditions which describe specific actions required to attain or maintain the desired conditions. Through monitoring and evaluation, the BLM, grazing permittees, and other interested parties determine if progress is being made to achieve activity plan objectives.

Wyoming rangelands support a variety of uses which are of significant economic importance to the state and its communities. These uses include oil and gas production, mining, recreation and tourism, fishing, hunting, wildlife viewing, and livestock grazing. Rangelands also provide amenities which contribute to the quality of life in Wyoming such as open spaces, solitude, and opportunities for personal renewal. Wyoming's rangelands should be managed with consideration of the state's historical, cultural, and social development and in a manner which contributes to a diverse, balanced, competitive, and resilient economy in order to provide opportunity for economic development. Healthy rangelands can best sustain these uses.

To varying degrees, BLM management of the public lands and resources plays a role in the social and economic well-being of Wyoming communities. The National Environmental Policy Act (part of the above-mentioned first planning tier) and various other laws and regulations mandate the BLM to analyze the socioeconomic impacts of actions occurring on public rangelands. These analyses occur during the environmental analysis process of land use planning (second planning tier), where resource allocations are made, and during the environmental analysis process of activity or implementation planning (third planning tier). In many situations, factors that affect the social and economic well-being of local communities extend far beyond the scope of BLM management or individual public land users' responsibilities. In addition, since standards relate primarily to physical and biological features of the landscape, it is very difficult to provide measurable socioeconomic indicators that relate to the health of rangelands. It is important that standards be realistic and within the control of the land manager and users to achieve.

Implementation of the Wyoming standards and guidelines will generally be done in the following manner. Grazing allotments or groups of allotments in a watershed will be reviewed based on the BLM's current allotment categorization and prioritization process. Allotments with existing management plans and high-priority allotments will be reviewed first. Lower priority allotments will then be reviewed as time allows. The permittees and interested public will be notified when allotments are scheduled for review and are encouraged to participate in the review. The review will first determine if an allotment meets each of the six standards. If it does, no further action will be necessary. If any of the standards aren't being met, rationale explaining the contributing factors will be prepared. If livestock grazing practices are found to be among the contributing factors, corrective actions consistent with the guidelines will be developed and implemented. If a lack of data prohibits the reviewers from determining if a standard is being met, a strategy will be developed to acquire the data in a timely manner.

Standards for Healthy Public Rangelands

Standard #1

Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

This Means That:

The hydrologic cycle will be supported by providing for water capture, storage, and sustained release. Adequate energy flow and nutrient cycling through the system will be achieved as optimal plant growth occurs. Plant communities are highly varied within Wyoming.

Indicators May Include But Are Not Limited To:

- Water infiltration rates
- Soil compaction
- Erosion (rills, gullies, pedestals, capping)
- Soil micro-organisms
- Vegetative cover (gully bottoms and slopes)
- Bare ground and litter

Standard #2

Riparian and wetland vegetation has structural, age, and species diversity characteristic of the stage of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for groundwater recharge.

This Means That:

Wyoming has highly varied riparian and wetland systems on public lands. These systems vary from large rivers to small streams and from springs to large wet meadows. These systems are in various stages of natural cycles and may also reflect other disturbance that is either localized or

widespread throughout the watershed. Riparian vegetation captures sediments and associated materials, thus enhancing the nutrient cycle by capturing and utilizing nutrients that would otherwise move through a system unused.

Indicators May Include But Are Not Limited To:

- Erosion and deposition rate
- Channel morphology and floodplain function
- Channel succession and erosion cycle
- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bank stability
- Woody debris and instream cover
- Bare ground and litter

Standard #3

Upland vegetation on each ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance.

This Means That:

In order to maintain desirable conditions and/or recover from disturbance within acceptable timeframes, plant communities must have the components present to support the nutrient cycle and adequate energy flow. Plants depend on nutrients in the soil and energy derived from sunlight. Nutrients stored in the soil are used over and over by plants, animals, and microorganisms. The amount of nutrients available and the speed with which they cycle among plants, animals, and the soil are fundamental components of rangeland health. The amount, timing, and distribution of energy captured through photosynthesis are fundamental to the function of rangeland ecosystems.

Indicators May Include But Are Not Limited To:

- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bare ground and litter
- Erosion (rills, gullies, pedestals, capping)
- Water infiltration rates

Standard #4

Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened, endangered, species of special concern, or sensitive species will be maintained or enhanced.

This means that:

The management of Wyoming rangelands will achieve or maintain adequate habitat conditions that support diverse plant and animal species. These may include listed threatened or endangered species (U.S. Fish and Wildlife-designated), species of special concern (BLM-designated), and other sensitive species (State of Wyoming-designated). The intent of this standard is to allow the listed species to recover and be delisted.

Indicators May Include But Are Not Limited To:

- Noxious weeds
- Species diversity
- Age class distribution
- All indicators associated with the upland and riparian standards
- Population trends
- Habitat fragmentation

Standard #5

Water quality meets State standards.

This Means That:

The State of Wyoming is authorized to administer the Clean Water Act. BLM management actions or use authorizations will comply with all federal and state water quality laws, rules and regulations to address water quality issues that originate on public lands. Provisions for the establishment of water quality standards are included in the Clean Water Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the CFR and in Wyoming's Water Quality Rules and Regulations. The latter regulations contain Quality Standards for Wyoming Surface Waters.

Natural processes and human actions influence the chemical, physical, and biological characteristics of water. Water quality varies from place to place with the seasons, the climate, and the kind substrate through which water moves. Therefore, the assessment of water quality takes these factors into account.

Indicators May Include But Are Not Limited To:

- Chemical characteristics (e.g., pH, conductivity, dissolved oxygen)
- Physical characteristics (e.g., sediment, temperature, color)
- Biological characteristics (e.g., macro- and micro-invertebrates, fecal coliform, and plant and animal species)

Standard #6

Air quality meets State standards.

This Means That:

The State of Wyoming is authorized to administer the Clean Air Act. BLM management actions or use authorizations will comply with all federal and state air quality laws, rules, regulations and standards. Provisions for the establishment of air quality standards are included in the Clean Air Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the CFR and in Wyoming Air Quality Standards and Regulations.

Indicators May Include But Are Not Limited To:

- Particulate matter
- Sulfur dioxide
- Photochemical oxidants (ozone)
- Volatile organic compounds (hydrocarbons)
- Nitrogen oxides
- Carbon monoxide
- Odors
- Visibility

BLM Wyoming Guidelines for Livestock Grazing Management

- I. Timing, duration, and levels of authorized grazing will ensure that adequate amounts of vegetative ground cover, including standing plant material and litter, remain after authorized use to support infiltration, maintain soil moisture storage, stabilize soils, allow the release of sufficient water to maintain system function, and to maintain subsurface soil conditions that support permeability rates and other processes appropriate to the site.
- II. Grazing management practices should restore, maintain, or improve riparian plant communities. Grazing management strategies consider hydrology, physical attributes, and potential for the watershed and the ecological site. Grazing management should maintain adequate residual plant cover to provide for plant recovery, residual forage, sediment capture, energy dissipation, and groundwater recharge.
- III. Range improvement practices (instream structures, fences, water troughs, etc.) in and adjacent to riparian areas will ensure that stream channel morphology (e.g., gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform are maintained or enhanced. The development of springs, seeps, or other projects affecting water and associated resources shall be designed to protect the ecological and hydrological functions, wildlife habitat, and significant cultural, historical, and archaeological values associated with the water source. Range improvements will be located away from riparian areas if they conflict with achieving or maintaining riparian function.

- IV. Grazing practices that consider the biotic communities as more than just a forage base will be designed in order to ensure that the appropriate kinds and amounts of soil organisms, plants, and animals to support the hydrologic cycle, nutrient cycle, and energy flow are maintained or enhanced.
- V. Continuous season-long or other grazing management practices that hinder the completion of plants' life-sustaining reproductive and/or nutrient cycling processes will be modified to ensure adequate periods of rest at the appropriate times. The rest periods will provide for seedling establishment or other necessary processes at levels sufficient to move the ecological site condition toward the resource objective and subsequent achievement of the standard.
- VI. Grazing management practices and range improvements will adequately protect vegetative cover and physical conditions and maintain, restore, or enhance water quality to meet resource objectives. The effects of new range improvements (water developments, fences, etc.) on the health and function of rangelands will be carefully considered prior to their implementation.
- VI- I. Grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federal threatened and endangered species or the conservation of federally-listed species of concern and other state-designated special status species. Grazing management practices will maintain existing habitat or facilitate vegetation change toward desired habitats. Grazing management will consider threatened and endangered species and their habitats.
- VI- II. Grazing management practices and range improvements will be designed to maintain or promote the physical and biological conditions necessary to sustain native animal populations and plant communities. This will involve emphasizing native plant species in the support of ecological function and incorporating the use of non-native species only in those situations in which native plant species are not available in sufficient quantities or are incapable of maintaining or achieving properly functioning conditions and biological health.
- IX. Grazing management practices on uplands will maintain desired plant communities or facilitate change toward desired plant communities.

Definitions

Activity Plans – Allotment Management Plans (AMPs), Habitat Management Plans (HMPs), Watershed Management Plans (WMPs), Wild Horse Management Plans (WHMPs), and other plans developed at the local level to address specific concerns and accomplish specific objectives.

Coordinated Resource Management (CRM) – A group of people working together to develop common resource goals and resolve natural resource concerns. CRM is a people process that strives for win-win situations through consensus-based decision making.

Desired Plant Community – A plant community which produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the land use plan/activity plan objectives established for an ecological site(s). The desired plant community must be consistent with the site's capability to produce the desired vegetation through management, land treatment, or a combination of the two.

Ecological Site – An area of land with specific physical characteristics that differs from other areas both in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

Erosion – (v.) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. (n.) The land surface worn away by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Grazing Management Practices – Grazing management practices include such things as grazing systems (rest-rotation, deferred rotation, etc.), timing and duration of grazing, herding, salting, etc. They do not include physical range improvements.

Guidelines (For Grazing Management) – Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management actions at the allotment and watershed level which move rangelands toward statewide standards or maintain existing desirable conditions. Appropriate guidelines will ensure that the resultant management actions reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. Guidelines, and, therefore, the management actions they engender, are based on sound science, past and present management experience, and public input.

Indicator – An indicator is a component of a system whose characteristics (e.g., presence, absence, quantity, and distribution) can be measured based on sound scientific principles. An indicator can be measured (monitored and evaluated) at a site- or species-specific level. Measurement of an indicator must be able to show change within timeframes acceptable to management and be capable of showing how the health of the ecosystem is changing in response to specific management actions. Selection of the appropriate indicators to be monitored in a particular allotment is a critical aspect of early communication among the interests involved on the ground. The most useful indicators are those for which change or trend can be easily quantified and for which agreement as to the significance of the indicator is broad based.

Litter – The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.

Management Actions – Management actions are the specific actions prescribed by the BLM to achieve resource objectives, land use allocations, or other program or multiple use goals. Management actions include both grazing management practices and range improvements.

Objective – An objective is a site-specific statement of a desired rangeland condition. It may contain qualitative (subjective) elements, but it must have quantitative (objective) elements so that it can be measured. Objectives frequently speak to change. They may measure the avoidance of negative changes or the accomplishment of positive changes. They are the focus of monitoring and evaluation activities at the local level. Objectives may measure the products of an area rather than its ability to produce them, but if they do so, it must be kept in mind that the lack of a product may not mean that the standards have not been met. Instead, the lack of a particular product may reflect other factors such as political or social constraints. Objectives often focus on indicators of greatest interest for the area in question.

Range Improvements – Range improvements include such things as corrals, fences, water developments (reservoirs, spring developments, pipelines, wells, etc.) and land treatments (prescribed fire, herbicide treatments, mechanical treatments, etc.).

Rangeland – Land on which the native vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs, or shrubs. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

Rangeland Health – The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained.

Riparian – An area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lakeshores and streambanks are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not have vegetation dependent on free water in the soil.

Standards – Standards are synonymous with goals and are observed on a landscape scale. Standards apply to rangeland health and not to the important by-products of healthy rangelands. Standards relate to the current capability or realistic potential of a specific site to produce these by-products, not to the presence or absence of the products themselves. It is the sustainability of the processes, or rangeland health, that produces these by-products.

Terms and Conditions – Terms and conditions are very specific land use requirements that are made a part of the land use authorization in order to assure maintenance or attainment of the standard. Terms and conditions may incorporate or reference the appropriate portions of activity plans (e.g., AMPs). In other words, where an activity plan exists that contains objectives focused on meeting the standards, compliance with the plan may be the only term and condition necessary in that allotment.

Upland – Those portions of the landscape which do not receive additional moisture for plant growth from run-off, streamflow, etc. Typically these are hills, ridgetops, valley slopes, and rolling plains.

This page intentionally
left blank

Appendix K. Livestock Grazing Allotments and Range Improvements

This appendix provides an overview of livestock grazing allotments including acreage and season of use; allotment categorization; and allotments assessed for standards and guidelines. In addition, it provides details of range improvement projects and the Bureau of Land Management's (BLM) approach to comprehensive grazing management strategies. The data are presented throughout the narrative and in the following six tables:

- Table K.1, "Grazing Allotments, Acres, Season of Use, and Animal Unit Months" (p. 1551)
- Table K.2, "Allotment Categorization – Current and Proposed" (p. 1563)
- Table K.3, "Lander Field Office Grazing Allotments Assessed for Meeting Standards" (p. 1569)
- Table K.4, "Allotment Management Plans and Rangeland Management Agreements Developed" (p. 1573)
- Table K.5, "Summary of Range Improvements Lander Field Office, 1986-2009" (p. 1576)
- Table K.6, "Animal Unit Months Authorized, 1989-2008" (p. 1581)

In 1985, the BLM established three categories for allotments to identify areas where management was needed, as well as to prioritize workloads and the use of range improvement dollars generated from the portion of grazing fees returned to the field office. See Chapter 4, *Fire and Fuels Management* for changes in the use of range improvement dollars. The categories and criteria used to place an allotment into each category are described below. Subsequently, in 2008, the BLM revised the definitions for these categories in Instruction Memorandum (IM) 2009–018, *Process for Setting Priorities for Issuing Grazing Permits and Leases*. The guidance makes clear that categorization is not done as part of a Resource Management Plan (RMP) revision and does not require an RMP amendment or maintenance action. However, part of the National Environmental Policy Act (NEPA) process associated with the RMP and Environmental Impact Statement (EIS) is to engage the public in scoping and providing input on management decisions. Accordingly, this appendix identifies information on grazing allotments to better inform the public on livestock grazing management on the allotment level. Any allotment specific decisions beyond analyzing closing as much as 12,839 acres to public grazing, would be analyzed on a site-specific basis as the procedures required by IM 2009–018 are implemented.

The categorization process now emphasizes ensuring that land health considerations are the primary basis for prioritizing the processing and issuing of grazing authorizations for use of allotments on public lands. A flow chart for the process of issuing grazing permits and leases establishes the process to be followed as outlined in IM 2009–018.

Category I – Allotments where current livestock grazing management or level of use on public land is, or is expected to be, a significant causal factor in the non-achievement of land health standards, or where a change in mandatory terms and conditions in the grazing authorization is or may be necessary. When identifying Category I allotments, review condition of critical habitat, conflicts with greater sage-grouse, and whether projects have been proposed specifically for

implementing the Healthy Lands Initiative. Some of these allotments might be administered by other BLM Field Offices.

Category M – Allotments where land health standards are met or where livestock grazing on public land is not a significant causal factor for not meeting the standards and current livestock management is in conformance with guidelines developed by the State Directors in consultation with Resource Advisory Councils. Allotments where an evaluation of land health standards has not been completed, but existing monitoring data indicates that resource conditions are satisfactory.

Category C – Allotments where public lands produce less than 10 percent of the forage in the allotment or are less than 10 percent of the land area. An allotment should generally not be designated Category C if the public land in the allotment contains: (1) critical habitat for a threatened or endangered species, and/or (2) riparian-wetlands adversely affected by livestock grazing.

Comprehensive grazing management strategies are first and foremost intended to maintain, and/or make substantial progress toward, fulfillment of the Wyoming Standards for Healthy Rangelands. Comprehensive grazing management strategies should include and consider defined resource management objectives for areas preferred by livestock, permitted use, class of livestock, livestock season of use, limits of flexibility, monitoring requirements, forage allocations necessary to support wildlife and wild horses, and the need for range improvements considerate of potential conflicts with other resource values. Existing permits that have already been fully processed under NEPA evaluating a range of grazing alternatives and existing functional Allotment Management Plans already include comprehensive grazing management strategies. The development of such a strategy will vary based on the identified management category for the grazing allotment as follows:

- Category “I” allotments will be prioritized for the development of comprehensive grazing strategies. The Lander Field Office will evaluate grazing strategies on I category allotments based on the following criteria.
 1. Carrying Capacity of the Allotment: Stocking rates will be established based on the current average forage production and availability considerate of forage requirements of wildlife and wild horse populations. Stocking rates must allow for adequate residual cover to dissipate energy, capture sediment, and support proper infiltration and soil moisture storage/release in support of ecological processes.
 2. Season of use: Grazing during the critical growing season and during the hot season will be required to be managed in a manner that allows for sufficient rest (e.g., rest/deferred rotation systems) to promote healthy, vigorous native plant communities and minimize soil loss and compaction.
 3. Class of livestock: If the current class of livestock is considered to be an important factor in non-fulfillment of the Wyoming Standards for Healthy Rangelands, a change in class of livestock will be considered to make substantial progress toward fulfillment of the Wyoming Standards for Healthy Rangelands. In the event a change in class of livestock is not feasible, stocking rates and/or the season of use shall be appropriately modified to make substantial progress toward fulfillment of the Wyoming Standards for Healthy Rangelands in consideration of the overall grazing strategy.
 4. Range Improvement Projects: Range improvement projects will be considered when existing range improvements have been satisfactorily maintained, the project has been found to be necessary for the establishment of modified grazing practices, and/or when the project has been designed to make substantial progress toward fulfillment of the

Wyoming Standards for Healthy Rangelands in conformance with the Lander RMP. All proposed range improvements will be evaluated for conflicts with other resource values and must be designed to mitigate impacts to any conflicting values. Resource values that will be evaluated for potential conflicts with range improvement projects include, but are not limited to, special status species, wild horses, critical wildlife habitats, cultural resources, National Historic Trail and Continental Divide National Scenic Trail corridors, recreation, designated Areas of Critical Environmental Concern, wilderness study areas, and lands with wilderness characteristics. Projects that are designed to promote substantial improvement toward meeting the Wyoming Standards for Healthy Rangelands and sufficiently mitigate impacts to other resource values, if any, will receive a higher priority consideration. Similarly, projects that are designed to promote substantial improvement toward meeting the Wyoming Standards for Healthy Rangelands, and are initiated to enhance other resource values (e.g., wildlife, recreation etc.) will receive a higher priority consideration. Figure K.1, "Range Infrastructure Development" (p. 1582), identifies the process by which the Lander Field Office will prioritize range improvement project proposals.

- Category "M" and "C" allotments will be evaluated for comprehensive grazing management strategies on a case-by-case basis. Where alternative grazing strategies and/or range improvement projects are proposed, the proposals will be evaluated for conflicts with other resources and the potential impacts to the Wyoming Standards for Healthy Rangelands. Projects that are designed to promote enhanced rangeland health and are initiated to enhance other resource values (e.g., wildlife, recreation) will receive a higher priority consideration.
- Monitoring programs will be incorporated into comprehensive grazing management strategies to evaluate the success of new management strategies in meeting resource objectives. The cooperative monitoring program is intended to provide a framework for the facts and data to be collected, analyzed, and shared with the public, and used by the BLM to make land management decisions. A cooperative monitoring effort with the active participation of the grazing permittees and interested public will be encouraged.

The following methods were used to calculate the disturbance areas associated with construction of range improvement projects.

Spring Developments

A. $(a+b+c) \div d = \text{area affected by development} = \mathbf{1.0 \text{ acre}}$

where $a = 40,000$ square feet; 200 feet by 200 feet area fenced around the spring to prevent damage from livestock,

$b = 1,200$ square feet; 60 feet of pipeline with a 20 foot width of disturbance for installation with a backhoe,

$c = 28$ square feet area displaced by a trough 2 feet in width by 14 feet in length, and

$d = 43,560$ square feet, the number of square feet in one acre.

B. $\pi r^2 \div d = \text{acres disturbed by livestock concentration} = \mathbf{1.6 \text{ acres}}$

where $\pi = 3.14$ and,

$r^2 = 50$ yards (150 feet), the radius of the livestock concentration area and

$d = 43,560$ square feet, the number of square feet in one acre.

C. Total affected area for the spring development would be $1.0 \text{ acre} + 1.6 \text{ acres} = \mathbf{2.6 \text{ acres.}}$

Water Well Developments

A. $(a+b+2c+d) \div e = \text{area affected by development} = \mathbf{0.2 \text{ acre}}$

where $a = 5,000$ square feet; affected area by well and storage tank,
 $b = 28$ square feet; a water trough 2 feet in width by 14 feet in length,
 $c = 1,000$ square feet; 50 feet of pipeline with a 20 foot width of disturbance
 for installation with a backhoe,
 $d = 2,500$ square feet; 50 feet by 50 feet affected area of an overflow pond, and
 $e = 43,560$ square feet, number of square feet in one acre.

B. $\pi r^2 \div d = \text{acres disturbed by livestock concentration} = \mathbf{1.6 \text{ acres}}$

where $\pi = 3.14$, and
 $r^2 = 50$ yards (150 feet), the radius of the livestock concentration area and
 $d = 43,560$ square feet, the number of square feet in 1 acre.

C. Total acres affected by a water well development would be $0.2 \text{ acres} + 1.6 \text{ acres} = \mathbf{1.8 \text{ acres}}$.

Fencing

BLM three-wire cattle fence and riparian-wetlands pasture fence.

$axb \div c = \text{total affected area} = \mathbf{1.5 \text{ acres/mile}}$

where $a = 12$ feet, this includes a two-tracked trail, produced by motor vehicles,
 on each side of the fence,
 $b = 5,280$ feet, the number of feet in 1 mile, and
 $c = 43,560$ square feet, the number of square feet per acre.

$12 \text{ feet/mile} \times 5,280 \text{ feet/mile} = 63,360 \text{ square feet/mile} \div 43,560 \text{ square feet/acre}$
 $= 1.45 \text{ acres/mile}$

Pasture Boundary Signs

Assumed to be 5 percent of the total affected area, the BLM three-wire cattle fence requires repeated travel along the previously constructed fence, therefore causing additional disturbances. Construction of a pasture boundary fence would require a single trip, therefore causing a minimal amount of disturbance.

Cattleguards

All proposed cattleguards would be constructed on an existing road; therefore, no additional disturbance would take place.

Artesian Well (Wetland Fencing)

A. $(600 \text{ feet} \times 6 \text{ feet} = 3,600 \text{ square feet}) + (600 \text{ feet} \times 12 \text{ feet} = 7,200 \text{ square feet})$
 $= 10,800 \text{ square feet} \div 43,560 \text{ square feet/acre} = \mathbf{0.2 \text{ acres}}$ on fenceline.

B. $200 \text{ feet} \times 200 \text{ feet} = 40,000 \text{ square feet} \div 43,560 \text{ square feet/acre} = \mathbf{0.9 \text{ acres}}$
 inside permanent enclosure.

Pipelines

1 foot x 5,280 feet/mile = 5,280 square feet/mile ÷ 43,560 square feet/acre = **0.1 acre/mile**

Table K.1. Grazing Allotments, Acres, Season of Use, and Animal Unit Months

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
180	Lost Creek	238	Permit – Sec 3	Cattle	6/15 – 9/25	21
655	Copper Mountain	248	Permit – Sec 3	Cattle	6/1 – 11/15	121
1301	Cantril Jack Allotment	6,875	Permit – Sec 3	Cattle	8/16 – 11/30	573
1302	North of CB&Q Railroad	961	Permit – Sec 3	Cattle	3/5 – 5/4	160
1303	South of CB&Q Railroad	7,256	Permit – Sec 3	Cattle	3/5 – 5/4	660
				Cattle	10/20 – 12/16	
				Cattle	11/15 – 12/16	
1304	Crawford Creek	1,209	Permit – Sec 3	Cattle	6/15 – 10/14	460
1305	Lybyer North	3,175	Permit – Sec 3	Cattle	4/26 – 5/31	262
1306	Canning Allotment	347	Permit – Sec 3	Cattle	8/10 – 2/28	28
				Cattle	3/1 – 5/1	
				Horse	3/1 – 2/28	
1307	Mallet-Smith Pasture	137	Permit – Sec 3	Cattle	7/1 – 9/30	24
1308	167A Scott-Robson	283	Permit – Sec 3	Cattle	5/1 – 6/15	33
				Cattle	10/15 – 12/17	
				Sheep	5/1 – 6/15	
				Sheep	10/15 – 12/17	
1309	Logan Pasture	3,427	Permit – Sec 3	Cattle	6/1 – 9/15	610
1310	Cottonwood Pass	2,321	Permit – Sec 3	Cattle	10/18 – 11/1	249
				Cattle	6/1 – 6/15	
1311	Keenan	191	Permit – Sec 3	Cattle	4/30 – 5/30	16
1312	North of Tracks	15,556	Permit – Sec 3	Cattle	2/14 – 6/15	2,820
				Cattle	10/1 – 12/31	
				Horse	3/1 – 2/28	
1313	South of Tracks	8,923	Permit – Sec 3	Cattle	4/1 – 12/31	1,110
1314	Moneta Hills Pasture	7,752	Permit – Sec 3	Cattle	4/1 – 12/31	587
1315	Ditch Pasture	782	Permit – Sec 3	Cattle	4/20 – 5/5	108
1316	Madden Ranch Pasture	1,442	Permit – Sec 3	Cattle	5/5 – 12/30	170
1317	Brandau Ranch Allotment	309	Permit – Sec 3	Cattle	8/15 – 12/31	167
1318	Below the Hill Pasture	2,793	Permit – Sec 3	Cattle	6/1 – 9/29	78
1319	Twidale	200	Permit – Sec 3	Cattle	5/1 – 5/31	39
				Cattle	10/1 – 10/31	
				Horse	11/1 – 2/28	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1320	St. Clair West	350	Permit – Sec 3	Cattle	4/10 – 5/10	65
1321	St. Clair Ranch	141	Permit – Sec 3	Cattle	11/15 – 2/28	89
				Cattle	3/1 – 3/31	
1322	St. Clair South Pasture	4,435	Permit – Sec 3	Horse	5/1 – 1/15	726
				Cattle	10/15 – 12/31	
1323	Fuller Allotment	3,050	Permit – Sec 3	Cattle	8/7 – 10/28	413
				Cattle	5/24 – 6/25	
1324	Hoodoo Creek Allotment	23,168	Permit – Sec 3	Cattle	9/1 – 10/10	1,491
				Cattle	1/6 – 6/26	
1325	East of Ranch	3,033	Permit – Sec 3	Cattle	12/1 – 5/31	236
				Sheep	12/1 – 6/15	
1326	Lichtenstein	5,998	Permit – Sec 3	Cattle	1/1 – 2/28	501
				Sheep	12/1 – 4/15	
1327	Myrtle Reed Allotment	1,213	Permit – Sec 3	Cattle	5/1 – 10/31	72
1328	Battle Axe South	6,994	Permit – Sec 3	Cattle	5/1 – 9/12	552
1329	Lysite Mountain ¹	8,192	Permit – Sec 3	Cattle	5/10 – 11/1	2,569
				Horse	6/1 – 5/31	
1330	Battle Axe Lysite ¹	3,717	Permit – Sec 3	Sheep	3/19 – 4/20	420
				Cattle	8/15 – 10/1	
				Cattle	4/15 – 6/1	
1331	Battle Axe Berger ¹	8,537	Permit – Sec 3	Cattle	5/16 – 4/30	911
				Horse	3/1 – 2/28	
1332	Bow & Arrow	1,094	Permit – Sec 3	Cattle	4/10 – 6/15	159
				Cattle	10/1 – 12/1	
				Horse	6/1 – 9/30	
1333	Gates Draw Allotment	12,793	Permit – Sec 3	Cattle	11/1 – 5/31	1,490
1334	Cottonwood Pass	3,890	Permit – Sec 3	Cattle	6/11 – 10/20	825
1335	OCLA South of Railroad	6,848	Permit – Sec 3	Cattle	12/1 – 3/31	912
1336	OCLA North of Railroad	5,600	Permit – Sec 3	Cattle	4/20 – 5/30	425
1337	De Pass Ranch	528	Permit – Sec 3	Cattle	3/1 – 2/28	125
1338	Fuller Ranch Pasture	1,450	Permit – Sec 3	Cattle	3/1 – 4/30	165
1339	Picard Private Allotment	3,146	Permit – Sec 3	Cattle	12/1 – 5/15	490
1340	168A North of Seeps	796	Permit – Sec 3	Cattle	9/20 – 12/1	200
				Cattle	5/1 – 6/1	
				Horse	6/1 – 9/30	
1341	168 A Stock Driveway ¹	2,016	Permit – Sec 3	Cattle	12/1 Permit – Sec 312/31	40
				Horse	12/1 – 12/31	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1342	Knapp Individual	997	Permit – Sec 3	Cattle	10/10 – 11/15	40
1343	Tuff Creek Pasture	15,728	Permit – Sec 3	Cattle	11/16 – 2/28	860
				Cattle	4/1 – 7/31	
1344	Westfall	3,620	Permit – Sec 3	Horse	3/1 – 12/20	698
				Cattle	6/1 – 2/28	
1345	Mountain Pasture	1,135	Permit – Sec 3	Cattle	5/20 – 1/15	277
1346	Bonneville Reservoir	10,968	Permit – Sec 3	Cattle	4/15 – 6/10	984
				Horse	4/15 – 6/10	
				Cattle	10/1 – 12/31	
1347	Jones Creek Basin	1,292	Permit – Sec 3	Cattle	7/1 – 10/10	488
1348	J. Herbst Summer	2,198	Permit – Sec 3	Cattle	6/1 – 9/30	308
				Horse	10/1 – 4/30	
1349	J. Herbst Tuff Creek	1,226	Permit – Sec 3	Cattle	10/1 – 11/15	228
				Cattle	5/1 – 5/30	
1350	Wm. Herbst Summer	885	Permit – Sec 3	Cattle	10/15 – 12/15	60
1351	Scott Draw	3,386	Permit – Sec 3	Cattle	10/1 – 11/7	303
1352	Joe Johns Pasture	1,109	Permit – Sec 3	Cattle	8/15 – 11/30	298
				Sheep	6/1 – 10/1	
1353	Campbell	2,843	Permit – Sec 3	Cattle	5/13 – 11/30	299
				Horse	4/15 – 1/1	
				Sheep	5/15 – 7/15	
				Sheep	9/1 – 12/10	
1354	Stinking Well	10,009	Permit – Sec 3	Sheep	3/1 – 4/15	789
				Sheep	5/15 – 6/15	
				Cattle	3/1 – 5/31	
				Cattle	12/1 – 2/28	
				Sheep	12/1 – 2/28	
1355	Lookout Hill	7,942	Permit – Sec 3	Sheep	4/1 – 6/28	682
				Sheep	10/20 – 12/10	
				Cattle	4/1 – 5/15	
1356	Howard Pasture	2,717	Permit – Sec 3	Cattle	1/1 – 2/28	224
				Sheep	4/1 – 7/31	
				Sheep	12/15 – 2/28	
1357	Summer Allotment	182	Permit – Sec 3	Cattle	6/15 – 7/14	32
1358	Top of Mountain Past	910	Permit – Sec 3	Cattle	6/15 – 10/15	23
1359	Ramage Ranch	11,990	Permit – Sec 3	Horse	3/1 – 2/28	1,549
				Cattle	11/1 – 6/20	
1360	Ruth Fuller Private	86	Permit – Sec 3	Cattle	5/15 – 5/23	9
				Cattle	6/26 – 8/6	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1361	Copper Mountain (Lander)	288	Permit – Sec 3	Cattle	7/1 – 9/30	40
1362	Lybyer South	2,500	Permit – Sec 3	Cattle	3/1 – 4/30	319
				Cattle	10/15 – 11/30	
1363	Hoodoo HQ Pastures	86	Permit – Sec 3	Cattle	3/1 – 2/28	4
				Horse	3/1 – 2/28	
1364	Red Ranch Pasture	24	Permit – Sec 3	Cattle	3/1 – 2/28	1
1365	Quien Sabe Ranch Pasture	5,973	Permit – Sec 3	Cattle	4/1 – 6/30	944
				Cattle	10/1 – 11/15	
1366	Cabin Pasture	265	Permit – Sec 3	Cattle	3/1 – 2/28	65
				Horse	5/1 – 11/30	
				Sheep	3/1 – 2/28	
1367	Henrich Pasture	81	Permit – Sec 3	Cattle	5/15 – 11/1	11
1368	Bridger Creek	114	Permit – Sec 3	Cattle	3/1 – 2/28	18
				Horse	3/1 – 2/28	
1369	Picard Ranch HQ	191	Permit – Sec 3	Cattle	3/1 – 2/28	17
1373	Copper Mountain	277	Permit – Sec 3	Cattle	6/1 – 10/15	16
1401	Rim Pasture ¹	19,100	Permit – Sec 3	Cattle	6/1 – 10/31	3,982
				Sheep	6/1 – 10/8	
1402	Delfelder Allotment	8,938	Permit – Sec 3	Cattle	3/1 – 1/17	1,203
1403	Conant Creek Common ¹	49,541	Permit – Sec 3	Sheep	12/16 – 4/15	7,987
				Cattle	5/1 – 11/30	
				Sheep	5/1 – 6/15	
				Sheep	10/14 – 11/30	
1404	Wm. Herbst Winter	2,932	Permit – Sec 3	Cattle	4/6 – 6/20	398
				Cattle	11/1 – 12/31	
1405	Posey North Allotment	4,410	Permit – Sec 3	Cattle	4/15 – 6/20	429
				Cattle	11/1 – 12/15	
1406	Poison Creek	16,759	Permit – Sec 3	Cattle	3/15 – 6/15	817
				Cattle	10/15 – 12/30	
1407	Muskrat AMP	39,494	Permit – Sec 3	Cattle	10/15 – 4/30	3,962
1408	Township Pasture	18,904	Permit – Sec 3	Cattle	10/1 – 1/15	2,478
				Horse	11/1 – 2/28	
				Horse	3/1 – 4/30	
				Cattle	4/1 – 4/30	
1409	Muskrat Open ¹	99,243	Permit – Sec 3	Cattle	5/1 – 11/30	10,519
1410	Posey Pasture	1,061	Permit – Sec 3	Cattle	4/22 – 5/20	165
1411	Shoshoni Road	21,158	Permit – Sec 3	Cattle	3/1 – 1/17	2,706
				Horse	3/1 – 2/28	
1412	Poston Winter	3,552	Permit – Sec 3	Cattle	3/1 – 2/28	437

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1413	Pipeline Pasture	4,228	Permit – Sec 3	Horse	12/1 – 4/30	452
				Cattle	12/1 – 5/4	
1414	Anderson Winter	5,864	Permit – Sec 3	Cattle	11/1 – 1/2	770
				Cattle	5/15 – 5/31	
1415	Myers Pasture	903	Permit – Sec 3	Cattle	5/1 – 9/15	116
1416	Lame Jack Draw	6,373	Permit – Sec 3	Cattle	5/1 – 9/30	720
1417	Haybarn Hill	9,947	Permit – Sec 3	Cattle	11/1 – 4/30	1,195
1512	South Dobie Flat	6,847	Permit – Sec 3	Cattle	5/23 – 6/9	1,207
				Cattle	10/25 – 12/6	
1518	Little Bug Pasture	3,837	Permit – Sec 3	Cattle	1/1 – 4/1	564
1601	Dodds Allotment	1,744	Permit – Sec 3	Sheep	5/1 – 10/30	446
1604	#17 Horse Heaven Pasture	16,329	Permit – Sec 3	Horse	6/1 – 9/30	3,077
				Cattle	6/15 – 10/19	
				Sheep	7/1 – 10/18	
1605	#18 Horse Creek Pasture	3,685	Permit – Sec 3	Sheep	5/1 – 6/15	459
				Sheep	10/19 – 11/30	
				Cattle	10/20 – 11/16	
1606	#19 Vinegar Hill Pasture	6,662	Permit – Sec 3	Sheep	10/19 – 12/12	981
				Horse	1/1 – 3/31	
				Cattle	11/18 – 12/24	
				Sheep	12/30 – 1/15	
1607	#16 Phillips Pasture	1,872.00	Permit – Sec 3	Sheep	1/16 – 4/15	259
				Cattle	12/25 – 2/8	
1608	#20 Calf Pasture	828	Permit – Sec 3	Cattle	5/1 – 6/15	130
				Sheep	5/1 – 6/15	
1609	#21 Horse Pasture	1,143	Permit – Sec 3	Horse	4/1 – 5/31	168
				Cattle	6/1 – 6/6	
			Permit – Sec 3	Sheep	6/16 – 6/30	
1610	#22 Bull Pasture	908	Permit – Sec 3	Cattle	4/1 – 6/30	156
				Sheep	5/1 – 6/15	
1612	Hamilton Rock Pasture	3,998	Permit – Sec 3	Cattle	12/25 – 1/27	454
				Sheep	1/16 – 4/15	
1614	Circle Bar Allotment	38,299	Permit – Sec 3	Horse	5/1 – 2/28	5,897
				Cattle	5/1 – 2/28	
1615	North of Drift Fence	20,318	Permit – Sec 3	Cattle	6/10 – 9/26	4,391
1616	Keester	29,779		Horse	11/15 – 12/5	4,582
			Permit – Sec 3	Cattle	5/16 – 11/28	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1619	Winter Pastures (incl. Clayto 1618)	17,569	Permit – Sec 3	Cattle	9/26 – 5/15	2,635
				Horse	12/6 – 6/30	
1620	Cabin Creek Pasture	1,153	Permit – Sec 3	Cattle	7/10 – 10/26	241
1622	Hat Ranch	5,022	Permit – Sec 3	Cattle	3/1 – 5/15	855
				Horse	3/1 – 5/15	
				Cattle	12/1 – 2/28	
				Horse	11/1 – 2/28	
1623	Murphree Pastures	9,219	Permit – Sec 3	Horse	6/25 – 11/16	1,061
				Cattle	3/1 – 11/30	
1625	Jamerman Pastures	6,603	Permit – Sec 3	Cattle	3/1 – 5/19	478
				Cattle	11/1 – 2/28	
1626	Mud Lake	1,324	Permit – Sec 3	Cattle	12/1 – 12/31	113
1628	Sage Hen	1,312	Permit – Sec 3	Cattle	12/1 – 2/28	189
1629	JJ Winter Pastures	721	Permit – Sec 3	Cattle	3/1 – 4/30	276
				Horse	3/1 – 2/28	
				Cattle	11/1 – 2/28	
1630	Tram Road Pasture	1,136	Permit – Sec 3	Cattle	4/1 – 5/15	135
1631	Claytor Homestead	59	Permit – Sec 3	Cattle	3/1 – 3/31	6
1632	North Hat Pasture	1,144	Permit – Sec 3	Cattle	3/15 – 4/30	180
				Horse	6/1 – 8/31	
1633	Stampede Bog	552	Permit – Sec 3	Cattle	3/1 – 4/30	89
				Cattle	10/15 – 11/30	
1635	Big Rock Pasture	13,386	Permit – Sec 3	Cattle	4/1 – 5/31	1,995
				Cattle	10/15 – 11/26	
1636	Granite Mtn. Open ¹	77,746	Permit – Sec 3	Cattle	5/10 – 10/31	12,584
1638	Winter Allotment	160	Permit – Sec 3	Cattle	3/1 – 3/31	16
1640	Garson Ranch	2,531	Lease – Sec 15	Cattle	6/1 – 10/31	403
1642	Devils Gate	24,227	Permit – Sec 3	Cattle	3/1 – 2/28	3,700
				Horse		
1644	Turkey Track Ranch	9,057	Permit – Sec 3	Cattle	3/1 – 2/28	1,832
				Horse		
1660	Home, North of Highway	1,231	Permit – Sec 3	Cattle	12/1 – 5/25	205
				Horse	3/1 – 5/25	
1701	Flagg AMP ¹	11,463	Permit – Sec 3	Cattle	5/1 – 11/30	2,086
1702	Flagg Individual	298	Permit – Sec 3	Cattle	12/1 – 2/28	51
1703	Big Pasture ¹	76,090	Permit – Sec 3	Cattle	5/1 – 11/7	11,909
1704	Breeding Pasture ¹	16,916	Permit – Sec 3	Cattle	4/3 – 6/8	1,956
				Cattle	9/1 – 11/16	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
				Horse	4/1 – 12/15	
1705	Myers Fenced Pasture	1,640	Permit – Sec 3	Cattle	4/6 – 4/30	175
1706	Trent and Home Place	427	Permit – Sec 3	Cattle	11/16 – 2/28	40
1707	Ice Slough	953	Permit – Sec 3	Cattle	5/1 – 7/31	183
1709	Long Creek Pasture	2,567	Permit – Sec 3	Cattle	4/1 – 9/30	227
				Cattle	11/16 – 12/15	
1710	Graham Ranch Pasture	1,129	Permit – Sec 3	Cattle	11/15 – 2/28	175
				Cattle	3/1 – 4/30	
1711	Hay Meadow Pasture	316	Permit – Sec 3	Cattle	3/1 – 5/14	50
				Cattle	9/1 – 2/28	
1712	Long Creek Sweetwater	426	Permit – Sec 3	Cattle	11/1 – 4/30	66
1713	Whitlock Fenced	1,057	Permit – Sec 3	Cattle	4/1 – 4/30	126
1714	Scarlett Pasture	41	Permit – Sec 3	Cattle	10/1 – 2/28	79
1715	Horse Pasture	130	Permit – Sec 3	Horse	3/1 – 3/31	14
				Horse	12/16 – 2/28	
1716	Dishpan Butte ¹	16,069	Permit – Sec 3	Cattle	5/15 – 11/1	1,983
1717	Fenced Individual	1,310	Permit – Sec 3	Cattle	5/1 – 6/14	171
1801	East Beaver Common ¹	61,911	Permit – Sec 3	Cattle	5/1 – 11/15	7,331
1802	Sand Draw AMP	13,635	Permit – Sec 3	Cattle	6/1 – 10/15	1,418
1803	Government Draw ¹	75,775	Permit – Sec 3	Cattle	5/7 – 10/31	8,940
1804	Government Draw-Lower Beaver ¹	20,468	Permit – Sec 3	Cattle	3/1 – 6/10	4,040
				Cattle	11/1 – 2/28	
1805	Kirby-Reservation Boundary	5,265	Permit – Sec 3	Cattle	5/16 – 6/14	734
				Cattle	11/1 – 11/30	
1806	Griffin Beaver Creek	6,087	Permit – Sec 3	Cattle	5/1 – 10/15	714
1807	Baldwin Pasture	465	Permit – Sec 3	Cattle	4/20 – 5/15	105
1808	Hudson Draw Private Allotment	481	Permit – Sec 3	Cattle	5/7 – 6/14	38
1809	Bringolf Ranch	668	Permit – Sec 3	Cattle	4/15 – 5/14	141
				Cattle	10/1 – 10/31	
1810	Yellowstone Ranch	338	Permit – Sec 3	Cattle	11/1 – 12/31	92
1813	Blue Ridge	260	Permit – Sec 3	Cattle	11/1 – 12/16	8
1814	Highway Pasture	152	Permit – Sec 3	Cattle	5/1 – 5/29	21

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1901	Atlantic City Common ¹	38,698	Permit – Sec 3	Cattle	5/20 – 9/30	4,765
				Cattle	5/8 – 10/4	
				Goat	5/20 – 9/30	
1902	Cottonwood Basin	7,625	Permit – Sec 3	Horse	5/1 – 9/30	705
				Cattle	4/20 – 10/31	
1903	Silver Creek Common ¹	32,941	Permit – Sec 3	Cattle	5/15 – 10/31	3,524
1904	Devils Canyon AMP ¹	3,585	Permit – Sec 3	Cattle	5/16 – 9/30	652
1905	Ellis Upper Beaver ¹	2,105	Permit – Sec 3	Cattle	5/16 – 9/30	530
1906	Twin Creek Individual	7,516	Permit – Sec 3	Cattle	5/1 – 12/1	1,644
				Horse	5/2 – 7/1	
1907	Commissary Hill	953	Permit – Sec 3	Cattle	6/1 – 6/15	74
				Cattle	10/1 – 10/15	
1908	Little Popo Agie AMP	8,541	Permit – Sec 3	Cattle	5/10 – 10/1	1,814
1909	Onion Flat	1,193	Permit – Sec 3	Cattle	5/1 – 5/31	188
				Cattle	10/16 – 11/15	
1910	Sawmill Basin	2,401	Permit – Sec 3	Cattle	6/1 – 10/15	197
1911	Red Canyon AMP ¹	3,605	Permit – Sec 3	Cattle	5/15 – 8/28	580
1912	Twin Creek Private	385	Permit – Sec 3	Cattle	5/16 – 10/15	44
1913	McGraw Flat Individual	1,034	Permit – Sec 3	Cattle	6/1 – 9/30	206
1914	McGraw Flat Common ¹	10,401	Permit – Sec 3	Cattle	5/1 – 10/31	1,824
1915	Beaver AMP	8,958	Permit – Sec 3	Cattle	5/1 – 10/31	1,964
1916	Hall CK Individual	12,464	Permit – Sec 3	Cattle	5/1 – 1/31	2,328
				Horse	5/15 – 2/28	
1917	Cottonwood Divide	5,685	Permit – Sec 3	Cattle	6/1 – 7/10	1,570
				Cattle	10/1 – 11/14	
1918	McGraw Flat-U. Beaver	8,388	Permit – Sec 3	Cattle	7/1 – 10/10	1,146
1919	Gravel Springs ¹	2,840	Permit – Sec 3	Cattle	5/16 – 10/10	488
1920	Salisbury AMP	5,389	Permit – Sec 3	Cattle	5/16 – 9/30	996
				Horse	5/16 – 9/30	
1921	Level Meadows	3,249	Permit – Sec 3	Cattle	6/1 – 10/30	701
1922	French George Crossing	626	Permit – Sec 3	Cattle	5/16 – 9/30	146
1923	Atlantic City Upper Fenced	248	Permit – Sec 3	Cattle	5/1 – 11/30	81
1924	Atlantic City Lower Fenced	127	Permit – Sec 3	Cattle	5/1 – 11/30	58

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1925	Hall Creek Winter Pasture ¹	1,299	Permit – Sec 3	Cattle	11/23 – 2/28	98
1926	McKinney Individual	818	Permit – Sec 3	Cattle	5/1 – 9/30	235
1927	Upper Ellis Ranch	236	Permit – Sec 3	Cattle	9/15 – 12/31	157
1928	Lower Ellis Ranch	321	Permit – Sec 3	Cattle	9/15 – 12/31	48
1929	Barras Spring	51	Not Licensed			
1930	Long Willow	709	Not Licensed			
1931	Woolery Individual	1,231	Not Licensed			
1932	Sheep Mountain	558	Permit – Sec 3	Cattle	6/1 – 9/30	99
1933	Lazy Y	173	Not Licensed			
1934	Red Canyon Rim	846	Permit – Sec 3	Cattle	6/5 – 10/31	29
1935	Bowman Ranch		Not Licensed			
1936	Derby		Not Licensed			
1937	Little Knoll		Not Licensed			
1938	Bergstedt Ranch	52	Not Licensed			
1939	Auer Ranch	649	Permit – Sec 3	Cattle	11/1 – 2/28	93
1940	Henton Ranch	24	Not Licensed			
1941	Flat Onion		Not Licensed			
1943	Red Bluff Creek	89	Permit – Sec 3	Cattle	3/1 – 2/28	1
				Cattle	6/1 – 9/30	
2009	Alkali Pasture	444	Permit – Sec 3	Cattle	5/1 – 6/30	28
				Cattle	8/1 – 10/31	
2011	Highway Allotment	509	Permit – Sec 3	Cattle	4/1 – 5/15	90
2021	Willow Creek Allotment	85	Permit – Sec 3	Cattle	5/1 – 6/30	15
2023	Crooks Gap	952	Permit – Sec 3	Cattle	10/1 – 11/30	83
2025	Leckinby Pasture	3,436	Permit – Sec 3	Cattle	5/1 – 11/30	607
2026	Little Camp Creek	2,281	Permit – Sec 3	Cattle	5/1 – 10/31	294
2028	Mitchell Pasture	544	Permit – Sec 3	Cattle	6/15 – 9/15	106
2029	Diamond Hook	141	Permit – Sec 3	Cattle	3/1 – 2/28	27
2103	Lime Kiln Gulch	1,159	Lease – Sec 15	Cattle	5/15 – 6/30	154
2104	Little Warm Springs Canyon	315	Not Licensed	Cattle	9/25 – 9/28	27
2106	Fire Ridge	148	Lease – Sec 15	Horse	6/15 – 9/30	8
2107	Wells 11	305	Lease – Sec 15	Horse	5/1 – 6/30	31
				Horse	8/1 – 10/31	
2108	Geyser Creek	829	Lease – Sec 15	Horse	6/1 – 9/30	50
2109	Cross 14	643	Lease – Sec 15	Cattle	6/1 – 9/30	134

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
2110	Little Horse Creek	720	Lease – Sec 15	Horse	5/15 – 10/31	51
2111	E A Mountain 16	1,761	Lease – Sec 15	Cattle	6/1 – 6/30	264
				Cattle	8/1 – 10/30	
2112	Bear Creek No. 2112	3,499	Lease – Sec 15	Cattle	5/1 – 6/30	542
				Cattle	10/15 – 11/30	
2113	Crooked Creek	1,247	Lease – Sec 15	Cattle	6/25 – 9/30	133
				Horse	6/25 – 10/28	
2114	Spence 23	1,470	Lease – Sec 15	Cattle	5/1 – 12/1	290
2115	Hat Butte	893	Lease – Sec 15	Cattle	6/1 – 6/30	154
				Cattle	9/1 – 10/30	
2116	Elk Ridge Southeast	316	Lease – Sec 15	Horse	6/1 – 8/31	21
2117	Blue Holes	682	Lease – Sec 15	Horse	3/1 – 4/30	90
				Horse	11/1 – 2/28	
2119	White Pass 31	650	Lease – Sec 15	Cattle	5/1 – 6/30	116
				Cattle	10/1 – 11/30	
2120	Windy Ridge	332	Lease – Sec 15	Cattle	4/1 – 6/30	54
				Cattle	10/1 – 10/31	
2121	Mason Drawn	6,813	Lease – Sec 15	Cattle	5/1 – 6/30	845
				Cattle	10/1 – 10/30	
2122	Tappan Creek 34	1,065	Lease – Sec 15	Cattle	6/1 – 11/15	180
2123	Battrum Mountain	5,936	Lease – Sec 15	Cattle	6/1 – 10/15	531
2125	Albright 47	286	Lease – Sec 15	Horse	4/1 – 6/30	28
				Horse	10/1 – 10/31	
2126	CM 49	940	Lease – Sec 15	Horse	11/10 – 12/9	67
				Horse	6/1 – 6/30	
2127	Wagon Gulch	80	Lease – Sec 15	Cattle	6/15 – 12/15	95
				Horse	6/15 – 12/15	
2128	Bitterroot 60	691	Lease – Sec 15	Horse	5/20 – 6/17	68
2130	Cross 67	591	Lease – Sec 15	Cattle	5/1 – 9/30	91
2132	Stoney Point 73	121	Lease – Sec 15	Horse	3/1 – 6/1	12
				Horse	10/15 – 2/28	
2201	North Fork Rim		Lease – Sec 15	Cattle	6/1 – 10/31	60
2202	Baldwin Creek School	1,959	Lease – Sec 15	Horse	5/1 – 7/1	16
2203	Madison Creek	1,656	Lease – Sec 15	Horse	5/1 – 11/30	20
		282		Cattle	5/1 – 11/30	
2204	Table Mountain 9	1,216	Lease – Sec 15	Cattle	6/1 – 10/1	128
2205	Hopkins 13	200	Lease – Sec 15	Cattle	6/1 – 9/30	40
				Horse	6/1 – 9/30	
2206	Wickstrom 17	179	Lease – Sec 15	Cattle	6/16 – 7/16	11
2207	Steers 19	2,522	Lease – Sec 15	Cattle	6/15 – 9/30	146
2208	Pine Bar 21	418	Lease – Sec 15	Cattle	6/1 – 8/31	6
2210	Willow Creek 24	1,108	Lease – Sec 15	Cattle	5/15 – 10/15	274

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
2211	Squaw Creek	1,174	Lease – Sec 15	Cattle	6/1 – 8/31	209
2212	Frank Ranch 28	582	Lease – Sec 15	Cattle	5/1 – 11/1	110
2213	Spriggs 36	2,196	Lease – Sec 15	Cattle	6/15 – 9/29	70
2214	Meyer Basin	1,273	Lease – Sec 15	Cattle	6/1 – 9/30	233
2215	Wunder 38	1,284	Lease – Sec 15	Cattle	7/1 – 9/15	63
2216	Day 39	106	Lease – Sec 15	Horse	6/1 – 7/13	4
2217	Nicholas 40	428	Lease – Sec 15	Cattle	6/1 – 9/29	48
2218	Double A 41	280	Lease – Sec 15	Cattle	6/1 – 6/30	38
2219	Orchard Draw	964	Lease – Sec 15	Cattle	5/10 – 10/1	124
2220	Red Butte	40	Lease – Sec 15	Cattle	6/1 – 10/31	5
2221	Juniper Hill	200	Lease – Sec 15	Cattle	10/1 – 11/15	15
2222	School Allotment	160	Lease – Sec 15	Cattle	5/1 – 7/2	25
2223	Baldwin Creek 51	200	Lease – Sec 15	Cattle	6/1 – 8/31	18
2224	Natural Lake	235	Lease – Sec 15	Cattle	6/1 – 7/27	22
2225	Crump 53	163	Lease – Sec 15	Horse	6/1 – 11/14	27
2226	Hunter	79	Lease – Sec 15	Cattle	6/1 – 8/31	6
2227	Smith Creek	78	Lease – Sec 15	Cattle	10/1 – 10/7	6
2228	Spriggs 57	120	Lease – Sec 15	Horse	8/1 – 9/30	6
2229	Kaper 59	277	Lease – Sec 15	Cattle	6/1 – 9/30	56
2230	Table Mountain 61	40	Lease – Sec 15	Cattle	6/1 – 9/22	7
2231	Booth 62	121	Lease – Sec 15	Cattle	6/1 – 6/21	8
2232	Beason Creek 63	476	Lease – Sec 15	Cattle	6/1 – 9/30	20
2233	Batrum Gap	474	Lease – Sec 15	Cattle	6/1 – 10/30	96
				Horse	12/1 – 12/15	
2234	Sjostrom 66	168	Lease – Sec 15	Horse	6/1 – 8/31	18
2235	Horny Toad Associate	522	Lease – Sec 15	Cattle	6/1 – 10/30	35
2236	Freeman 70	121	Lease – Sec 15	Horse	5/1 – 9/25	24
2237	North Fork	473	Lease – Sec 15	Cattle	5/10 – 10/31	38
2238	Hilltop	40	Lease – Sec 15	Cattle	3/1 – 6/1	7
				Cattle	11/15 – 2/28	
2239	Cyclone Pass		Not Licensed			
2240	Harvey Basin	1,475	Lease – Sec 15	Cattle	5/15 – 10/30	183
2520	Woods Basin	173	Lease – Sec 15	Cattle	6/20 – 9/30	25
10160	Cedar Ridge LRA	520	Permit – Sec 3	Cattle	3/1 – 2/28	67
10203	Cherry Creek	28,793	Permit – Sec 3	Cattle/Horse	3/1 – 2/28	4,841
10205	Bar Eleven	51,065	Permit – Sec 3	Cattle	3/1 – 2/28	11,419
				Horse		
				Sheep		
10224	Stewart Creek ¹	61,284	Permit – Sec 3	Cattle	5/28 – 8/30	149
10533	Steamboat Lake	1,633	Permit – Sec 3	Cattle	3/1 – 2/28	261
				Horse		
11501	Muskrat-Linn	54,118	Permit – Sec 3	Cattle	1/1 – 12/31	6,799
11502	Fraser Draw ¹	73,110	Permit – Sec 3	Cattle	5/16 – 12/16	5,941
11504	Canyon Creek	11,109	Permit – Sec 3	Cattle	5/20 – 10/31	1,400

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
11505	South Deer Creek	11,319	Permit – Sec 3	Cattle	5/10 – 10/31	1,292
11506	Deer Creek AMP	7,052	Permit – Sec 3	Cattle	5/15 – 11/15	1,297
11507	South Cross L	2,360	Permit – Sec 3	Cattle	3/1 – 5/21	386
				Horse	6/1 – 10/12	
11508	Gas Hills	48,496	Permit – Sec 3	Cattle	5/16 – 12/10	3,547
				Sheep	5/16 – 12/10	
11509	Diamond Springs	40,573	Permit – Sec 3	Cattle	6/10 – 11/20	4,956
				Horse	10/23 – 11/20	
11510	North Willow Creek	3,475	Permit – Sec 3	Cattle	4/20 – 6/10	616
11511	North Dobie Flat	11,469	Permit – Sec 3	Cattle	5/5 – 6/5	1,516
				Cattle	10/15 – 11/30	
11513	Blackjack Ranch	31,197	Permit – Sec 3	Cattle	6/6 – 9/6	1,721
11514	Gap Pasture	3,433	Permit – Sec 3	Cattle	5/1 – 6/2	581
11515	Cross L Pastures	1,327	Permit – Sec 3	Cattle	12/16 – 4/30	316
				Horse	5/26 – 6/24	
11516	Basin Pasture	18,286	Permit – Sec 3	Cattle	7/1 – 11/30	2,471
11517	Bug Meadows Pastures	568	Permit – Sec 3	Cattle	3/1 – 5/31	91
12002	Harris Slough Past	110	Permit – Sec 3	Cattle	4/20 – 5/19	5
12003	Whiskey Peak Incomm ¹	63,446	Permit – Sec 3	Cattle	6/1 – 12/30	5,254
				Sheep		
12004	Green Mountain Fenced	4,310	Permit – Sec 3	Cattle	4/10 – 5/10	652
				Cattle	10/1 – 11/1	
				Horse	8/1 – 9/30	
12005	Home, South of Highway	2,715	Permit – Sec 3	Cattle	12/16 – 3/5	383
12006	46 Pasture ¹	2,683	Permit – Sec 3	Cattle	3/1 – 6/15	488
				Cattle	10/1 – 2/28	
12007	Rigby Pasture	1,091	Permit – Sec 3	Cattle	6/1 – 10/31	176
12012	East Allotment	2,002	Permit – Sec 3	Cattle	10/16 – 11/7	377
				Cattle	4/16 – 5/15	
12013	Fenced Allotment	10,329	Permit – Sec 3	Cattle	5/16 – 10/31	1,703
12014	South Hat Pasture	1,789	Permit – Sec 3	Cattle	4/15 – 6/13	287
12015	Hadsell Pasture	3,806	Permit – Sec 3	Cattle	5/10 – 10/16	547
12016	State-71 Meadows	274	Permit – Sec 3	Cattle	5/1 – 5/31	51
12018	Alma Grieve Pasture	3,271	Permit – Sec 3	Cattle	10/1 – 2/28	453
12019	Cooper Creek	1,247	Permit – Sec 3	Cattle	6/1 – 7/15	200
				Cattle	10/1 – 12/30	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
12020	Cottonwood Pasture	2,019	Permit – Sec 3	Cattle	11/1 – 2/28	265
12242	Squaw Creek	80	Lease – Sec 15	Cattle	10/1 – 11/14	13
14289	Upper Poison Spider Creek	9,065	Permit – Sec 3	Cattle		1,693
				Sheep		
14808	Three Crossings Allotment	1,514	Permit – Sec 3	Cattle	5/1 – 10/11	602
				Cattle	11/10 – 11/30	
20213	Elkhorn LRA (including Oil City Allotment 1602)	305	Permit – Sec 3	Cattle	5/20 – 6/8	791
				Horse	5/15 – 6/14	
				Cattle	7/15 – 10/15	
21519	Miller Springs Pasture	1,884	Permit – Sec 3	Cattle	6/1 – 9/30	313
21520	School Pasture	874	Permit – Sec 3	Cattle	9/1 – 11/30	251
21521	Riddle Pasture	1,350	Permit – Sec 3	Cattle	4/1 – 5/31	306
				Cattle	11/1 – 12/31	
21522	Decker Pasture	331	Permit – Sec 3	Cattle	4/1 – 5/31	49
				Cattle	11/1 – 12/31	
21523	Hay Meadow Pastures	69	Permit – Sec 3	Cattle	12/1 – 4/30	168
31519	Beef Gap Pasture	352	Permit – Sec 3	Cattle	5/1 – 6/2	72
32001	Green Mountain CMN ¹	466,474	Permit – Sec 3	Sheep	3/1 – 2/28	11,450
				Cattle	5/1 – 12/31	35,911
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases.						
¹ Indicates a common allotment.						
AMP Allotment Management Plan						
AUM Animal Unit Month						

Table K.2. Allotment Categorization – Current and Proposed

Allotment	Allotment Name	Existing RMP	Proposed New Category
01323	Fuller Allotment	I	I
180	Lost Creek	M	M
00655	Copper Mountain	I	I
01301	Cantril Jack Allotment	M	M
01302	North of CB&Q Railroad	C	I
01303	South of CB&Q Railroad	M	I
01304	Crawford Creek	I	I
01305	Lybyer North	I	I
01306	Canning Allotment	M	M
01307	Mallet-Smith Pasture	C	C
01308	167A Scott Robson	M	M
01309	Logan Pasture	M	M
01310	Cottonwood Pass	C	I
01311	Keenan	C	C

Allotment	Allotment Name	Existing RMP	Proposed New Category
01312	North of Tracks	M	I
01313	South of Tracks	I	I
01314	Moneta Hills Pasture	M	M
01315	Ditch Pasture	C	C
01316	Madden Ranch Pasture	C	C
01317	Brandau Ranch Allotment	C	I
01318	Below the Hill Pasture	M	M
01319	Twidale	C	C
01320	St. Clair West	C	I
01321	St. Clair Ranch	C	C
01322	St. Clair South Past.	I	I
01324	Hoodoo Creek Allotment	I	I
01325	East of Ranch	I	I
01326	Lichtenstein	I	I
01327	Myrtle Reed Allotment	I	I
01328	Battle Axe South	M	M
01329	Lysite Mountain	I	I
01330	Battle Axe Lysite	M	M
01331	Battle Axe Berger	M	I
01332	Bow & Arrow	M	M
01333	Gates Draw Allotment	I	I
01334	Cottonwood Pass	I	I
01335	OCLA South of Railroad	I	I
01336	OCLA North of Railroad	I	I
01337	De Pass Ranch	C	C
01338	Fuller Ranch Pasture	I	I
01339	Picard Private Allotment	I	I
01340	168A North of Seeps	C	I
01341	168A Stock Driveway	M	M
01342	Knapp Individual	C	C
01343	Tuff Creek Pasture	C	I
01344	Westfall	I	I
01345	Mountain Pasture	C	I
01346	Bonneville Reservoir	I	I
01347	Jones Creek Basin	I	M
01348	J. Herbst Summer	M	I
01349	J. Herbst Tuff Creek	C	I
01350	Wm. Herbst Summer	C	C
01351	Scott Draw	I	M
01352	Joe Johns Pasture	C	C
01353	Campbell	M	M
01354	Stinking Well	I	I
01355	Lookout Hill	M	M
01356	Howard Pasture	I	I
01357	Summer Allotment	M	M
01358	Top of Mountain Pasture	C	C
01359	Ramage Ranch	I	I
01360	Ruth Fuller Private	C	C
01361	Copper Mountain (Lander)	C	C
01362	Lybyer South	I	M
01363	Hoodoo HQ Pastures	C	C
01364	Red Ranch Pasture	C	C
01365	Quien Sabe Ranch Pasture	I	M

Allotment	Allotment Name	Existing RMP	Proposed New Category
01366	Cabin Pasture	C	C
01367	Henrich Pasture	I	I
01368	Bridger Creek	C	C
01369	Picard Ranch HQ	C	C
01373	Copper Mountain	C	C
01401	Rim Pasture	I	I
01402	Delfelder Allotment	I	I
01403	Conant Creek Common	I	I
01404	Wm. Herbst Winter	I	I
01405	Posey North Allotment	I	I
01406	Poison Creek	M	M
01407	Muskrat AMP	I	I
01408	Township Pasture	I	I
01409	Muskrat Open	I	I
01410	Posey Pasture	I	I
01411	Shoshoni Road	I	I
01412	Poston Winter	I	M
01413	Pipeline Pasture	I	M
01414	Anderson Winter	M	M
01415	Myers Pasture	I	M
01416	Lame Jack Draw	I	I
01417	Haybarn Hill	C	I
01512	South Dobie Flat	M	I
01518	Little Bug Pasture	M	M
01519	Miller Springs Pasture	M	I
01520	School Pasture	M	M
01521	Riddle Pasture	M	M
01523	Bug Lake	M	M
01601	Dodds Allotment	M	M
01604	#17 Horse Heaven Pasture	M	I
01605	#18 Horse Creek Pasture	M	M
01606	#19 Vinegar Hill Pasture	M	M
01607	#16 Phillips Pasture	M	M
01608	#20 Calf Pasture	M	M
01609	#21 Horse Pasture	M	M
01610	#22 Bull Pasture	C	C
01612	Hamilton Rock Pasture	M	M
01614	Circle Bar Allotment	M	I
01615	North of Drift Fence	M	I
01616	Keester	M	M
01619	Winter Pastures	M	M
01620	Cabin Creek Pasture	C	C
01622	Hat Ranch	I	M
01623	Murphree Pastures	I	I
01625	Jamerman Pastures	M	M
01626	Mud Lake	C	C
01628	Sage Hen	M	M
01629	JJ Winter Pastures	C	C
01630	Tram Road Pasture	M	I
01631	Claytor Homestead	C	C
01632	North Hat Pasture	M	M
01633	Stamped Bog	C	M
01635	Big Rock Pasture	I	I

Allotment	Allotment Name	Existing RMP	Proposed New Category
01636	Granite Mountain Open	I	I
01638	Winter Allotment	M	M
01640	Garson Ranch	C	C
01642	Devils Gate	M	M
01644	Turkey Track	I	I
01660	Home, North of Highway	M	M
01701	Flagg AMP	I	I
01702	Flagg Individual	C	C
01703	Big Pasture	I	I
01704	Breeding Pasture	M	M
01705	Myers Fenced Pasture	I	I
01706	Trent & Home Place	M	M
01707	Ice Slough	I	I
01709	Long Creek Pasture	I	M
01710	Graham Ranch Pasture	M	M
01711	Hay Meadow Pasture	C	C
01712	Long Creek Sweetwater	C	C
01713	Whitlock Fenced	I	I
01714	Scarlett Pasture	C	C
01715	Horse Pasture	M	M
01716	Dishpan Butte	I	I
01717	Fenced Individual	I	M
01801	East Beaver Common	I	I
01802	Sand Draw AMP	I	I
01803	Government Draw	I	I
01804	Government Draw – Lower Beaver	I	I
01805	Kirby-Reservation Boundary	I	I
01806	Griffin Beaver Creek	M	M
01807	Baldwin Pasture	I	I
01808	Hudson Draw Private Allotment	M	M
01809	Bringolf Ranch	C	C
01810	Yellowstone Ranch	C	C
01813	Blue Ridge	C	C
01814	Highway Pasture	C	C
01901	Atlantic City Common	I	I
01902	Cottonwood Basin	I	I
01903	Silver Creek Common	I	I
01904	Devils Canyon AMP	I	I
01905	Ellis Upper Beaver	I	I
01906	Twin Creek Individual	I	I
01907	Commissary Hill	I	M
01908	Little Popo Agie AMP	I	M
01909	Onion Flat	I	I
01910	Sawmill Basin	I	I
01911	Red Canyon AMP	I	I
01912	Twin Creek Private	C	C
01913	McGraw Flat Individual	I	I
01914	McGraw Flat Common	I	I
01915	Beaver AMP	I	I
01916	Hall Creek Individual	I	I

Allotment	Allotment Name	Existing RMP	Proposed New Category
01917	Cottonwood Divide	I	I
01918	McGraw Flat-U. Beaver	I	I
01919	Gravel Springs Allotment	I	I
01920	Salisbury AMP	I	I
01921	Level Meadows	I	I
01922	P. Heart Individual	I	I
01923	Atlantic City Upper Fenced	C	C
01924	Atlantic City Lower Fenced	C	C
01925	Hall Creek Winter Past	M	M
01926	McKinney Individual	I	I
01927	Upper Ellis Ranch	C	C
01928	Lower Ellis Ranch	C	C
01929	Barras Spring	C	C
01930	Long Willow	C	C
1931	Woolery Individual	M	M
01932	Sheep Mountain	M	M
01933	Lazy Y	C	C
01934	Red Canyon Rim	I	M
01935	Bowman Ranch	C	C
01936	Derby Allotment	M	M
01937	Little Knoll	C	C
01938	Bergstedt Ranch	C	C
01939	Auer Ranch	C	C
01940	Henton Ranch	C	C
01941	Flat Onion	I	I
01943	Red Bluff Creek	M	M
02009	Alkali Pasture	M	M
02011	Highway Allotment	I	I
02019	Cooper Creek	M	M
02021	Willow Creek Allotment	C	C
02023	Crooks Gap	M	M
02025	Leckinby Pasture	M	M
02026	Little Camp Creek	I	I
02028	Mitchell Pasture	C	C
02029	Diamond Hook	C	C
02103	Lime Kiln Gulch	C	C
02104	Little Warm Spring Canyon	M	M
02106	Fire Ridge	M	M
02107	Wells 11	M	M
02108	Geyser Creek	M	M
02109	Cross 14	C	C
02110	Little Horse Creek	I	I
02111	E A Mountain 16	M	M
02112	Bear Creek No. 2112	C	C
02113	Crooked Creek	C	C
02114	Spence 23	C	C
02115	Hat Butte Ranch	C	C
02116	Elk Ridge Southeast	C	C
02117	Blue Holes	C	C
02119	White Pass 31	C	C
02120	Windy Ridge	C	C
02121	Mason Draw	I	I
02122	Tappan Creek 34	I	I

Allotment	Allotment Name	Existing RMP	Proposed New Category
02123	Battrum Mountain	C	I
02125	Albright 47	C	C
02126	CM 49	M	M
02127	Wagon Gulch	C	C
02128	Bitterroot 60	C	C
02130	Cross 67	C	C
02132	Stoney Point 73	C	C
02201	North Fork Rim	M	M
02202	Baldwin Creek School	C	C
02203	Madison Creek	C	C
02204	Table Mountain 9	C	C
02205	Hopkins 13	I	I
02206	Wickstrom 17	I	C
02207	Steers 19	I	I
02208	Pine Bar 21	M	M
02210	Willow Creek 24	I	I
02211	Squaw Creek	I	I
02212	Frank Ranch 28	C	C
02213	Spriggs 36	I	C
02214	Meyer Basin	I	I
02215	Wunder 38	I	C
02216	Day 39	C	C
02217	Nicholas 40	I	I
02218	Double A 41	I	I
02219	Orchard Draw	I	I
02220	Red Butte	I	I
02221	Juniper Hill	C	C
02222	School Allotment	I	I
02223	Baldwin Creek 51	I	I
02224	Natural Lake	C	C
02225	Crump 53	I	I
02226	Hunter	C	C
02227	Smith Creek	C	C
02228	Spriggs 57	I	I
02229	Kaper 59	C	C
02230	Table Mountain 61	C	C
02231	Booth 62	C	C
02232	Beason Creek 63	I	I
02233	Batrum Gap	C	C
02234	Sjostrom 66	C	C
02235	Horny Toad Associate	I	I
02236	Freeman 70	I	I
02237	North Fork	C	C
02238	Hilltop	C	C
02239	Cyclone Pass	I	I
02240	Harvey Basin	I	I
02520	Woods Basin	C	C
10160	Cedar Ridge LRA	C	C
10203	Cherry Creek	I	I
10205	Bar Eleven	I	I
10224	Stewart Creek	I	I
10533	Steamboat Lake	C	C
11501	Muskat-Linn	I	I

Allotment	Allotment Name	Existing RMP	Proposed New Category
11502	Fraser Draw	M	M
11504	Canyon Creek	I	M
11505	South Deer Creek	I	M
11506	Deer Creek AMP	I	I
11507	South Cross L	M	M
11508	Gas Hills	M	I
11509	Diamond Springs	I	I
11510	North Willow Creek	M	M
11511	North Dobie Flat	M	I
11513	Blackjack Ranch	I	I
11514	Gap Pasture	M	M
11515	Cross L Pastures	M	M
11516	Basin Pasture	M	I
11517	Bug Meadows Pastures	M	M
12002	Harris Slough Past	C	C
12003	Whiskey Peak Incomm.	I	I
12004	Green Mountain Fenced	I	I
12005	Home, South of Highway	I	I
12006	46 Pasture	I	I
12007	Rigby Pasture	I	I
12012	East Allotment	M	M
12013	Fenced Allotment	I	I
12014	South Hat Pasture	M	M
12015	Hadsell Pasture	I	I
12016	State-71 Meadows	C	C
12018	Alma Grieve Pasture	M	M
12020	Cottonwood Pasture	M	M
12242	Squaw Creek	C	C
14289	Upper Poison Spider Creek	I	I
14808	Three Crossings Allotment	M	M
20213	Elkhorn – LRA	I	I
21522	Decker Pasture	M	C
31519	Beef Gap Pasture	M	I
32001	Green Mountain CMN	I	I
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.			
AMP Allotment Management Plan			
RMP Resource Management Plan			

Table K.3. Lander Field Office Grazing Allotments Assessed for Meeting Standards

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
1304	Crawford Creek	2012	2,342			X	
1306	Canning	2012	347			X	
1307	Mallet-Smith Pasture	2003	181	X			
1310	Cotton-wood Pass	2012	2,317			X	

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
1318	Below the Hill	2012	2,548			X	
1323	Fuller Allotment	2012	3,050			X	
1324	Hoodoo Creek	2001	23,209		X		
1327	Myrtle Reed	2003	1,209	X			
1329	Lysite Mountain	2012	8,194			X	
1330	Battle Axe Lysite	2000	4,298	X			
1334	Cottonwood Pass	2012	3,890			X	
1335	OCLA South of Railroad	2000	6,413	X			
1336	OCLA North of Railroad	2000	4,861		X		
1337	De Pass Ranch	2000	472	X			
1338	Fuller Ranch Pasture	2000	1,477		X		
1340	168A North of Seeps	2012	794	X			
1341	Stock Driveway	2000	2,185		X		
1344	Westfall	2012	3,620			X	
1345	Mountain Pasture	2012	1,135			X	
1347	Jones Creek Basin	2012	1,292			X	
1348	J. Herbst Summer	2012	2,385			X	
1350	Wm Herbst Summer	2012	699			X	
1352	Joe Johns Pasture	2012	1,109	X			
1357	Summer Allotment	2012	182	X			
1358	Top Of Mountain Pasture	2001	1,449	X			
1359	Ramage Ranch	1998	12,060				X
1360	Ruth Fuller Private	2012	89			X	
1361	Copper Mountain	2012	288	X			
1363	Hoodoo HQ Pasture	2001	149			X	
1366	Cabin Pasture	2012	265			X	

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
1367	Heinrich Pasture	2012	81	X			
1369	Picard Ranch HQ	2000	169		X		
1373	Copper Mountain	2001	128	X			
1401	Rim Pasture	2000	19,095	X			
1403	Conant Creek	2000	50,376	X			
1404	Wm. Herbst Winter	2000	2,989		X		
1405	Posey North	2000	4,431		X		
1412	Poston Winter	2000	3,239	X			
1414	Anderson Winter	2000	5,924	X			
1416	Lame Jack Draw	2000	6,060	X			
1417	Haybarn Hill	2000	10,288	X			
1506	Deer Creek AMP	1998	7,000				X
1508	Gas Hills	1998	42,201	X			
1509	Diamond Springs	2008	40,890		X		
1511	North Dobie Flat	2008	11,435		X		
1512	South Dobie Flat	2008	6,752		X		
1513	Black Jack Ranch	2008	31,708		X		
1633	Stampede Bog	2000	301	X			
1704	Breeding Pasture	2001	17,107	X			
1705	Myers Fenced Pasture	2001	1,288	X			
1706	Trent & Home Place	2001	500	X			
1707	Ice Slough	2002	947	X			
1709	Long Creek Pasture	2001	2,406	X			
1710	Graham Ranch Pasture	2001	1,118	X			
1712	Long Creek Sweetwater	2001	388	X			
1713	Whitlock Fenced	2001	1,086	X			
1714	Scarlett Pasture	2001	173	X			

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
1715	Horse Pasture	2004	133	X			
1802	Sand Draw AMP	1999	11,092	X			
1805	Kirby Reservation Boundary	2000	5,333	X			
1806	Griffin Beaver Creek	2000	6,068	X			
1901	Atlantic City Common	2001	39,094		X		
1903	Silver Creek Common	2000	33,702		X		
1904	Devils Canyon AMP	2004	3,717			X	
1905	Ellis Upper Beaver	2000	3,326	X			
1906	Twin Creek Individual	1998	7,602	X			
1908	Little Popo Agie AMP	1998	8,651	X			
1911	Red Canyon AMP	1999	3,699		X		
1914	McGraw Flat Common	2000	10,149	X			
1915	Beaver AMP	2004	10,640			X	
1916	Hall Creek Individual	1998	12,711				X
1921	Level Meadows	2000	3,271	X			
1923	Atlantic City Upper Fenced	2000	60	X			
1924	Atlantic City Lower Fenced	2000	78	X			
1925	Hall Creek Winter Pasture	1998	1,305	X			
1927	Upper Ellis Ranch	2002	598	X			
1928	Lower Ellis Ranch	2002	339	X			
1934	Red Canyon Rim	1998	853	X			
1939	Auer Ranch	2004	427	X			
2001	Green Mountain Common	1999	466,474		X		

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
2002	Harris Slough Pasture	2001	94	X			
2103	Lime Kiln Gulch	2012	1,159	X			
2104	Little Warm Sp. Cnyn	2012	315	X			
2106	Fire Ridge	2012	148	X			
2107	Wells 11	2012	305	X			
2108	Geyser Creek	2012	829	X			
2109	Cross 14	2012	643	X			
2110	Little Horse Creek	2012	720	X			
2111	E A Mountain 16	2012	1,761	X			
2113	Crooked Creek	2012	1,247	X			
2115	Hat Butte	2012	893	X			
2116	Elk Ridge Southeast	2012	316	X			
2117	Blue Holes	2012	682	X			
2119	White Pass 31	2012	650	X			
2120	Windy Ridge	2012	332	X			
2121	Mason Draw	2012	6,813	X			
2122	Tappan Creek 34	2012	1,065	X			
2123	Battrum Mountain	2012	5,936	X			
2125	Albright 47	2012	286	X			
2126	CM 49	2012	940	X			
2127	Wagon Gulch	2012	80	X			
2128	Bitterroot 60	2012	691	X			
2130	Cross 67	2012	591	X			
2132	Stoney Point 73	2012	121	X			
2210	Willow Creek	2009	982			X	
2219	Orchard Draw	1998	1361	X			
2520	Woods Basin	2012	173	X			
Number of allotments			107	71	15	18	3
Total Acreage			1,019,044	266,537	673,075	47,661	31,771

Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases.

Table K.4. Allotment Management Plans and Rangeland Management Agreements Developed

Allotment Number	Allotment Name	AMP Implement Date	Public Acres
01330	Battle Axe Lysite	08/23/89	4,298
01361	Copper Mountain (Lander)	03/29/96	270

Allotment Number	Allotment Name	AMP Implement Date	Public Acres
01401	Rim Pasture	05/01/92	19,037
01403	Conant Creek Common	07/15/92	47,078
01406	Poison Creek*	08/06/97	16,815
01407	Muskrat AMP	11/01/68	39,876
01408	Township Pasture*	05/16/94	19,162
01414	Anderson Winter	05/01/92	5,914
01415	Myers Pasture*	06/10/95	923
01512	South Dobie Flat	06/11/92	6,752
01636	Granite Mountain Open*	03/24/93	77,896
01643	Rawlins Draw	05/21/08	6,367
01660	Home, North of Highway	06/11/92	1,353
01701	Flagg AMP	06/01/69	11,361
01703	Big Pasture	07/05/91	74,351
01802	Sand Draw AMP	05/01/66	11,905
01803	Government Draw	11/26/90	77,299
01901	Atlantic City Common	07/31/97	38,765
01903	Silver Creek Common	05/08/97	31,953
01904	Devils Canyon AMP	05/01/69	3,717
01905	Ellis Upper Beaver	05/01/70	2,370
01906	Twin Creek Individual	03/28/93	7,532
01907	Commissary Hill	06/14/94	994
01908	Little Popo Agie AMP	06/01/70	10,760
01911	Red Canyon AMP	06/01/69	4009
01914	Mcgraw Flat Common	05/08/97	11,295
01915	Beaver AMP	06/01/69	10,640
01916	Hall Creek Individual	12/20/89	14,386
01920	Salisbury AMP	11/01/69	5,384
01925	Hall Creek Winter Past	12/20/89	492
01926	McKinney Individual*	04/03/97	800
01934	Red Canyon Rim	06/14/94	853
01939	Auer Ranch	06/01/69	427
102019	Cooper Creek	10/01/87	1,402
02021	Willow Creek Allotment	10/01/87	71
02029	Diamond Hook	10/01/87	207
02219	Orchard Draw	06/09/69	804
11504	Canyon Creek	02/25/99	11,065
11505	South Deer Creek	09/23/88	11,225
11506	Deer Creek AMP	05/01/69	6,447
11507	South Cross L	06/11/92	2,347
11509	Diamond Springs	06/11/92	40,890
11510	North Willow Creek*	05/21/08	3469
11511	North Dobie Flat	06/11/92	11,435
11513	Blackjack Ranch	06/11/92	31,708
11514	Gap Pasture	06/11/92	3,604
11515	Cross L Pastures	06/11/92	1,535
11516	Basin Pasture	02/16/01	16,830
12003	Whiskey Peak	10/01/87	76,083
12005	Home, South Of Highway	06/11/92	2,560
12018	Alma Grieve Pasture	10/01/87	3,249
31519	Beef Gap Pasture	06/11/92	381

Allotment Number	Allotment Name	AMP Implement Date	Public Acres
Total Allotments:	52	Total Acres:	790,346
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2012. *Denotes Rangeland Management Agreement. AMP Allotment Management Plan			

Table K.5. Summary of Range Improvements Lander Field Office, 1986-2009

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total	
Im-prove-ment Fences																										
Antelope drop panels								18.5												0.1						18.6
Electric								5	3		3	9		5	9	34	10	4.75		20.9	9.7					113.38
Exclosures, enclosures			1	2	1	5.5	3.3		1.4	1.4	1	0.5					5.7	2.7	1	1						27.5
Four strand plus	23.1	9.7	2.7		1			1	1	1	0.52	3.13		0.35	2.7	6.8	6.2	2.05		1.4	1	1.25				64.9
Three strand		4	1		17	4.2	9.05	11.2	5.84	6.3		29.2	11.2		4.8	3	5	2.6		9.4	2.5					126.19
Wood Rail													0.1	0.25					0.25	0.1		0.5				1.2
Other			0.1			1.3	0.2	1							1											3.6
Fence Total (Miles)	23.1	13.7	4.8	2	19	11	12.6	36.7	11.2	8.7	4.52	41.8	11.3	5.6	17.5	43.8	26.9	12.1	1.25	32.9	13.2	1.75	0	0		355.4
Land Treat-ments																										
Lake and Wet-land Im-prove-ment					1															3			1			5

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total
Lake and Wet-land Improvement Total																				3			1		4
Land Treatment						5		6.5	50	9	35						100		100						305.5
Land Treatment Total					1	5		6.5	50	9	35						100		100	6			2		314.5
Management Facility																									
Cattle-guard for vehicle use	2	2	1			1	2		1	7			1		11				1						29
Corrals and loading chutes						1																			1
Line Cabins																	1								1
Other																				1					1

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total
Management Facility Total (Each)	2	2	1			2	2		1	7			1		11		1		1	1					32
Vegetation Manipulation																									
Stream Improvement											1														1
Chemical																				313			2,300		2,613
Cutting or Beating																					4,000	1,220			5,220
Prescribed Fire	910	160	250	100			1,228		12			56													2,716
Vegetation Manipulation Total (Acres)	910	160	250	100			1,228		12		1	56								313	4,000	1,220	2,300		10,550
Water Control/Development																									

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total
Pipe-lines (miles)	1	5		4	9		9.2	3	5		1	7.26	10	5	38	1		2		7.5		0	1	1	109.96
Check Dams, earthen (each)				2																					2
Reservoirs (each)	6	5	2	2	6	1	4	2	6	5	3		3	1		2	5								53
Retention Dams: retains water/silt; primary object (each)							1		1		1														3
Sheet piling drop structure (each)													1				1								2
Springs (each)		2	3		1		1	1	4	7	5	2	1	1	3	2	2	2					1		38
Supplemental Water Storage (each)												1	1												2
Wells (each)	6		4	4	8	3	3		1	3	2	7	2	5	12	2	5	3	3	1	1		1		76

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total
Water Control/Development Total	12	7	9	8	15	4	9	3	12	15	11	10	8	7	15	6	13	5	3	1	1		2	0	176
Weed Control (acres)	0	246	240	297	60	207	183	156	69	18	56	216	408	561	882	735	620	800	770	948	700	996	0	1,650	10,818

Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.

Table K.6. Animal Unit Months Authorized, 1989-2008

Year	AUMs Billed	Percent Actual Use
1989	230,351	82
1990	217,122	78
1991	211,366	76
1992	217,322	78
1993	227,202	81
1994	218,276	78
1995	223,874	80
1996	247,568	89
1997	221,688	79
1998	228,616	82
1999	245,140	88
2000	246,760	88
2001	220,107	77
2002	152,198	54
2003	143,590	51
2004	177,260	63
2005	191,272	68
2006	160,237	57
2007	143,026	51
2008	165,907	59
2009	193,800	69
2010	187,698	67
2011	200,161	72
Average Total:	203,067	73
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.		
AUM Animal Unit Month		

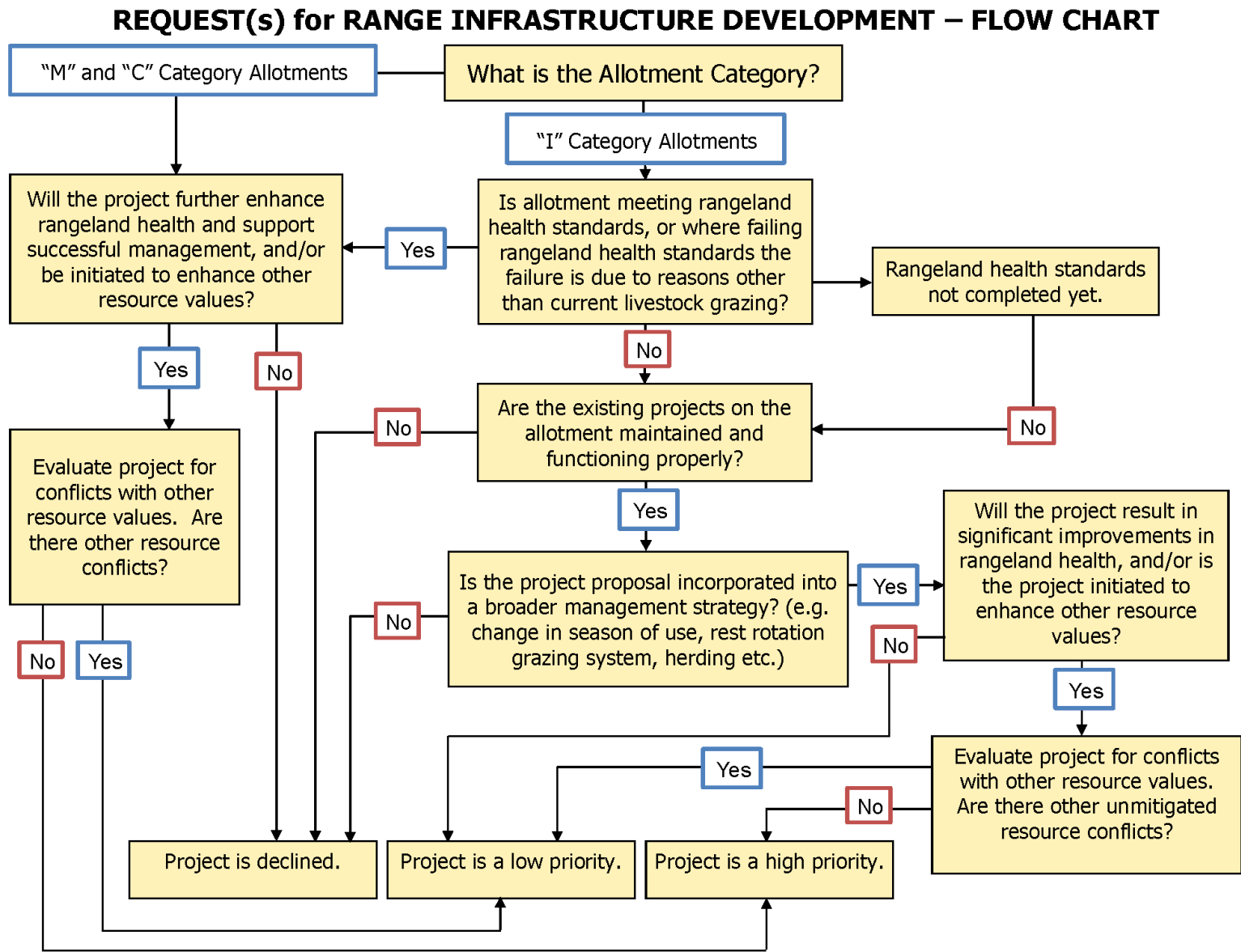


Figure K.1. Range Infrastructure Development

Appendix L. Economic Impact Analysis Methodology

L.1. Introduction

This appendix describes the methods and data that underlie the economic impact modeling analysis. Input-output models such as the Impact Analysis for Planning (IMPLAN) model, an economic impact analysis model, provide a quantitative representation of the production relationships between individual economic sectors. Thus, the economic modeling analysis uses information about physical production quantities and the prices and costs for goods and services. The inputs required to run the IMPLAN model are described in the following narrative and tables. The resulting estimates from the IMPLAN model, by alternative, can be found in the Economic Conditions section in Chapter 4. The first section of this appendix describes general aspects of the IMPLAN model and how it was used to estimate economic impacts. The remaining sections provide additional detailed data used in the analysis for oil and gas, livestock grazing, and recreation.

L.2. The IMPLAN Model

IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the ripple effect (also called the "multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly impacted) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

This analysis used IMPLAN 2007; prior to running the model, cost and price data were converted to a consistent dollar year (2007) using regional and sector-specific adjustment factors from the IMPLAN model. The values in this appendix are expressed in year 2007 dollars so that the earnings and employment estimates can be easily compared to the latest (i.e., 2007) earnings and employment data available from the Bureau of Economic Analysis.

The current IMPLAN model has 440 economic sectors, of which 221 are represented in the five planning area counties. This analysis involved direct changes in economic activity for 33 IMPLAN economic sectors, as well as changes in all other related sectors due to the ripple effect. The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the study area. As a result, the calibrated model does a better job of generating multipliers and the subsequent impacts that reflect the interaction between and among the sectors in the study area compared to a model using unadjusted national coefficients. For instance, worker productivity in oil and gas production is higher in Wyoming than the national average. Key variables used in the IMPLAN model were filled in using data specific to Wyoming, including employment estimates, labor earnings, and total industry output. The IMPLAN model is run at a regional (multi-county) scale, with the coefficients that describe linkages between sectors aggregated to the five-county level. Because of this mathematical aggregation, it is not possible to identify total economic impacts for an individual community.

L.3. Oil and Gas

The economic impacts analysis for oil and gas reflects drilling, completion, and production activities. The number of wells drilled and completed is based on the Reasonable Foreseeable Development scenario (BLM 2009c) and the constraints applied under each alternative. Total well numbers for each alternative are presented in Table L.1, “Oil and Gas Well Numbers” (p. 1584). Table L.2, “Projected Oil and Gas Production (Federal Surface)” (p. 1585) presents the quantity of oil and gas produced on federal surface, and Table L.3, “Projected Oil and Gas Production (Federal, State, and Fee Surface)” (p. 1586) presents the projected quantity of oil and gas produced from federal, state, and private (fee) surface.

Table L.1. Oil and Gas Well Numbers

Item	Non-Coalbed Exploratory	Non-Coalbed Development	Coalbed Natural Gas	Deep	Total
Federal Surface					
Alternative A – Wells Drilled	237	1,511	480	46	2,274
Alternative A – Wells Completed	142	1,209	432	37	1,820
Alternative B – Wells Drilled	189	1,209	93	37	1,528
Alternative B – Wells Completed	113	967	84	30	1,194
Alternative C – Wells Drilled	237	1,516	484	47	2,284
Alternative C – Wells Completed	142	1,213	436	38	1,828
Alternative D – Wells Drilled	227	1,447	406	45	2,125
Alternative D – Wells Completed	136	1,158	365	36	1,695
Federal, State, and Fee Surface					
Alternative A – Wells Drilled	331	2,107	823	73	3,334
Alternative A – Wells Completed	199	1,686	741	58	2,683
Alternative B – Wells Drilled	283	1,806	436	63	2,588
Alternative B – Wells Completed	170	1,445	392	50	2,057
Alternative C – Wells Drilled	331	2,112	827	74	3,344
Alternative C – Wells Completed	199	1,690	744	59	2,692
Alternative D – Wells Drilled	321	2,044	749	71	3,185
Alternative D – Wells Completed	193	1,635	674	57	2,559
Source: BLM 2009c					

Table L.2. Projected Oil and Gas Production (Federal Surface)

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2008	131.9	2.2	99.4	1.7	132.5	2.2	123.0	2.1
2009	147.7	2.2	111.4	1.7	148.3	2.2	137.8	2.1
2010	153.4	2.3	115.7	1.7	154.1	2.3	143.2	2.1
2011	154.5	2.3	116.5	1.7	155.2	2.3	144.1	2.1
2012	165.2	2.3	124.6	1.7	165.9	2.3	154.1	2.2
2013	180.7	2.3	136.3	1.8	181.5	2.3	168.6	2.2
2014	183.6	2.5	138.4	1.9	184.4	2.5	171.3	2.4
2015	195.9	2.4	147.7	1.8	196.7	2.4	182.8	2.2
2016	218.2	2.5	164.5	1.9	219.1	2.5	203.5	2.3
2017	213.0	2.4	160.6	1.8	214.0	2.4	198.8	2.2
2018	220.7	2.2	166.4	1.6	221.7	2.2	205.9	2.0
2019	244.0	2.4	184.0	1.8	245.1	2.5	227.6	2.3
2020	255.3	2.5	192.5	1.9	256.4	2.6	238.2	2.4
2021	270.5	2.7	204.0	2.0	271.8	2.7	252.4	2.5
2022	274.7	2.6	207.2	1.9	275.9	2.6	256.3	2.4
2023	280.8	2.8	211.8	2.1	282.1	2.8	262.0	2.6
2024	299.7	2.7	226.0	2.0	301.0	2.7	279.6	2.5
2025	305.8	2.7	230.6	2.1	307.2	2.7	285.4	2.5
2026	317.0	2.7	239.1	2.1	318.4	2.8	295.8	2.6
2027	318.4	2.9	240.1	2.2	319.9	2.9	297.1	2.7
Source: BLM 2009c. Estimated from production on federal, state, and fee surface, multiplied by the percentage of federal wells.								
BCF billion cubic feet								
MMBO million barrels of oil								

Table L.3. Projected Oil and Gas Production (Federal, State, and Fee Surface)

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2008	194.4	3.3	162.6	2.7	195.0	3.3	185.7	3.1
2009	217.7	3.3	182.1	2.8	218.4	3.3	208.0	3.1
2010	226.3	3.3	189.2	2.8	226.9	3.4	216.1	3.2
2011	227.8	3.4	190.5	2.8	228.4	3.4	217.6	3.2
2012	243.6	3.4	203.7	2.8	244.3	3.4	232.7	3.2
2013	266.4	3.4	222.8	2.9	267.2	3.4	254.5	3.3
2014	270.7	3.7	226.3	3.1	271.5	3.7	258.6	3.6
2015	288.8	3.5	241.5	2.9	289.7	3.5	275.9	3.4
2016	321.7	3.6	269.0	3.0	322.6	3.7	307.3	3.5
2017	314.1	3.5	262.7	2.9	315.0	3.5	300.1	3.3
2018	325.4	3.2	272.1	2.7	326.4	3.2	310.9	3.1
2019	359.7	3.6	300.8	3.0	360.8	3.6	343.7	3.4
2020	376.4	3.8	314.7	3.1	377.5	3.8	359.6	3.6
2021	398.9	3.9	333.6	3.3	400.1	3.9	381.1	3.7
2022	405.0	3.8	338.7	3.2	406.3	3.8	386.9	3.6
2023	414.0	4.1	346.2	3.4	415.3	4.1	395.5	3.9
2024	441.9	3.9	369.5	3.3	443.2	3.9	422.1	3.8
2025	451.0	4.0	377.1	3.4	452.3	4.0	430.8	3.8
2026	467.4	4.0	390.9	3.4	468.9	4.1	446.6	3.9
2027	469.5	4.3	392.6	3.6	470.9	4.3	448.5	4.1

Source: BLM 2009c

BCF billion cubic feet

MMBO million barrels of oil

The costs of drilling and completing wells and producing oil and gas are also relevant for the economic impact analysis, because a portion of these costs represents spending on local services and locally produced products. Table L.4, “Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type” (p. 1587) provides a summary of the costs of drilling, completion, and production for each well type (non-coalbed development, non-coalbed exploratory, coalbed natural gas, and deep) used for the economic analysis.

Table L.4. Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type

Assumption	Well Type			
	Non-Coalbed Exploratory	Non-Coalbed Development	Coalbed Natural Gas	Deep
Well Drilling Impacts				
Drilling Cost (\$/well)	\$1,292,076	\$1,174,615	\$434,648	\$5,603,020
Local Drilling Costs ¹	75%	75%	75%	75%
Local Direct Impact (\$/well)	\$969,057	\$880,961	\$325,986	\$4,202,265
Local Total Impact (\$/well) ²	\$1,350,770	\$1,227,973	\$445,006	\$5,825,255
Multiplier (total impact/direct impact)	1.39	1.39	1.37	1.39
Well Completion Impacts				
Completion Cost (\$/well)	\$1,396,749	\$1,269,772	\$892,071	\$2,580,899
Local Completion Costs ¹	75%	75%	75%	75%
Local Direct Impact (\$/well)	\$1,047,562	\$952,329	\$669,053	\$1,935,674
Local Total Impact (\$/well) ²	\$1,470,533	\$1,336,848	\$836,215	\$2,530,834
Multiplier (total impact/direct impact)	1.40	1.40	1.25	1.31
Source: BLM 2010i. Data are based on Authorizations For Expenditure provided by exploration and development companies, converted from 2009 to 2007 dollars using adjustment factors (that differ by economic sector) from the IMPLAN 2007 model. ¹ The local cost shares were based on the percent of total drilling or completion costs that would be spent on goods and services purchased from the local economy. Most services come from Rock Springs, Riverton, Rawlins and Casper. All of these communities are located within the planning area identified counties. However, a portion of the value comes from outside the planning area, even for supplies purchased locally, because the raw material and embedded labor comes from outside the planning area. ² Total impacts estimated using IMPLAN include direct, indirect, and induced impacts.				
IMPLAN Impact Analysis for Planning				

Table L.5, “Assumptions for Analysis of Economical Impacts on Output for Oil and Gas Production” (p. 1588) provides the assumptions used to determine the economic impact associated with the production of oil and gas. For the analysis, Bureau of Land Management (BLM) estimated a production cost (for gas) of \$1.43 per thousand cubic feet (mcf), in year 2007 dollars, based on data from the Energy Information Administration (Taylor 2010).

Table L.5. Assumptions for Analysis of Economical Impacts on Output for Oil and Gas Production

Economic Impact	Oil Production (per million barrels)	Gas Production (per billion cubic feet)
Direct Economic Impact ¹	\$63,300,000 ²	\$4,010,000 ³
Indirect Economic Impact ⁴	\$9,942,658	\$629,859
Induced Economic Impact ⁵	\$2,678,476	\$169,679
Total Economic Impact	\$75,921,134	\$4,809,538
Multiplier (total impact/direct impact)	1.20	1.20
Note: All dollar values are in 2007 dollars. ¹ Direct economic impact is the market value of output. ² Based on an oil price of \$63.30 per barrel, which is an average of the prices for 2009-2014 projected by the Wyoming Consensus Revenue Estimating Group (CREG 2009b) and adjusted to 2007 dollars. ³ Based on a gas price of \$4.01 per mcf, which is an average of the prices for 2009-2014 projected by the Wyoming Consensus Revenue Estimating Group (CREG 2009b) and adjusted to 2007 dollars. ⁴ Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide supplies to the oil and gas industry. ⁵ Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors. mcf thousand cubic feet IMPLAN Impact Analysis for Planning		

The forecasted number of wells and production used for estimating employment impacts is the same as for estimating impacts on labor earnings and output. Table L.6, “Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type” (p. 1588) shows the direct and total employment impacts attributable to drilling and completion.

Table L.6. Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type

Employment Impact	Well Type			
	Non-Coalbed Exploratory	Non-Coalbed Development	Coalbed Natural Gas	Deep
Well Drilling Impacts				
Direct Employment (jobs/well)	4.40	4.00	1.50	19.80
Total Employment Impact (jobs/well)	7.59	6.90	2.50	32.80
Multiplier (Total Impact/Direct Impact)	1.73	1.73	1.67	1.66
Average Earnings per Job (2007 dollars)	\$57,776	\$57,776	\$56,203	\$59,044
Well Completion Impacts				
Direct Employment (jobs/well)	5.28	4.80	2.10	7.50
Total Employment Impact (jobs/well)	8.80	8.00	3.50	12.50
Multiplier (Total Impact/Direct Impact)	1.67	1.67	1.67	1.67
Average Earnings per Job (2007 dollars)	\$58,859	\$58,859	\$58,835	\$59,315
Note: Direct and total employment impact and average earnings per job are calculated using IMPLAN. IMPLAN Impact Analysis for Planning				

Table L.7, “Assumptions for Employment Impacts Analysis for Oil and Gas Production” (p. 1589) shows the direct and total employment impacts associated with production.

Table L.7. Assumptions for Employment Impacts Analysis for Oil and Gas Production

Employment Impact (annual number of jobs)	Oil Production (per million barrels)	Gas Production (per billion cubic feet)
Direct Employment	31.7	2.0
Indirect Employment	57.0	3.6
Induced Employment	25.3	1.6
Total Employment	113.9	7.2
Multiplier (Total Impact/Direct Impact)	3.60	3.60
Average Earnings per Job (2007 dollars)	\$55,267	\$55,267
Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using IMPLAN.		
IMPLAN Impact Analysis for Planning		

The analysis of potential changes in tax revenues is based on tax rates of 12.5 percent of taxable value for federal mineral royalties, 6 percent of taxable value for state severance taxes (Wyoming DOR 2001c), and 7.1 percent of taxable value for local ad valorem production taxes. The average estimated local tax rate is based on average tax rates for the planning area counties: Carbon (6.5 percent), Fremont (7.2 percent), Hot Springs (7.1 percent), Natrona (6.6 percent), and Sweetwater (6.6 percent) (Wyoming DOR 2008). Taxable value refers to value of sales minus allowable deductions, including certain costs of production and transportation. For purposes of estimating tax revenues, taxable value was estimated based on the average taxable value per unit sold from the counties in the planning area for production year 2007 using data from Wyoming Department of Revenue (Wyoming DOR 2008). Taxable value was estimated as \$58.08 per barrel for oil, and \$4.15 per mcf for natural gas (2007 dollars).

L.4. Livestock Grazing

Economic impacts due to changes in livestock grazing are a function of the amount of forage available and the economic value of the forage. For livestock grazing, long-term surface-disturbing actions from actions listed in Appendix T (p. 1641) could affect the authorized animal unit months (AUMs). In addition, land disposal actions could have economic impacts; however, those impacts were not analyzed quantitatively because it is difficult to predict the net change in AUMs. Subsequent landowners may continue to graze the land, leaving overall livestock production and output in the region unaffected.

The economic analysis of livestock grazing impacts is based on a long-term average (from 1989 to 2008) of actual use as a proportion of permitted use. Based on data from the BLM (BLM 2009a), actual use ranged from 51 percent to 89 percent of active use between 1989 and 2008, with an average value of 73 percent. Whereas permitted AUMs include suspended non-use AUMs, actual use represents the AUMs physically used on the ground in a given year. Actual use therefore accounts for the forage value of the land in a given year, based on climatic conditions (e.g., drought), as well as taking into account the needs of the land and the ranch operators as evidenced by how much of their full authorized amount they utilize.

Whereas reductions in land available for livestock grazing (via long-term surface disturbance or grazing withdrawal) are based on permitted AUMs, financial conditions on a given ranch

operation are determined by actual use (i.e., the actual forage value of the land that is used for livestock) and authorized use (e.g., bank loans that are based on the available forage value of federal leases held by the ranch operator). Thus, actual use is a more appropriate baseline from which to measure reductions in available AUMs due to surface disturbance or restrictions on grazing land. If reductions were measured from a baseline of permitted use, economic impacts would be overstated.

Historical analysis of data from the Lander Field Office shows that actual use in the planning area averaged 73 percent of permitted use from 1989 to 2008 (BLM 2009a). Thus, the economic analysis of livestock grazing impacts uses a baseline of 204,993 AUMs, which represents 73 percent of the permitted use of 280,813 AUMs. Reductions in AUMs due to long-term surface disturbance and grazing restrictions are also adjusted for the ratio of actual to permitted use. The 73 percent ratio is used to estimate AUMs and economic impacts for alternatives A, C, and D. For Alternative B, there would be a substantial reduction in permitted AUMs, occurring gradually over time as BLM adjusts permitted AUMs to comply with rangeland health standards. BLM believes that as these adjustments come into effect, operators would increase their actual use relative to permitted use. Therefore, in Alternative B the actual-to-permitted ratio would be somewhat higher, moving gradually from 73 percent in the first year of analysis to 95 percent in the final year of analysis.

Table L.8, “Estimated AUMs by Alternative” (p. 1591) provides a summary of initial AUMs and total AUMs for each alternative. Based on current allocations of AUMs to cattle, sheep, and other species, 91.6 percent of the AUM reduction, for the purpose of estimating changes in output and employment, is allocated to cattle and the remainder is allocated to sheep. (Approximately one percent of AUMs are allocated to horses, and a handful are allocated to goats; the value of these AUMs is assumed to be approximately equivalent to those for cattle and sheep.) BLM presently authorizes 280,813 AUMs for grazing (BLM 2009a).

Under Alternative A, BLM assumes that the present authorization will be affected only by long-term surface disturbance (i.e., due to other surface uses). Under Alternative B, the assumption is that no new range improvements will be constructed and that grazing management will meet Wyoming Standards for Healthy Rangelands. Allotments that are currently meeting standards will not be adjusted. These assumptions result in a decrease in BLM-authorized AUMs in Alternative B. For example, areas of an allotment greater than two miles from a watering facility would not be included in BLM-authorized AUMs under Alternative B, and the BLM would not build new watering facilities to provide water within two miles of these areas. As a result, areas far from an existing watering facility would not count toward BLM-authorized AUMs in Alternative B. Under Alternative C, the BLM would construct range improvements so as to facilitate the maximum number of AUMs to be available for livestock grazing. These assumptions result in somewhat lower AUMs than Alternative A, but more AUMs than in Alternative B (BLM 2010j, BLM 2011b). Under Alternative D, the BLM would construct range improvements in a fashion similar to that used for Alternative C and would also close some areas to grazing; nonetheless, surface disturbance under Alternative D would be less than that under Alternative C, so that Alternative D would result in a greater number of AUMs available in 2027. For all alternatives, reductions in AUMs over the 20-year planning horizon were modeled in IMPLAN, based on a gradual reduction over the planning timeline, rather than all at once.

Table L.8. Estimated AUMs by Alternative

Item	Alternative A	Alternative B	Alternative C	Alternative D
Permitted AUMs				
Initial AUMs	280,813	280,813	280,813	280,813
AUMs adjusted to meet rangeland health standards	0	149,364	23,432	49,696
AUMs lost due to grazing closures	0	1,873	0	1,043
AUMs lost from long-term surface-disturbing activities	1,414	853	6,890	1,301
Total AUMs lost (over 20 years)	1,414	152,054	30,322	51,808
AUMs lost per year, total	71	7,603	1,516	2,590
Net AUMs in 2027	279,399	128,759	250,491	229,005
Actual AUMs				
Estimated Percentage of Permitted AUMs	73%	73 to 95% ¹	73%	73%
Estimated Actual Use (2008)	204,993	204,993	204,993	204,993
Estimated Actual Use (2027)	203,962	122,321	182,858	167,173
Source: BLM 2010j, BLM 2011b ¹ In Alternative B, the BLM estimates that actual use relative to permitted AUMs will increase from 73 percent to 95 percent gradually over time. Note: Acres (e.g., land affected by surface disturbance) were converted to AUMs based on total acres authorized for grazing and AUMs authorized for grazing. AUM Animal Unit Month BLM Bureau of Land Management				

Due to price fluctuations, average per-AUM values for cattle and sheep are based on the 1998 to 2007 average value of production estimates from the Wyoming Agricultural Statistics Service (Taylor 2010). The value for cattle is \$44.81 per AUM and the value for sheep is \$43.38 per AUM (in 2007 dollars). Including indirect and induced impacts, the value of one AUM for cattle is \$92.58 and for sheep \$101.58. Table L.9, "Assumptions for Analysis of Impacts on Output for Livestock Grazing" (p. 1592) shows the economic impact assumptions for cattle and sheep. The direct economic impact is the estimated change in livestock output per AUM; IMPLAN generates the indirect and induced impacts.

Table L.9. Assumptions for Analysis of Impacts on Output for Livestock Grazing

Economic Impact	Cattle	Sheep
Direct Economic Impact (\$/AUM)	\$44.81	\$43.38
Indirect Economic Impact (\$/AUM) ¹	\$35.98	\$42.94
Induced Economic Impact (\$/AUM) ²	\$11.76	\$15.61
Total Economic Impact (\$/AUM)	\$92.55	\$101.92
Multiplier (Total Impact/Direct Impact)	2.07	2.35
Note: All dollar values are in 2007 dollars. ¹ Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the livestock industry. ² Induced impacts reflect increased demand in the consumer and government sectors. AUM Animal Unit Month		

Table L.10, “Assumptions for Analysis of Employment Impacts for Livestock Grazing” (p. 1592) provides a summary of the employment impacts according to unit changes in livestock AUMs.

Table L.10. Assumptions for Analysis of Employment Impacts for Livestock Grazing

Employment Impact	Cattle	Sheep
Direct Employment (Jobs/1,000 AUMs)	0.466	0.980
Indirect Employment (Jobs/1,000 AUMs)	0.215	0.529
Induced Employment (Jobs/1,000 AUMs)	0.125	0.174
Total Employment (Jobs/1,000 AUMs)	0.806	1.683
Multiplier (Total Impact/Direct Impact)	1.73	1.72
Average Earnings per Job (2007 dollars)	\$33,469	\$17,374
Note: Direct, indirect, and induced employment impacts and average earnings per job are calculated using IMPLAN. AUM Animal Unit Month IMPLAN Impact Analysis for Planning		

L.5. Recreation

The analysis of economic impacts considers only recreation expenditures of nonresidents of the study area. This is based on the assumption that expenditures of residents would occur in the region regardless of the BLM’s actions that impact recreational opportunities; however, changes in nonresident recreation patterns would alter the amount of money entering the local region.

Economic impacts from recreation are a function of recreation visitor days (RVDs) and expenditures per day. Future RVDs were estimated based on current RVDs, recent growth rates, and projected trends. Estimates of future RVDs were based on the professional judgment of BLM staff (BLM 2010k), as well as a United States (U.S.) Forest Service (USFS) study that provides forecasts of recreation activity for the Rocky Mountain region (Bowker et al. 1999). Table L.11, “Estimated Nonresident Recreation Visitor Days” (p. 1593) provides a summary of estimated annual RVDs.

Table L.11. Estimated Nonresident Recreation Visitor Days

Activity	Item	Alternative A	Alternative B	Alternative C	Alternative D
OHV	2008 RVDs	1,283	1,283	1,283	1,283
	2013 RVDs	1,571	1,717	1,487	1,637
	2018 RVDs	1,923	2,298	1,724	2,090
	2023 RVDs	2,354	3,075	1,999	2,667
	2027 RVDs	2,767	3,882	2,250	3,242
	Average Annual Growth Rate	4.1%	6.0%	3.0%	5.0%
Hunting	2008 RVDs	7,900	7,900	7,900	7,900
	2013 RVDs	10,627	11,608	10,627	10,083
	2018 RVDs	14,295	17,056	14,295	12,868
	2023 RVDs	19,230	25,060	19,230	16,424
	2027 RVDs	24,378	34,094	24,378	19,963
	Average Annual Growth Rate	6.1%	8.0%	6.1%	5.0%
Fishing	2008 RVDs	600	600	600	600
	2013 RVDs	774	730	803	842
	2018 RVDs	997	888	1,075	1,180
	2023 RVDs	1,286	1,081	1,438	1,655
	2027 RVDs	1,576	1,264	1,815	2,170
	Average Annual Growth Rate	5.2%	4.0%	6.0%	7.0%
Other Dispersed Recreation	2008 RVDs	66,185	66,185	66,185	66,185
	2013 RVDs	88,871	101,834	84,471	97,247
	2018 RVDs	119,333	156,684	107,808	142,888
	2023 RVDs	160,235	241,078	137,594	209,950
	2027 RVDs	202,842	340,301	167,246	285,635
	Average Annual Growth Rate	6.1%	9.0%	5.0%	8.0%
Source: BLM 2010k					
OHV Off-highway vehicle					
RVD recreation visitor days					

The estimates for average expenditure per visitor day, in 2007 dollars, are \$85.72 for fishing (WGFD 2008, USFWS 2008b); \$130.34 for hunting (Responsive Management 2004); \$52.18 for off-highway vehicle (OHV) use (Foulke et al. 2006), and \$57.71 for other dispersed recreation (Stynes and White 2003). Table L.12, “Assumptions for Analysis of Impacts on Output for Recreation Activities” (p. 1594) shows the direct, indirect, and induced output per RVD for each recreation activity, in 2007 dollars.

Table L.12. Assumptions for Analysis of Impacts on Output for Recreation Activities

Economic Impact	OHV (per RVD)	Hunting (per RVD)	Fishing (per RVD)	Other Dispersed (per RVD)
Direct Economic Impact ¹	\$52.18	\$130.34	\$85.72	\$57.71
Indirect Economic Impact ²	\$7.40	\$31.60	\$11.70	\$8.63
Induced Economic Impact ³	\$6.11	\$22.72	\$11.19	\$7.26
Total Economic Impact	\$65.69	\$184.67	\$108.61	\$73.60
Multiplier (total impact/direct impact)	1.26	1.42	1.27	1.28

Sources: WGFD 2008, USFWS 2008b, Responsive Management 2004, Foulke et al. 2006, Stynes and White 2003, Taylor 2010.
Note: Detail may not add to total due to rounding.
¹Direct economic impact is the average expenditure per visitor day.
²Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide support for the recreation industry.
³Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors.

IMPLAN Impact Analysis for Planning
OHV Off-highway vehicle
RVD recreation visitor day

Table L.13, “Assumptions for Employment Impacts Analysis for Recreation Activities” (p. 1594) provides a summary of employment impacts assumed according to unit changes in RVDs.

Table L.13. Assumptions for Employment Impacts Analysis for Recreation Activities

Employment Impact (annual number of jobs)	OHV (per 1,000 RVDs)	Hunting (per 1,000 RVDs)	Fishing (per 1,000 RVDs)	Other Dispersed (per 1,000 RVDs)
Direct Employment	0.58	1.89	1.02	0.64
Indirect Employment	0.06	0.26	0.09	0.07
Induced Employment	0.06	0.22	0.10	0.07
Total Employment	0.70	2.37	1.22	0.78
Multiplier (Total Impact/Direct Impact)	1.21	1.26	1.19	1.22
Average Earnings per Job (2007 dollars)	\$20,486	\$22,399	\$21,547	\$21,858

Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using IMPLAN.

IMPLAN Impact Analysis for Planning
OHV Off-highway vehicle
RVD recreation visitor day

Appendix M. Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities

Wyoming Mitigation Guidelines are a compilation of practices employed by the Bureau of Land Management (BLM) to mitigate impacts from surface disturbance. They apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities. The guidelines are designed to protect resources such as soils and vegetation, wildlife habitat, and cultural or historic properties. The guidelines are presented as an appendix of the Resource Management Plan (RMP) and Environmental Impact Statement (EIS) for easy reference as they apply to many resources and derive from many laws. All BLM RMPs have included these guidelines as appendices. Public comment on the guidelines, per se, has not been requested. The guidelines are not land use decisions; rather they are examples of mitigation measures that could be applied, as appropriate, based on site-specific National Environmental Policy Act (NEPA) analysis for individual proposals. Comment on the use and application of specific mitigation measures can be made during the NEPA process for individual proposals. Because mitigation measures change or are modified, based on new information, the guidelines are updated periodically for all field offices in Wyoming.

These guidelines are primarily for the purpose of attaining statewide consistency in how requirements are determined for avoiding and mitigating environmental impacts and resource and land use conflicts. Consistency in this sense does not mean that identical requirements would be applied for all similar types of land use activities that may cause similar types of impacts. Nor does it mean that the requirements or guidelines for a single land use activity would be identical in all areas.

There are two ways the mitigation guidelines are used in the RMP and EIS process: (1) as part of the planning criteria in developing the RMP alternatives; and (2) in the analytical processes of both developing the alternatives and analyzing the impacts of the alternatives. In the first case, an assumption is made that any one or more of the mitigations will be appropriately included as conditions of relevant actions being proposed or considered in each alternative. In the second case, the mitigations are used (1) to develop a baseline for measuring and comparing impacts among the alternatives; (2) to identify other actions and alternatives that should be considered; and (3) to help determine whether more stringent or less stringent mitigations should be considered.

The EIS for the RMP does not decide or dictate the exact wording or inclusion of these guidelines. Rather, the guidelines are used in the RMP and EIS process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. These guidelines will be used in the same manner in analyzing activity plans and other site-specific proposals. These guidelines and their wording are matters of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP and EIS process. Any further changes that may be made in the continuing refinement of these guidelines and any development of program-specific standard stipulations will be handled in another forum, including appropriate public involvement and input.

PURPOSE

The purposes of the “Wyoming BLM Mitigation Guidelines” are (1) to reserve, for the BLM, the right to modify the operations of all surface and other human presence disturbance activities as part of the statutory requirements for environmental protection; and (2) to inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands. These guidelines have been written in a format that will allow for (1) their direct use as stipulations, and (2) the addition of specific or specialized mitigation following the submission of a detailed plan of development or other project proposal and an environmental analysis.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the mitigation guidelines as stipulations or as conditions of approval, or as a baseline for developing specific stipulations for a given activity or program.

Because use of the mitigation guidelines was integrated into the RMP and EIS process and will be integrated into the site-specific environmental analysis process, the application of stipulations or mitigation requirements derived through the guidelines will provide more consistency with planning decisions and plan implementation than has occurred in the past. Application of the mitigation guidelines to all surface and other human presence disturbance activities concerning BLM-administered public lands and resources will provide more uniformity in mitigation than has occurred in the past.

MITIGATION GUIDELINES

Surface Disturbance Mitigation Guideline

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- Slopes in excess of 25 percent
- Within important scenic areas (Visual Resource Management Class I and II areas)
- Within 500 feet of surface water and/or riparian-wetland areas
- Within either ¼ mile or the visual horizon (whichever is closer) of historic trails
- Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur

Guidance

The intent of the surface disturbance mitigation guideline is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five conditions exist, surface-disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, specific geographical areas and seasons must be delineated at the field level. Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of the proposal (e.g., activity plan, plan of development, Plan of

Operation, and Application for Permit to Drill [APD]) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

Wildlife Mitigation Guideline

- A. To protect important big game winter habitat, activities or surface use will not be allowed from November 15 to April 30 within certain areas encompassed by the authorization. The same criteria apply to defined big game birthing areas from May 1 to June 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- B. To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, activities or surface use will not be allowed from February 1 to July 31 within certain areas encompassed by the authorization. The same criteria apply to defined raptor and game bird winter concentration areas from November 15 to April 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- C. No activities or surface use will be allowed on that portion of the authorization area identified within (legal description) for the purpose of protecting (e.g., sage/sharp-tailed grouse breeding grounds, and/or other species/activities) habitat.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- D. Portions of the authorized use area legally described as (legal description), are known or suspected to be essential habitat for (name) which is a threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines to verify the presence or absence of this species. In the event that (name) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications).

Guidance

The Wildlife Mitigation Guideline is intended to provide two basic types of protection: seasonal restriction and prohibition of activities or surface use (2c). Item 2d is specific to situations involving threatened or endangered species. Legal descriptions will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to the time of processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

The seasonal restriction section identifies three example groups of species and delineates three similar timeframe restrictions. The big game species including elk, moose, deer, pronghorn, and bighorn sheep, all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance from May 1 to June 30, when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons (peregrine, prairie, and merlin), buteos (ferruginous and Swainson's hawks), osprey, and burrowing owls. The raptors and sage and sharp-tailed grouse require nesting protection between February 1 and July 31. The same birds often require protection from disturbance from November 15 through April 30 while they occupy winter concentration areas.

Item 2c, the prohibition of activity or surface use, is intended for protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., sage-grouse strutting grounds, known threatened and endangered species habitat).

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of the proposal (e.g., activity plan, plan of development, Plan of Operation, APD) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

Cultural Resource Mitigation Guideline

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places (NRHP), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 Code of Federal Regulations (CFR) 800 will be used in consultation with the Wyoming State Historic Preservation Officer and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

Guidance

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manuals, the cultural resource permit stipulations, and in other policy issued by the BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the NRHP are located within these areas of potential impact and cannot be avoided, the Authorized Officer shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM Authorized Officer. Such plans are usually prepared by the land use applicant according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for NRHP eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of

damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM approved or BLM formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in the Federal Land Policy and Management Act, Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

Special Resource Mitigation Guideline

To protect (resource value), activities or surface use will not be allowed (i.e., within a specific distance of the resource value or between date to date) in (legal description).

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

Example Resource Categories (Select or identify category and specific resource value):

- a. Recreation areas
- b. Special natural history or paleontological features
- c. Special management areas
- d. Sections of major rivers
- e. Prior existing rights-of-way
- f. Occupied dwellings
- g. Other (specify)

Guidance

The *Special Resource Mitigation Guideline* is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, APD) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

No Surface Occupancy Guideline

No Surface Occupancy (NSO) will be allowed on the following described lands (legal description) because of (resource value).

Example Resource Categories (Select or identify category and specific resource value):

- a. Recreation Areas (e.g., campgrounds, historic trails, national monuments)
- b. Major reservoirs/dams
- c. Special management area (e.g., known threatened or endangered species habitat, areas suitable for consideration for wild and scenic rivers designation)
- d. Other (specify)

Guidance

The *No Surface Occupancy Mitigation Guideline* is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to “no development” or “no leasing.” The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (e.g., environmental assessment, EIS, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requirement will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the “no development” or “no leasing” option, a rigorous test must be met and fully documented in the record. This test must be based upon stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that consideration was given to development subject to reasonable mitigation, including “no surface occupancy.” The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A “no development” or “no leasing” decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

Appendix N. Standard Oil and Gas Stipulations

Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

Lease Notice 1

Under Regulation 43 Code of Federal Regulations (CFR) 3101.1 2 and terms of the lease (Bureau of Land Management [BLM] Form 3100 11), the Authorized Officer may require reasonable measures to minimize adverse impacts to other resource values, land uses, and users not addressed in lease stipulations at the time operations are proposed. Such reasonable measures may include, but are not limited to, modification of siting or design of facilities, timing of operations, and specification of interim and final reclamation measures, which may require relocating proposed operations up to 200 meters, but not off the leasehold, and prohibiting surface disturbance activities for up to 60 days.

The lands within this lease may include areas not specifically addressed by lease stipulations that may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, prohibited. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing wells.

1. Slopes in excess of 25 percent
2. Within 500 feet of surface water and/or riparian-wetland areas
3. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur
4. Within 500 feet of Interstate highways and 200 feet of other existing rights of way (i.e., United States [U.S.] and state highways, roads, railroads, pipelines, powerlines)
5. Within ¼ mile of occupied dwellings
6. Material sites

Guidance

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when one or more of the above conditions exist, surface-disturbing activities will be prohibited unless or until the permittee or the designated representative and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Specific threshold criteria (e.g., 500 feet from water) have been established based upon the best information available. However, geographical areas and time periods of concern must be delineated at the field level (i.e., “surface water and/or riparian-wetland areas” may include both intermittent and ephemeral water sources or may be limited to perennial surface water).

The referenced oil and gas leases on these lands are hereby made subject to the stipulation that the exploration or drilling activities will not interfere materially with the use of the area as a materials site/free use permit. At the time operations on the above lands are commenced, notification will be made to the appropriate agency. The name of the appropriate agency may be obtained from the proper BLM Field Office.

Lease Notice 2

Background

The BLM, by including National Historic Trails (NHTs) within its National Landscape Conservation System, has recognized these trails as national treasures. Our responsibility is to review the strategy for management, protection, and preservation of these trails. The NHTs in Wyoming, which include the Oregon, California, Mormon Pioneer, and Pony Express Trails, as well as the Nez Perce Trail, were designated by Congress through the National Trails System Act (Public Law [P.L.] 90-543; 16 United States Code [U.S.C.] 1241-1251) as amended through P.L. 106-509 dated November 13, 2000. Protection of the NHTs is normally considered under the National Historic Preservation Act (NHPA) (P.L. 89-665; 16 U.S.C. 470 et seq.) as amended through 1992 and the National Trails System Act. Additionally, Executive Order 13195, "Trails for America in the 21st Century," signed January 18, 2001, states in Section 1: "Federal agencies will ... protect, connect, promote, and assist trails of all types throughout the U.S. This will be accomplished by ... (b) Protecting the trail corridors associated with national scenic trails and the high priority potential sites and segments of NHTs to the degrees necessary to ensure that the values for which each trail was established remain intact." Therefore, the BLM will be considering all impacts and intrusions to the NHTs, their associated historic landscapes, and all associated features, such as trail traces, grave sites, historic encampments, inscriptions, natural features frequently commented on by emigrants in journals, letters and diaries, or any other feature contributing to the historic significance of the trails. Additional NHTs will likely be designated amending the National Trails System Act. When these amendments occur, this notice will apply to those newly designated NHTs as well.

Strategy

The BLM will proceed in this objective by conducting a viewshed analysis on either side of the designated centerline of the NHTs in Wyoming, except, at this time, for the Nez Perce Trail, for the purpose of identifying and evaluating potential impacts to the trails, their associated historic landscapes, and their associated historic features. Subject to the viewshed analysis and archeological inventory, reasonable mitigation measures may be applied. These may include, but are not limited to, modification of siting or design of facilities to camouflage or otherwise hide the proposed operations within the viewshed. Additionally, specification of interim and final reclamation measures may require relocating the proposed operations within the leasehold. Surface-disturbing activities will be analyzed in accordance with the National Environmental Policy Act of 1969 (P.L. 91-190; 42 U.S.C. 4321-4347) as amended through P.L. 94-52, July 3, 1975 and P.L. 94-83, August 9, 1975, and the NHPA, *supra*, to determine if any design, siting, timing, or reclamation requirements are necessary. This strategy is necessary until the BLM determines that, based on the results of the completed viewshed analysis and archeological inventory, the existing land use plans (Resource Management Plans) have to be amended.

The use of this lease notice is a predecisional action, necessary until final decisions regarding surface-disturbing restrictions are made. Final decisions regarding surface-disturbing restrictions

will take place with full public disclosure and public involvement over the next several years if BLM determines that it is necessary to amend existing land use plans.

Guidance

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when any oil and gas lease contains remnants of NHTs, or is located within the viewshed of an NHT's designated centerline, surface-disturbing activities will require the lessee, permittee, operator or, their designated representative, and the surface management agency to arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Attachment to Each Lease

Notice to Lessee

Provisions of the Mineral Leasing Act (MLA) of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976, affect an entity's qualifications to obtain an oil and gas lease. Section 2(a)(2)(A) of the MLA, 30 U.S.C. 201 (a)(2)(A), requires that any entity that holds and has held a federal coal lease for 10 years beginning on or after August 4, 1976, and who is not producing coal in commercial quantities from each such lease, cannot qualify for the issuance of any other lease granted under the MLA. Compliance by coal lessees with Section 2(a)(2)(A) is explained in 43 CFR 3472.

In accordance with the terms of this oil and gas lease, with respect to compliance by the initial lessee with qualifications concerning federal coal lease holdings, all assignees and transferees are hereby notified that this oil and gas lease is subject to cancellation if: (1) the initial lessee as assignor or as transferor has falsely certified compliance with Section 2(a)(2)(A), or (2) because of a denial or disapproval by a State Office of a pending coal action, i.e., arms-length assignment, relinquishment, or logical mining unit, the initial lessee as assignor or as transferor is no longer in compliance with Section 2(a)(2)(A). The assignee, sublessee or transferee does not qualify as a bona fide purchaser and, thus, has no rights to bona fide purchaser protection in the event of cancellation of this lease due to noncompliance with Section 2(a)(2)(A).

Information regarding assignor, sublessor or transferor compliance with Section 2(a)(2)(A) is contained in the lease case file as well as in other BLM records available through the State Office issuing this lease.

This page intentionally
left blank

Appendix O. Fire Management

Table O.1, “Fire Management by Fire Management Unit” (p. 1606) provides a description of fire management by Fire Management Units within the planning area.

Table O.1. Fire Management by Fire Management Unit

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
Green and Crooks Mountain FMU	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Use prescribed fire treatments to create a vegetative mosaic and maintain natural openings in the mountain shrub habitat within the FMU. Emphasis on the mountain shrub communities (mountain sagebrush, bitterbrush, snowberry, buckbrush and other associated shrubs) and marginal timbered communities, including areas where there is declining health of aspen stands.	Multi-year stated treatments will be utilized to revitalize aspen stands and to improve and maintain forest health in conifer-timbered communities.	Post-fire rehabilitation and restoration of wildfires will be initiated to allow reestablishment of native plant communities and to stabilize erosive soil conditions on a case-by-case basis.	Coordinate fuels reduction plans and actions with private land and homeowners to significantly reduce the likelihood of landscape-level fire within the WUI and thereby enhance public safety.	Initiate prescribed burning in the next 10 years on approximately 1,500 acres within mountain shrub and marginal timber communities to improve wildlife habitat, create opening in vegetation communities with conifer encroachment, restore aspen stands that are decadent and in declining health, and reduce hazardous fuels. A portion of the 1,500 acres may also be treated with mechanical, manual chemical, or biological methods.	Restoration and rehabilitation will emphasize the reestablishment of habitat diversity and ecosystem health on a case-by-case basis. Site-specific projects will be considered to meet the objectives as identified in the Resource Management Plan.
Sweetwater Valley FMU	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife	Allow fire use to protect, maintain, and enhance resources, and as nearly as possible, be allowed to function in its natural ecological role. Use of	Chemical and various methods of mechanical treatments are planned within this FMU over the next 10 years to improve sagebrush-grassland health	Post-fire rehabilitation and restoration of wildlands fires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety, and	There are no identified communities at risk in this FMU.	Initiate prescribed burning on approximately 20,000 acres of sagebrush-grassland and marginal timbered communities in the next 10 years	Post-fire rehabilitation and restoration of wildfires would be initiated, if necessary, to protect and sustain ecosystems, public health,

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
	habitat, watersheds, etc.).	prescribed fire is desired to reintroduce fire into the ecosystem. Create and maintain a vegetative mosaic across the landscape. Air quality objectives would be met.	and to allow greater water infiltration into the soil.	to help communities protect infrastructure.		to reduce fuels and encourage restoration of ecosystem health. A portion of the 20,000 acres may also be treated with mechanical, manual chemical, or biological methods.	safety, and to help communities protect infrastructure.
Rattlesnake Hills FMU	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Allow fire use to protect, maintain, and enhance resources, and as nearly as possible, be allowed to function in its natural ecological role. Use of prescribed fire is desired to reintroduce fire into the ecosystem. Create and maintain a vegetative mosaic across the landscape. Air quality objectives would be met.	Chemical and various methods of mechanical treatments will be considered, as needed, by a site-specific plan to create uneven aged vegetative mosaics within sagebrush-grasslands and to improve diversity of herbaceous species and regeneration of decadent aspen stands.	Evaluate the need for rehabilitation or restoration work following disturbances focusing on immediate reestablishment of native vegetation species suited to local range sites.	There are no identified communities at risk (as listed on the Federal Register) in this FMU. Work closely with homeowners, ranchers, and communities in the FMU to develop and implement hazardous fuels reduction projects on public lands adjacent to private lands and structures at risk in the event of a landscape-level wildland fire.	Initiate prescribed burning on approximately 12,000 acres of sagebrush-grassland communities (primarily improvement of mountain shrub habitat and restoration of aspen stands) over the next 10 years to reduce fuels and encourage restoration of ecosystem health. A portion of the 12,000 acres may also be treated with mechanical, manual chemical, or biological methods.	Projects will be identified on an as-needed basis to reestablish native vegetation species.

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
Lander Slope FMU	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Use prescribed fire to reintroduce fire into the ecosystem. Use prescribed fire treatments to create a vegetative mosaic and limit the extent of conifer encroachment into sagebrush/mountain shrub communities, and rejuvenate older aspen stand and promote aspen regeneration. Use prescribed fire in the form of pile burning to reduce the hazardous fuel buildup created by thinning near communities and subdivisions and also created by cutting conifers of vegetative communities. Air quality objectives would be met.	Chemical and various methods of mechanical treatments will be considered, as needed, by a site-specific plan to create uneven aged vegetative mosaics.	Evaluate the need for rehabilitation or restoration work following disturbances focusing on immediate reestablishment of native vegetation species suited to local range sites.	Reduce fire risk to WUI communities. Develop risk assessment and mitigation plans for public and private lands.	Initiate prescribed burning on approximately 2,500 acres for hazardous fuels reduction, aspen regeneration, restoration of ecosystem health in mountain shrub habitat (mountain sagebrush, bitterbrush, serviceberry and other associated shrubs), and burning of slab piles produced from mechanical vegetation treatments over the next 10 years to reduce fuels and encourage restoration of ecosystem health. A portion of the 2,500 acres may also be treated with mechanical, manual chemical, or biological methods.	Projects will be identified on an as-needed basis to reestablish native vegetation species.

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
Copper Mountain FMU	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Allow fire use to protect, maintain, and enhance resources, and as nearly as possible be allowed to function in its natural ecological role. Use of prescribed fire is desired to reintroduce fire into the ecosystem. Create and maintain a vegetative mosaic and limit the extent of conifer encroachment into sagebrush/mountain shrub communities. Air quality objectives would be met.	Chemical and various methods of mechanical treatments will be considered, as needed, by a site-specific plan to create uneven aged vegetative mosaics.	Evaluate the need for rehabilitation or restoration work following disturbances focusing on immediate reestablishment of native vegetation species suited to local range sites.	Currently, there are no identified communities at risk in this FMU (as listed in the Federal Register).	Initiate prescribed burning on approximately 5,600 acres over the next 10 years of mountain sagebrush-grassland communities to treat sagebrush steppe with juniper encroachment, hazardous fuels reduction and aspen regeneration. A portion of the 5,600 acres may also be treated with mechanical, manual chemical, or biological methods.	Post-fire rehabilitation and restoration of wildfires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety and to help communities protect infrastructure.
Dubois FMU	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Create and maintain a vegetative mosaic across the landscape. Emphasis on the mountain shrub communities and marginal timbered communities, including area where there is declining health of aspen stands.	Multi-year staged treatments will be utilized to revitalize aspen stands, rejuvenate shrub communities, and to improve and maintain forest health.	Depending upon the size and intensity of the burn, post-fire rehabilitation and restoration of wildfires will be initiated to allow reestablishment of native plant communities and to stabilize erosive soil conditions.	Coordinate fuels reduction plans and actions with Dubois and Union Pass communities to significantly reduce the likelihood of landscape-level fire within the WUI and to lower the risk of danger to public safety. Develop risk assessment and fire defense plan for	Initiate prescribed burning on approximately 2,400 acres over the next 10 years of mountain shrub and marginal timber communities for hazardous fuels reduction as well as restoring ecosystem health (aspen regeneration, treating areas	Post-fire rehabilitation and restoration of wildfires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety, and to help communities protect infrastructure.

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
					public lands in the Dubois WUI area.	of conifer encroachment and wildlife habitat improvement) and burning slash piles produced by mechanical operations and timber harvest. A portion of the 2,400 acres may also be treated with mechanical, manual chemical, or biological methods.	
FMU Fire Management Unit WUI Wildland-Urban Interface							

Appendix P. Species Mentioned in the Lander Field Office Resource Management Plan and Environmental Impact Statement

Table P.1. Common and Scientific Names of Plant and Wildlife Species

Common Name	Scientific Name
Plants	
Alder	<i>Alnus serrulata</i>
Arrowleaf balsamroot	<i>Balsamorhiza sagittata</i>
Aspen	<i>Populus tremuloides</i>
Barneby's clover	<i>Trifolium barnebyi</i>
Basin big sagebrush	<i>Artemisia tridentata ssp. tridentata</i>
Beaver Rim phlox	<i>Phlox pungens</i>
Big sagebrush	<i>Artemisia tridentata</i> Nutt.
Bitterbrush	<i>Purshia tridentata</i>
Black henbane	<i>Hyoscyamus niger</i>
Blowout penstemon	<i>Penstemon haydenii</i>
Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>
Bluegrass	<i>Poa annua</i>
Bottlebrush squirreltail	<i>Elymus elymoides</i>
Boxelder	<i>Acer negundo</i>
Bud sagebrush	<i>Picrothamnus desertorum</i>
Buffalobur	<i>Solanum rostratum</i>
Bull thistle	<i>Cirsium vulgare</i>
Canada thistle	<i>Cirsium arvense</i>
Cedar Rim thistle	<i>Cirsium aridum</i>
Cheatgrass	<i>Bromus tectorum</i>
Cinquefoil	<i>Potentilla</i>
Common burdock	<i>Arctium minus (Hill) Bernh.</i>
Common St. Johnswort	<i>Hypericum perforatum</i>
Common tansy	<i>Tanacetum vulgare</i>
Cottonwood	<i>Populus spp.</i>
Curlycup gumweed	<i>Grindelia squarrosa</i>
Dalmatian toadflax	<i>Linaria genistifolia ssp. dalmatica</i>
Dandelion	<i>Taraxacum officinale</i>
Desert yellowhead	<i>Yermo xanthocephalus</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Douglas-fir	<i>Pseudotsuga menziesii</i>
Dubois milkvetch	<i>Astragalus gilviflorus var. purpureus</i>
Dwarf mistletoe	<i>Arceuthobium spp.</i>
Dyers woad	<i>Isatis tinctoria</i>
Engelmann spruce	<i>Picea engelmannii</i>
Field bindweed	<i>Convolvulus arvensis</i>
Foxtail barley	<i>Hordeum jubatum</i>
Fremont bladderpod	<i>Lesquerella fremontii</i>
Gardner's saltbush	<i>Atriplex gardneri</i>
Greasewood	<i>Sarcobatus vermiculatus</i>
Great Basin wild rye	<i>Leymus cinereus</i>
Green needlegrass	<i>Nassella viridula</i>
Halogeton	<i>Halogeton glomeratus</i>

Appendix P Species Mentioned in the Lander
Field Office Resource Management Plan and
Environmental Impact Statement

Common Name	Scientific Name
Hoary cress (whitetop)	<i>Cardaria draba and Cardaria pubescens</i> Desv.
Houndstongue	<i>Cynoglossum officinale</i>
Idaho fescue	<i>Festuca idahoensis</i>
Indian ricegrass	<i>Achnatherum hymenoides</i>
Lady's bedstraw	<i>Galium verum</i>
Larkspur	<i>Delphinium occidentale</i>
Leafy spurge	<i>Euphorbia esula</i>
Limber pine	<i>Pinus flexilis</i>
Lodgepole pine	<i>Pinus contorta</i>
Mat muhly	<i>Muhlenbergia richardsonis</i>
Meadow pussytoes	<i>Antennaria arcuata</i>
Mountain brome	<i>Bromus marginatus</i>
Mountain mahogany	<i>Cercocarpus kunth</i>
Mountain big sagebrush	<i>Artemisia tridentata ssp. vaseyana</i>
Mountain thermopsis	<i>Thermopsis montana</i>
Musk thistle	<i>Carduus nutans</i>
Mustard	<i>Brassicaceae spp.</i>
Needle grass	<i>Achnatherum</i>
Owl Creek miner's candle	<i>Cryptantha subcapitata</i>
Ox-eye daisy	<i>Leucanthemum vulgare or Chrysanthemum leucanthemum</i>
Perennial pepperweed (giant whitetop)	<i>Lepidium latifolium</i>
Perennial sowthistle	<i>Sonchus arvensis</i>
Persistent sepal yellowcress	<i>Rorippa calycina</i>
Plains larkspur / Geyer larkspur	<i>Delphinium geyeri</i>
Plains prickly pear	<i>Opuntia polyacantha</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Poplar bud-gall mite	<i>Eriophes parapopuli</i>
Porter's sagebrush	<i>Artemisia porteri</i>
Prairie junegrass	<i>Koeleria macrantha</i>
Puncturevine	<i>Tribulus terrestris</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Quackgrass	<i>Agropyron repens</i>
Rocky Mountain juniper	<i>Juniperus scopulorum</i>
Rocky Mountain twinpod	<i>Physaria saximontana var. saximontana</i>
Russian knapweed	<i>Acrotilon repens (synonym = Centaurea repens)</i>
Russian olive	<i>Elaeagnus angustifolia</i>
Russian thistle	<i>Salsola tragus</i>
Sagebrush	<i>Artemisia spp.</i>
Salt cedar	<i>Tamarix spp.</i>
Sandberg bluegrass	<i>Poa secunda</i>
Scotch thistle	<i>Onopordum acanthium</i>
Showy milkweed	<i>Asclepias speciosa</i>
Silver sage	<i>Salvia argentea</i>
Skeletonleaf bursage	<i>Franseria discolor Nutt.</i>
Snowberry	<i>Symphoricarpos albus</i>
Spotted knapweed	<i>Centaurea maculosa</i>
Sulfur cinquefoil	<i>Potentilla recta</i>
Swainsonpea	<i>Sphaerophysa salsula</i>
Thickspike wheatgrass	<i>Elymus lanceolatus</i>
Threadleaf sedge	<i>Carex filifolia</i>
Utah juniper	<i>Juniperus osteosperma</i>
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>
Water birch	<i>Betula occidentalis</i>

Common Name	Scientific Name
Whitebark pine	<i>Pinus albicaulis</i>
Wild licorice	<i>Glycyrrhiza lepidota</i>
Willow	<i>Salix spp.</i>
Wyeth lupine	<i>Lupinus wyethii</i>
Wyoming big sagebrush	<i>Artemisia tridentata ssp. wyomingensis</i>
Yellow toadflax	<i>Linaria vulgaris</i>
Fungi	
Blister rust or white pine blister rust	<i>Cronartium ribicola</i>
Fish	
Black bullhead	<i>Ameiurus melas</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill	<i>Lepomis macrochirus</i>
Bonneville cutthroat trout	<i>Oncorhynchus clarki utah</i>
Brook trout	<i>Salvelinus fontinalis</i>
Brown trout	<i>Salmo trutta</i>
Burbot	<i>Lota lota</i>
Channel catfish	<i>Ictalurus punctatus</i>
Common carp [Carp in text]	<i>Cyprinus carpio</i>
Creek chub	<i>Semotilus atromaculatus</i>
Cutthroat trout	<i>Oncorhynchus clarki</i>
Emerald shiner	<i>Notropis atherinoides</i>
Fathead minnow	<i>Pimephales promelas</i>
Flathead chub	<i>Platygobio gracilis</i>
Golden shiner	<i>Notemigonus crysoleucas</i>
Green sunfish (green sunfish - bluegill hybrid)	<i>Lepomis cyanellus</i>
Iowa darter	<i>Etheostoma exile</i>
Johnny darter	<i>Etheostoma nigrum</i>
Lake chub	<i>Couesius plumbeus</i>
Lake trout	<i>Salvelinus namaycush</i>
Largemouth bass	<i>Micropterus salmoides</i>
Longnose dace	<i>Rhinichthys cataractae</i>
Longnose sucker	<i>Catostomus catostomus</i>
Mottled Sculpin	<i>Cottus bairdi</i>
Mountain sucker	<i>Catostomus platyrhynchus</i>
Mountain whitefish	<i>Prosopium williamsoni</i>
Pallid sturgeon	<i>Scaphirhynchus albus</i>
Plains killifish	<i>Fundulus zebrinus</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
River carpsucker	<i>Carpionodes carpio</i>
Sand shiner	<i>Notropis stramineus</i>
Sauger	<i>Sander canadensis</i>
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
Snake River cutthroat	<i>Oncorhynchus clarki spp.</i>
Splake (brook and lake trout hybrid)	<i>Salvelinus namaycush X Salvelinus fontinalis</i>
Spottail shiner	<i>Notropis hudsonius</i>
Stonecat	<i>Noturus flavus</i>
Walleye	<i>Sander vitreus</i>
White crappie	<i>Pomoxis annularis</i>
White sucker	<i>Catostomus commersoni</i>
Yellow perch	<i>Perca flavescens</i>
Yellowstone cutthroat trout	<i>Oncorhynchus clarki bouvieri</i>
Wildlife	
American kestrel	<i>Falco sparverius</i>

Common Name	Scientific Name
Badger	<i>Taxidea taxus</i>
Baird's sparrow	<i>Ammodramus bairdii</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Barn owl	<i>Tyto alba</i>
Beaver	<i>Castor canadensis</i>
Bighorn sheep	<i>Ovis canadensis</i>
Bison	<i>Bison bison</i>
Black bear	<i>Ursus americanus</i>
Black-footed ferret	<i>Mustela nigripes</i>
Bobcat	<i>Lynx rufus</i>
Boreal chorus frog	<i>Pseudacris maculata</i>
Boreal owl	<i>Aegolius funereus</i>
Boreal toad (Rocky Mountain population)	<i>Anaxyrus boreas boreas</i>
Brewer's sparrow	<i>Spizella breweri</i>
Bullsnake	<i>Pituophis catenifer sayi</i>
Burrowing owl	<i>Athene cunicularia</i>
Canada lynx	<i>Lynx canadensis</i>
Chukar partridge	<i>Alectoris chukar</i>
Columbia spotted frog	<i>Rana luteiventris</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Coot	<i>Fulica spp.</i>
Cottontail rabbit	<i>Sylvilagus spp.</i>
Coyote	<i>Canis latrans</i>
Ducks and geese	family Anatidae
Dusky grouse	<i>Dendragapus obscurus</i>
Dwarf shrew	<i>Sorex nanus</i>
Eastern yellow-bellied racer	<i>Coluber constrictor flaviventris</i>
Elk	<i>Cervus elaphus</i>
Ferruginous hawk	<i>Buteo regalis</i>
Golden eagle	<i>Aquila chrysaetos</i>
Gray partridge	<i>Perdix perdix</i>
Gray wolf	<i>Canis lupus</i>
Great Basin spadefoot toad	<i>Scaphiopus intermontana</i>
Great gray owl	<i>Strix nebulosa</i>
Great horned owl	<i>Bubo virginianus</i>
Greater sage-grouse	<i>Centrocercus urophasianus</i>
Greater short-horned lizard	<i>Phrynosoma (Tapaja) hernandesi</i>
Grizzly bear	<i>Ursus arctos horribilis</i>
Ground squirrel	<i>Spermophilus sp.</i>
Jackrabbit	<i>Lepus</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Long-billed curlew	<i>Numenius americanus</i>
Long-eared myotis	<i>Myotis evotis</i>
Long-eared owl	<i>Asio otus</i>
Marten	<i>Martes sp.</i>
Merlin	<i>Falco columbarius</i>
Mink	<i>Mustela vison</i>
Moose	<i>Alces alces</i>
Mountain bluebird	<i>Sialia currucoides</i>
Mountain lion	<i>Puma concolor</i>
Mountain plover	<i>Charadrius montanus</i>
Mourning dove	<i>Zenaida macroura</i>
Mouse	<i>Peromyscus spp.</i>

Common Name	Scientific Name
Mule deer	<i>Odocoileus hermionus</i>
Muskrat	<i>Ondatra zibethicus</i>
North American wolverine	<i>Gulo gulo luscus</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern harrier	<i>Circus cyaneus</i>
Northern leopard frog	<i>Lithobates pipiens</i>
Northern pygmy owl	<i>Glaucidium californicum</i>
Northern sagebrush lizard	<i>Sceloporus graciosus graciosus</i>
Northern saw-whet owl	<i>Aegolius acadicus</i>
Osprey	<i>Pandion haliaetus</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pheasant	<i>Phasianus colchicus</i>
Prairie rattlesnake	<i>Crotalus viridis</i>
Plains spadefoot toad	<i>Spea bombifrons</i>
Porcupine	<i>Hystricomorph hystricidae</i>
Prairie dogs	<i>Cynomys spp.</i>
Prairie falcon	<i>Falco mexicanus</i>
Pronghorn	<i>Antilocapra americana</i>
Pygmy rabbit	<i>Brachylagus idahoensis</i>
Raccoon	<i>Procyon lotor</i>
Rail	<i>family Rallidae</i>
Rat	<i>Rattus spp.</i>
Red fox	<i>Vulpes vulpes</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Rough-legged hawk	<i>Buteo lagopus</i>
Ruffed grouse	<i>Bonasa umbellus</i>
Sage sparrow	<i>Amphispiza belli</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Sandhill crane	<i>Grus canadensis</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Short-eared owl	<i>Asio flammeus</i>
Shrew	<i>family Soricidae</i>
Skunk	<i>family Mephitidae</i>
Snipe	<i>Gallinago sp.</i>
Snowshoe hare	<i>Lepus americanus</i>
Spotted bat	<i>Euderma maculatum</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Swift fox	<i>Vulpes velox</i>
Tiger salamander	<i>Ambystoma mavortium</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Turkey vulture	<i>Cathartes aura</i>
Vesper sparrow	<i>Pooecetes gramineus</i>
Vole	<i>Microtus sp.</i>
Wandering gartersnake	<i>Thamnophis elegans vagrans</i>
Weasel	<i>Mustela spp.</i>
Western screech owl	<i>Megascops kennicottii</i>
White-faced ibis	<i>Plegadis chihi</i>
White-tailed deer	<i>Odocoileus virginianus</i>
White-tailed prairie dog	<i>Cynomys leucurus</i>
Yellow-billed cuckoo	<i>Coccyzus americanus</i>
Invertebrates	

Common Name	Scientific Name
Army cutworm	<i>Euxos auxillarius</i>
Aphthona flea beetle	<i>Aphthona nigriscutis</i>
Beet leafhopper	<i>Circulifer tenellus</i>
Didymo	<i>Didymosphenia geminata</i>
Grasshopper	suborder <i>Caelifera</i> ; order <i>Orthoptera</i>
Mormon cricket	<i>Anabrus simplex</i>
Mosquito	<i>Culicidae spp.</i>
Mosquito	<i>Culex tarsalis</i>
Mountain pine beetle	<i>Dendroctonus ponderosae</i>
New Zealand mud snail	<i>Potamopyrgus antipodarum</i>
Poplar bud-gall mite	<i>Eriophes parapopuli</i>
Quagga mussel	<i>Dreissena rostriformis</i>
Zebra mussel	<i>Dreissena polymorpha</i>

Appendix Q. Fire Regime and Vegetation Condition

This appendix provides an overview of Fire Regime Groups and descriptions, fire regime condition classifications, and a general description of the condition of corresponding vegetation types.

Table Q.1. Fire Regime Groups and Descriptions

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 75 percent of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75 percent of the overstory
II	0-35 years	Replacement	High-severity fires replacing greater than 75 percent of the dominant overstory vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High-severity fires
V	200+ years	Replacement/any severity	Generally replacement-severity; can include any severity type in this frequency range
Source: DOI and The Nature Conservancy 2008			

Table Q.2. Fire Regime Condition Classifications

Condition Class	Severity Description
1	For the most part, fire regimes in this fire condition class are within historical ranges. Vegetation composition and structure are intact. Therefore, the risk of losing key ecosystem components from the occurrence of fire remains relatively low.
2	Fire regimes on these lands have been moderately altered from their historical range by either increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified on these lands.
3	Fire regimes on these lands have been substantially altered from their historical return interval. The risk of losing key ecosystem components from fire is high. Fire frequencies have departed from historical ranges by multiple return intervals. Vegetation composition, structure, and diversity have been substantially altered.
Source: DOI and The Nature Conservancy 2008	

The tables below are an estimate of vegetative conditions based on data from Existing Vegetation, Fire Regimes, and Fire Regime Condition Class (FRCC) from regional LANDFIRE data on biophysical settings (BpS model), as well as estimates from on the ground conditions. The BpS model describes the vegetation, geography, biophysical characteristics, succession stage, disturbance regime, and assumptions. It is designed to accompany the quantitative state and transition models.

Table Q.3. Forest and Woodland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area

Vegetation Type	FRCC Description	Fire Regime Group	Landscape Level FRCC	Vegetation Structure and Health
Forest (inclusive of major forest types; lodgepole pine and Douglas-fir)	Stand replacement fires dominate FRG IV. The FRCC for the forested communities is displaying indicators of moderate departure from reference conditions and is within the timeline where stand replacement fire would return the communities to a vegetative state dominated by perennial grass and forbs with tree seedlings. Some of these indicators include insect and disease outbreaks and fuel loading associated with a mature forest stand. Some areas of the planning area that point within the timeline may have been altered by changes in the fuel loading by logging and fuels reduction activities, as well as historic fire suppression.	IV	2	Lodgepole Pine Structure: Mid-development with mid-open to closed canopy, 21 to 100 percent moderate to dense pole-sized trees sometimes very dense (dog hair) trees. Health: Fire regime of replacement severity – high (35-100 years). Very dense tree stands are more susceptible to disease and insect infestations. Douglas-Fir Structure: Mid-development closed to open canopy, canopy closure is 10 percent to greater than 35 percent, with small trees to late development with large trees with mixed understory of grass and scattered shrubs. Some stands of Douglas-fir showing old growth characteristics are specific areas. Health: Fire Regime of replacement severity – (35-100 years) high number of trees per acre more susceptible to disease and insect infestations.
Woodlands (inclusive of major woodland types; juniper, aspen and limber pine)	The majority of woodlands fall within FRG IV with isolated woodland stands in rock outcrops falling within FRG V. FRCC 2 is indicative of the woodland communities having moderate departure from reference conditions. Indicators for this FRCC include encroachment of conifers into mature to decadent aspen stands and encroachment of juniper and limber pine out from historic rocky and shallow-soiled sites into shrub habitat.	IV and V	2	Juniper Structure: Mid-development open class, canopy 21-40 percent, and trees established usually short and widely spaced. Health: Fire frequency 35-100+ years. This class last until trees are approximately 100 years old then succeeds to vegetative class with trees greater than 100 years of age. Aspen Structure: Mid-development closed canopy 41-100 percent; dense, pole six trees in this class. Succession to different class after 50 years. Less forb and shrub cover in understory. Health: Succession to different class after 50 years. Less forb and shrub cover in understory in this class. Limber Pine Structure: Mid development open canopy 21-40 percent; trees established usually short and widely spaced.

Vegetation Type	FRCC Description	Fire Regime Group	Landscape Level FRCC	Vegetation Structure and Health
				<i>Health:</i> Fire frequency 35-100+ years. This class last until trees are approximately 100 years old then succeeds to vegetative class with trees greater than 100 years of age.
Source: LANDFIRE 2010 FRG Fire Regime Group FRCC Fire Regime Condition Class				

Table Q.4. Grasslands and Shrubland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area

Vegetation Type	Dominant Fire Regime Group	Estimated Landscape Level FRCC	FRCC Description	Vegetation Structure and Health
Grasslands	I	FRCC 1: 34 percent FRCC 2: 26 percent FRCC 3: 41 percent	Grasslands within the Lander Field Office would historically have experienced fire return interval of 25 years across the landscape. These areas have an altered fuel loading due to a combination of factors including historic and current livestock grazing, human infrastructure and fire suppression. Fire frequency within this vegetative type is far less than would have occurred historically, though the potential loss of key ecosystem components is minimal. Vegetation composition and structure has been significantly altered in FRCC 3 areas.	FRCC 1 Structure: Early development class – shrub cover minimal or non-existent, bare ground 10-30 percent, vegetative canopy 0-30 percent (forb cover 10-40 percent, grasses 60-90 percent), maintains vegetation in early development, mixed-severity fire (0-37 years) does not change successional age. Health: Replacement fire frequency 75 years. Forb density and cover responsive to climatic conditions, in rare flood events (500-year). Moves vegetation to more shrubby condition mid-development, closed after down cutting. FRCC 2 Structure: Mid-development open to closed class – mostly stable and resilient system with moderate canopy closure, total canopy cover 25-80 percent (grasses greater than 85 percent, forbs 0-5 percent, shrubs 0-10 percent). Health: Replacement fire frequency of 75 years, causes transition back to early development class; recurring drought would thin vegetation and keep canopy open. FRCC 3 Structure: Late development open to closed class – closed canopy of grasses forbs and shrubs; total cover greater than 85 percent (grasses 25-50 percent, forbs 0-5 percent, shrubs 10-75 percent, 10 percent in transition to shrub or tree dominated communities), mixed fire 35 years moving to mid-development class. Health: Replacement fire frequency 75 years. Extended drought would cause transition back to mid-development class with thinning of shrubs; flooding every 100 years would cause transition to early development class.
Sagebrush Shrublands	IV	FRCC 1: 16 percent FRCC 2: 48 percent FRCC 3: 35 percent	Sagebrush shrublands within the Lander Field Office are generally dominated by mature to decadent sagebrush with a secondary component of grass. Depending upon their location within	FRCC 1 Structure: Early development Sagebrush cover 0-15 percent (area depending if basin big sagebrush, Wyoming big sagebrush and/or mountain big sagebrush), generally grass dominated with herbaceous cover 30-50 percent, fire frequency 0-35 years. Health: Early development class-replacement fire occurs 150-200 years; little to no effect by insect or disease.

Vegetation Type	Dominant Fire Regime Group	Estimated Landscape Level FRCC	FRCC Description	Vegetation Structure and Health
			the Lander Field Office, these sites would have historically carried fire with variable burnt patch size. A combination of factors including historic and current livestock grazing, human infrastructure and fire suppression have altered the natural disturbance regime within the sagebrush shrublands found in the Lander Field Office. Key ecosystem components are still present, though vegetation composition and structure has been significantly altered in FRCC 3 areas.	FRCC 2 Structure: Mid-development open sagebrush cover 15-30 percent (area depending if basin big sagebrush, Wyoming big sagebrush and/or mountain big sagebrush), generally becoming shrub dominated, herbaceous cover 10-20 percent, fire frequency same and FRCC 1. <u>Health:</u> Same year span on replacement fire however some occurrence of insect or disease impact. FRCC 3 Structure: Late development (open and closed). Sagebrush cover greater than 25-80 percent (area depending if basin big sagebrush, Wyoming big sagebrush and/or mountain big sagebrush). Generally shrub dominated with mature and over mature with suppressed understory; herbaceous cover 10 percent; replacement fire occurs every 80-100 years. <u>Health:</u> 35-100+ year frequency replacement; replacement fire may cause transition to early development class. Insects and disease occur.
Greasewood and Salt Desert Shrub	IV	Unspecified, needs to be split from Sagebrush Shrublands. Estimated to be dominated by FRCC 1 across landscape.	Fire was very infrequent in this vegetative type. Fire Return Intervals are estimated to be 200 years.	Greasewood Structure: Vegetative cover 0-20 percent and/or 21-50 percent; some grasses with greasewood sprouts and rabbitbrush present in early development. In late development open class – greasewood shrubs maturing or have reached maturity and would increase canopy closure; perennial grasses still in understory. <u>Health:</u> Wet periods contribute to mortality; susceptible to invasion of nonnative grasses (cheatgrass). Salt Desert Shrub Structure: Early development class is only class for the vegetative type – vegetative cover is 0-20 percent; shrubland composed of Gardener's and mat saltbush with some winterfat, scattered forbs, and grasses. <u>Health:</u> Wet periods contribute to mortality; susceptible to invasion of nonnative grasses (cheatgrass).

Vegetation Type	Dominant Fire Regime Group	Estimated Landscape Level FRCC	FRCC Description	Vegetation Structure and Health
Mountain Shrub	IV	Unspecified, needs to be split from Sagebrush Shrublands. Estimated to be dominated by FRCC 2 across landscape.	These vegetative communities are dominated by mature to decadent shrub. Though these communities are generally in condition class 2, all of the ecological components are present.	Structure: In mid to late development class dominant shrubs are (dependent on primary shrub): sagebrush 15-30 percent; shrub cover with curleaf mountain mahogany, bitterbrush, snowberry and rabbitbrush, and mature sagebrush co-dominant, 30-40 percent; grasses and forbs may be present in gaps between shrubs. Health: Replacement fire frequency is 80-150 years. Insect and disease may occur; weather-related mortality every 200 years would transition to early development.
Source: LANDFIRE 2010 Vegetative structure in each vegetative class incorporates biophysical setting models for Map Zone 22; Inter-Mountain Basins Curl-leaf Mountain Mahogany woodland, Inter-mountain Basins Mat Saltbush shrubland, Wyoming Basins Dwarf Sagebrush shrubland and steppe, Inter-Mountains Basins Big Sagebrush shrubland-Basin Big Sagebrush, Inter-Mountain Basins Big Sagebrush shrubland-Wyoming Big Sagebrush, Inter-Mountain Basin Montane Sagebrush steppe, Inter-Mountain Basins Semi-Desert Shrub Steppe, Inter-Mountains Basins Semi-desert Grassland, Northern Rocky Mountain Lower Montane-Foothill-valley grassland, and Inter-Mountains Basins Greasewood Flat. FRG Fire Regime Group FRCC Fire Regime Condition Class				

Appendix R. Lands Identified for Land Tenure Adjustment(s)

The Bureau of Land Management's (BLM) land tenure program (that is, the acquisition or disposal of land) is designed to: (1) improve management of natural resources through consolidation of federal, state, and private lands; (2) increase recreational opportunities and preserve open space; (3) secure key property necessary to protect endangered species and promote biological diversity; (4) preserve archeological and historical resources; (5) implement specific acquisitions authorized by Acts of Congress; and (6) allow for expansion of communities and consolidation of non-federal land ownership. Alternative A carries forward all of the lands identified for land tenure adjustment or disposal that were identified in the 1987 Resource Management Plan (RMP). Alternatives B, C, and D identify fewer acres for disposal, based on values that were not considered in 1987 or on other issues such as changed land ownership patterns. The lands that were part of the 1987 decision (including ones not carried forward by alternatives B, C, and D) are listed in Appendix S (p. 1629) and displayed in Maps 94 and 95.

Site-specific environmental review and documentation in conformance with the National Environmental Policy Act, including completion of categorical exclusions and plan conformance determinations where appropriate, will be accomplished for each proposed land program action. Interdisciplinary impact analysis will be tiered within the framework of this and other applicable environmental documents. Future shifts in policy and national priorities could result in modifications of these provisions and changes in addressing priority lands actions; the current emphasis on greater sage-grouse is an example of a policy shift that has impacted the land tenure program. Land tenure adjustments must serve the public interest.

The following are some criteria that will be considered in land tenure adjustment proposals, but they are not considered all inclusive. These criteria are meant to guide and streamline consideration of land tenure adjustment proposals.

- Important, crucial, or critical habitat for fish, wildlife, and plants;
- Riparian-wetland areas and designated floodplains;
- Parcels that provide access to larger blocks of public land;
- Lands with special designation or management emphasis, or areas found to meet the relevance and importance criteria for Area of Critical Environmental Concern (ACEC) management;
- Significant cultural resources, especially within the Congressionally Designated Trails corridors;
- Recreation opportunities and benefits;
- Visual Resource Management Class I and Class II areas;
- Lands that will improve greater sage-grouse habitat, contain leks, or would facilitate greater sage-grouse management.

Members of the public and others identified additional parcels that were not identified in the 1987 RMP for the BLM to consider for disposal or exchange. These properties are described below and depicted on Map 141.

Lands near Big Atlantic Gulch Campground: T. 27 N., R. 90 W.,

Sec. 34: S2N2, S2, SESW.

These lands are in the South Pass Historic Mining Area ACEC and in the northeast part of the Atlantic City common grazing allotment. Recreation is the major focus in the area, with high seasonal use of the campground (tourists and campers in the summer and hunters in the fall months). Although the campground is not staffed in the winter, the area is frequently visited for cross-country skiing, snowshoeing, and snowmobiles.

Lands near the National Historic Trails: T. 28 N., R. 99 W.,

Sec. 19: N2NE4, NE4NW4.

Lands near the Burnt Ranch: T. 28 N., R. 100 W.,

Sec. 17: SESW;

20: NENW;

23: SE4SE4;

24: S2NE4, NW4SW4, S2SE4;

25: NE4NW4, SW4NW4.

These lands contain many culturally important artifacts and a portion of the main branch of the Oregon National Historic Trail. These lands are part of the Atlantic City Upper Fenced allotment.

T. 29 N., R. 101 W.,

Sec. 13: W2SW, SWSE.

Located to the north and east of Atlantic City, these lands are part of the Silver Creek grazing allotment and partially in the National Historic Trails ACEC. Strawberry Creek joins the Sweetwater River adjacent to these lands. The area has a number of old mining operations and many other cultural properties. Recreation is the primary use of the land.

T. 29 N., R. 91 W.,

Sec. 6: E2SE, SWSE, SENW;

7: E2SW, SWSE;

18: NENW.

These parcels are associated with retired uranium mill sites, which have been segregated from land use laws in preparation for withdrawal and transfer to the U.S. Department of Energy.

T. 29 N., R. 92 W.,

Sec. 1: S2NE, SW, W2SE, SESE;

2: NESW, S2SW, SE;

3: SESE;

11: All;

12: All;

13:N2;

14: NE, NENW.

These parcels are associated with retired uranium mill sites, which have been segregated from land use laws in preparation for withdrawal and transfer to the U.S. Department of Energy.

T. 29 N., R. 96 W.,

Sec. 7: SWNW, NWSW.

T. 29 N., R. 97 W.,

Sec. 1: SWSW;

2: SE;

3: N2N2, SWNE, SWNW;

4: N2, SWSW, N2SE;

5: N2NE, W2SW, SESW, SWSE;

6: W2NW, S2;

7: SENE, N2NW, SWNW, SE;

8: All;

9: N2, N2S2, SWSW;

10: N2;

11: N2, NESE;

12: All;

17: NE, W2, NWSE;

18: All.

T. 29 N., R. 98 W.,

Sec. 12: E2NE, NESE;

13: All;

14: SENE, E2SE.

T. 30 N., R. 97 W.,

Sec. 21: E2SE;

22: SW, W2SE, SESE;

26: SWNW, W2SW;

- 27: All Except SWSW;
- 28: N2NE, SENE, SWNW, W2SW, SESW, SWSE;
- 29: S2N2, NWNW, S2;
- 30: NENE, SW4, S2SE;
- 31: All;
- 32: All;
- 33: NWNE, S2NE, NW, S2;
- 34: All Except NWNW;
- 35: W2W2, SENW, E2SW, W2SE.

T. 33 N., R. 89 W.,

Sec. 9: SE;

21: NE.

These parcels are associated with retired uranium mill sites, which have been segregated from land use laws in preparation for withdrawal and transfer to the U.S. Department of Energy.

T. 33 N., R. 90 W.,

Sec. 9: NESE;

10: NW, W2SE;

15: S2NE, NWNE, N2SE, SESE;

21: E2NE, NESE;

22: NENE.

These parcels are associated with retired uranium mill sites, which have been segregated from land use laws in preparation for withdrawal and transfer to the U.S. Department of Energy.

T. 33 N., R. 98 W.,

Sec. 8: NENE;

17: W2SW;

18: E2E2, SWSE;

19: All Except NWNW;

20: W2.

T. 33 N., R. 99 W.,

Sec. 24: SENE;

25: NWSW; S2SW;

26: SENE.

The lands in T. 33 N., R. 98 and 99 W. are in a portion of blocked lands with public access from Johnny Behind the Rocks from the south, and from the Coal Mine Road to the north. These lands are southwest of Hudson, Wyoming, and are part of a common grazing allotment. The lands are used for recreation as well as grazing. The lands are within greater sage-grouse Core Area and comprise deer and pronghorn habitat.

T. 33 N., R. 100 W.,

Sec. 5: NWNE, NW, N2SW.

T. 34 N., R. 90 W.,

Sec. 22: N2N2, S2NE, SENW, S2SW, NESE.

T. 34 N., R. 100 W.,

Sec. 32: SWNW, W2SW, SESW, SWSE.

These lands are located west of Lander, Wyoming, with Red Butte to the south and the North Fork Road to the north. They contain important wildlife habitat and open space in an area that has experienced significant residential development.

T. 36 N., R. 91 W.,

Sec. 24; All;

25; All;

35. All.

T. 36 N., R. 92 W.,

Sec. 22: S2S2;

23: S2S2.

This page intentionally
left blank

Appendix S. Lands Identified for Disposal

In Table S.1, “Lands Identified for Disposal” (p. 1630), the Lander Field Office Resource Management Plan (RMP) specifically identifies areas available for consideration for disposal by employing the “isolated, difficult or expensive to manage, or needed-for community expansion” disposal criteria in the Federal Land Policy and Management Act (FLPMA). The areas below were identified during development of the new RMP as complying with FLPMA disposal criteria. Inclusion in Table S.1, “Lands Identified for Disposal” (p. 1630), does not constitute a decision that the land will be disposed. Before taking any disposal action, consideration will be given to each individual tract and will include public involvement. As stated elsewhere in the RMP, the preferred method of disposal or acquisition of lands is through exchanges. Proposals for disposal of lands not identified in Table S.1, “Lands Identified for Disposal” (p. 1630), will be considered if they are consistent with the objectives of the approved RMP and could require a land use plan amendment.

FLPMA provides for retention of the public lands in federal ownership and management by the Bureau of Land Management (BLM) for multiple uses. FLPMA and other federal laws, executive orders, and policies suggest criteria to use when categorizing public lands for retention or disposal, and for identifying acquisition priorities. Disposal by sale, exchange, airport grant, or Recreation and Public Purposes patent remains an option if such an action would serve an important objective and have a public benefit.

Site-specific environmental review and documentation in conformance with the National Environmental Policy Act, including completion of categorical exclusions and plan conformance determinations where appropriate, will be accomplished for each proposed land program action. Interdisciplinary impact analysis will be tiered within the framework of this and other applicable environmental documents. Many of the foregoing provisions of this appendix are based on current policy. Future shifts in policy and national priorities could result in modifications of these provisions and changes in addressing priority lands actions. Land tenure adjustments must serve the public interest.

The following are suggested criteria to consider in land tenure adjustment proposals, but the list is not considered all inclusive. These criteria are meant to guide and streamline consideration of land tenure adjustment proposals. Acquisition of lands will be considered, if in compliance with the RMP, to facilitate various resource management objectives and to acquire lands with high resource values including, but not limited to:

- Important, crucial, or critical habitat for fish, wildlife, and plants, particularly if located in greater sage-grouse Core Area or in an Area of Critical Environmental Concern with relevant and important wildlife values
- Riparian-wetland areas, and designated floodplains
- Parcels that provide access to blocks of public land
- Lands with or adjacent to special designation or management emphasis
- Significant cultural resources
- Recreation opportunities and benefits
- Visual Resource Management Class I and Class II areas

The preferred method for acquisition will be through exchange. Acquisitions, including easements, can be completed through exchange, Land and Water Conservation Fund purchases, or donations. Acquisitions of private lands will be pursued only with willing landowners.

Table S.1. Lands Identified for Disposal

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
1	T. 43 N., R. 108 W., Sec. 27: SW $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$ 80 ac.	All alternatives
5	T. 42 N., R. 108 W., Sec. 21: S $\frac{1}{2}$ NE $\frac{1}{4}$ 80 ac.	All alternatives
7	T. 43 N., R. 108 W., Sec. 35: NE $\frac{1}{4}$ SW $\frac{1}{4}$ 40 ac.	All alternatives
8	T. 42 N., R. 108 W., Sec. 2: E2SE $\frac{1}{4}$ 80 ac.	All alternatives
11	T. 42 N., R. 107 W., Sec. 18: S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ 240 ac.	All alternatives
14	T. 42 N., R. 107 W., Sec. 17: S $\frac{1}{2}$ SW $\frac{1}{4}$ 20: NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$ 280 ac.	All alternatives
20	T. 41 N., R. 107 W., Sec. 13: N $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$ 24: NE $\frac{1}{4}$ NE $\frac{1}{4}$ 160 ac.	Alternatives A and D
21	T. 41 N., R. 106 W., Sec. 7: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 18: N $\frac{1}{2}$ NW $\frac{1}{4}$ T. 41 N., R. 107 W., Sec. 13: SE $\frac{1}{4}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ SE $\frac{1}{4}$ 160 ac.	All alternatives
24	T. 43 N., R. 105 W., Sec. 32: W $\frac{1}{2}$ NW $\frac{1}{4}$ 80 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
25	T. 43 N., R. 105 W., Sec. 33: E $\frac{1}{2}$ E $\frac{1}{2}$, W $\frac{1}{2}$ NE $\frac{1}{4}$ 34: W $\frac{1}{2}$ W $\frac{1}{2}$ 400 ac.	All alternatives
26	T. 42 N., R. 105 W., Sec. 4: Lots 3, 4 (N $\frac{1}{2}$ NW $\frac{1}{4}$) S $\frac{1}{2}$ NW $\frac{1}{4}$ Sec. 5: SE $\frac{1}{4}$ NE $\frac{1}{4}$ 200.7 ac.	All alternatives
27	T. 42 N., R. 105 W., Sec. 3: S $\frac{1}{2}$ SE $\frac{1}{4}$ 10: NE $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$ 280 ac.	All alternatives
28	T. 42 N., R. 105 W., Sec. 9: SW $\frac{1}{4}$ SE $\frac{1}{4}$ 40 ac.	Alternative D with restrictions
31	T. 41 N., R. 105 W., Sec. 12: Lot 2(NE $\frac{1}{4}$ SE $\frac{1}{4}$) 24 ac.	Alternative D with restrictions
34	T. 41 N., R. 105 W., Sec. 8: NW $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$ 80 ac.	All alternatives
38	T. 40 N., R. 106 W., Sec. 22: SE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ 360 ac.	Alternative D with restrictions
40	T. 33 N., R. 101 W., Sec. 2: NE $\frac{1}{4}$ SW $\frac{1}{4}$ 40 ac.	All alternatives
44	T. 33 N., R. 100 W., Sec. 7: Lots 3, 4 SE $\frac{1}{4}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$ 161 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
45	T. 33 N., R. 100 W., Sec. 8: SW $\frac{1}{4}$ SE $\frac{1}{4}$, 40 ac.	All alternatives
46	T. 33 N., R. 100 W., Sec. 17: NW $\frac{1}{4}$ NW $\frac{1}{4}$, 40 ac.	All alternatives
48	T. 33 N., R. 100 W., Sec. 28: E $\frac{1}{2}$ SE $\frac{1}{4}$ 80 ac.	All alternatives
49	T. 33 N., R. 100 W., Sec. 23: W $\frac{1}{2}$ SW $\frac{1}{4}$, 80 ac.	Alternative A
53	T. 33 N., R. 99 W., Sec. 1: SE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 11: E $\frac{1}{2}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 12: W $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$ 280 ac.	All alternatives
54	T. 33 N., R. 99 W., Sec. 25: W $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 26: SE $\frac{1}{4}$ NE $\frac{1}{4}$ 160 ac.	Alternative D with restrictions
56	T. 32 N., R. 99 W., Sec. 17: SE $\frac{1}{4}$ NW $\frac{1}{4}$ 40 ac.	All alternatives
59	T. 32 N., R. 100 W., Sec. 27: SW $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 28: S $\frac{1}{2}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec 33: NW $\frac{1}{4}$ NE $\frac{1}{4}$ 320 ac.	All alternatives
62	T. 32 N., R. 99 W., Sec. 30: SE $\frac{1}{4}$ NE $\frac{1}{4}$ 40 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
63	T. 32N., R. 99W, Sec. 28: $W\frac{1}{2}W\frac{1}{2}$ 29: $SW\frac{1}{4}SW\frac{1}{4}$ 280 ac.	All alternatives
64	T. 32 N., R. 99 W., Sec. 32: $S\frac{1}{2}NE\frac{1}{4}$, $N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$ Sec. 33: $SW\frac{1}{4}SW\frac{1}{4}$ 200 ac.	All alternatives
66	T. 31 N., R. 98 W., Sec. 5: Lot 4, $SE\frac{1}{4}NW\frac{1}{4}$ 80.86 ac.	All alternatives
67	T. 31 N., R. 98 W., Sec. 21: $SE\frac{1}{4}NE\frac{1}{4}$ 40 ac.	Alternatives A and D
68	T. 30 N., R. 98 W., Sec. 7: $NE\frac{1}{4}SE\frac{1}{4}$ 18: $SE\frac{1}{4}NE\frac{1}{4}$, $NE\frac{1}{4}NW\frac{1}{4}$ 120 ac.	Alternatives A and D
69	T. 30 N., R. 98 W., Sec. 12: $S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$ $N\frac{1}{2}N\frac{1}{2}$ 280 ac.	Alternatives A and D
71	T. 29 N., R. 100 W., Sec. 25: $NE\frac{1}{4}$ 160 ac.	Alternatives A and D
72	T. 29 N., R. 98 W., Sec. 7: Lot 5 37.57 ac.	All alternatives
73	T. 29 N., R. 98 W., Sec. 10: $SE\frac{1}{4}SW\frac{1}{4}$, $SW\frac{1}{4}SE\frac{1}{4}$ 15: $NE\frac{1}{4}NE\frac{1}{4}$ 120 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
74	T. 29 N., R. 98 W., Sec. 11: SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$ 120 ac.	All alternatives
75	T. 29 N., R. 98 W., Sec. 1: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 12: W $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$ 160 Ac.	All alternatives
79	T. 31 N., R. 97 W., Sec. 12: SE $\frac{1}{4}$ SE $\frac{1}{4}$ 40 ac.	All alternatives
80	T. 31 N., R. 96 W., Sec. 18: SW $\frac{1}{4}$ SE $\frac{1}{4}$ 19: N $\frac{1}{2}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$ 160 ac.	All alternatives
81	T. 31 N., R. 96 W., Sec. 20: SE $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$ 29: NE $\frac{1}{4}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ NE $\frac{1}{4}$ 28: W $\frac{1}{2}$ NW $\frac{1}{4}$ 320 ac.	All alternatives
82	T. 31 N., R. 96 W., Sec. 21: SE $\frac{1}{4}$ SE $\frac{1}{4}$ 22: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 80 ac.	All alternatives
83	T. 31 N., R. 96 W., Sec. 27: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 34: NW $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$ 120 ac.	All alternatives
84	T. 31 N., R. 96 W., Sec. 33: E $\frac{1}{2}$ SE $\frac{1}{4}$ 80 ac.	All alternatives
85	T. 31 N., R. 96 W., Sec. 35: N $\frac{1}{2}$ SW $\frac{1}{4}$ 80 ac.	Alternatives A and D

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
86	T. 40 N., R. 94 W., Sec. 11: NE $\frac{1}{4}$ NW $\frac{1}{4}$ 40 ac.	All alternatives
87	T. 40 N., R. 94 W., Sec. 12: SE $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$ T. 39 N., R. 93 W., Sec. 7: SW $\frac{1}{4}$ NW $\frac{1}{4}$ 120 ac.	All alternatives
88	T. 40 N., R. 93 W., Sec. 5: SE $\frac{1}{4}$ NE $\frac{1}{4}$ 40 ac.	All alternatives
89	T. 40 N., R. 93 W., Sec. 3: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 40 ac.	All alternatives
90	T. 40 N., R. 92 W., Sec. 6: Lot 5 T. 40 N., R. 93 W., Sec. 1: NW $\frac{1}{4}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$ 128.15 ac.	All alternatives
91	T. 40 N., R. 93 W., Sec. 14: SW $\frac{1}{4}$ NW $\frac{1}{4}$ 15: NE $\frac{1}{4}$ SE $\frac{1}{4}$ 80 ac.	All alternatives
92	T. 40 N., R. 91 W., Sec. 19: NW $\frac{1}{4}$ SE $\frac{1}{4}$ 20: NW $\frac{1}{4}$ SW $\frac{1}{4}$ 80 ac.	All alternatives
93	T. 40 N., R. 92 W., Sec. 11: S $\frac{1}{2}$ SE $\frac{1}{4}$ 80 ac.	All alternatives
96	T. 40 N., R. 91 W., Sec. 5: NE $\frac{1}{4}$ NW $\frac{1}{4}$ (Lot 3) 45.83 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
97	T. 40 N., R. 91 W., Sec. 8: N½NE¼, SW¼NE¼ 120 ac.	All alternatives
98	T. 40 N., R. 91 W., Sec. 9: NE¼NW¼ 40 ac.	Alternatives A and D
99	T. 40 N., R. 91 W., Sec. 10: SW¼NW¼ 40 ac.	All alternatives
101	T. 40 N., R. 91 W., Sec. 3: Lots 1, 2 91.88 ac.	All alternatives
105	T. 40 N., R. 89 W., Sec. 9: N½NE¼ 80 ac.	All alternatives
106	T. 39 N., R. 91 W., Sec. 24: NW¼SE¼ 40 ac.	All alternatives
108	T. 39 N., R. 89 W., Sec. 8: E½NW¼ 80 ac.	All alternatives
109	T. 39 N., R. 89 W., Sec. 8: NE¼SE¼ 40 ac.	All alternatives
110	T. 39 N., R. 89 W., Sec. 8: SW¼SW¼ 17: NW¼NW¼ 18: NE¼NE¼ 120 ac.	All alternatives
112	T. 38 N., R. 94 W., Sec. 11: SW¼SW¼ 14: W½NW¼ 120 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
118	T. 37 N., R. 89 W., Sec. 28: NW $\frac{1}{4}$ NW $\frac{1}{4}$ 29: N $\frac{1}{2}$ N $\frac{1}{2}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$ 320 ac.	All alternatives
119	T. 35 N., R. 92 W., Sec. 4: Lot 1 41.31 ac.	All alternatives
121	T. 35 N., R. 90 W., Sec. 10: SE $\frac{1}{4}$ SW $\frac{1}{4}$ 40 ac.	All alternatives
122	T. 34 N., R. 94 W., Sec. 31: NE $\frac{1}{4}$ NE $\frac{1}{4}$ 32: NW $\frac{1}{4}$ NW $\frac{1}{4}$ 80 ac.	All alternatives
124	T. 31 N., R. 92 W., Sec. 33: S $\frac{1}{2}$ NW $\frac{1}{4}$ 80 ac.	All alternatives
127	T. 30 N., R. 93 W., Sec. 26: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 34: NE $\frac{1}{4}$ NE $\frac{1}{4}$ 35: NW $\frac{1}{4}$ NW $\frac{1}{4}$ 120 ac.	Alternatives A and D
133	T. 29 N., R. 92 W., Sec. 23: NE $\frac{1}{4}$ SE $\frac{1}{4}$ 24: NW $\frac{1}{4}$ SW $\frac{1}{4}$ 80 ac.	All alternatives
137	T. 30 N., R. 89 W., Sec. 15: S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ 240 ac.	All alternatives
138	T. 30 N., R. 89 W., Sec. 9: SE $\frac{1}{4}$ 10: NW $\frac{1}{4}$ SW $\frac{1}{4}$ 200 ac.	All alternatives

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
139	T. 32 N., R. 88 W., Sec. 3: NW $\frac{1}{4}$ SW $\frac{1}{4}$ 40 ac.	All alternatives
140	T. 32 N., R. 88 W., Sec. 15: W $\frac{1}{2}$ SE $\frac{1}{4}$ 22: NW $\frac{1}{4}$ NE $\frac{1}{4}$ 120 Ac.	All alternatives
141	T. 32 N., R. 87 W., Sec. 3: Lot 4 41.58 ac.	All alternatives
143	T. 32 N., R. 87 W., Sec. 15: NW $\frac{1}{4}$ NE $\frac{1}{4}$ 40 ac.	All alternatives
144	T. 32 N., R. 87 W., Sec. 31: NW $\frac{1}{4}$ SE $\frac{1}{4}$ 40 ac.	All alternatives
145	T. 31 N., R. 87 W., Sec. 5: SE $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$ 80 ac.	All alternatives
146	T. 31 N., R. 87 W., Sec. 28: W $\frac{1}{2}$ NE $\frac{1}{4}$ 80 ac.	Alternatives B and C and D with restrictions
147	T. 32 N., R. 85 W., Sec. 13: NE $\frac{1}{4}$ NE $\frac{1}{4}$ 40 ac.	All alternatives
149	T. 30 N., R. 85 W., Sec. 7: SE $\frac{1}{4}$ SW $\frac{1}{4}$ 18: E $\frac{1}{2}$ NW $\frac{1}{4}$ 120 ac.	Alternative A
150	T. 30 N., R. 85 W., Sec. 29: NW $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$ 80 ac.	Alternative A

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
151	T. 30 N., R. 85 W., Sec. 28: SW $\frac{1}{4}$ SW $\frac{1}{4}$ 40 ac.	Alternatives A and D
158	T. 29 N., R. 88 W., Sec. 20: NE $\frac{1}{4}$ NW $\frac{1}{4}$, E2NW $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ 19: N $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ 100 ac.	Alternatives A and D
160	T. 28 N., R. 89 W., Sec. 24: SW $\frac{1}{4}$ NW $\frac{1}{4}$ 40 ac.	All alternatives
167	T. 33 N., R. 93 W., Sec. 33: E $\frac{1}{2}$ E $\frac{1}{2}$ 34: W $\frac{1}{2}$ NW $\frac{1}{4}$ 240 ac.	All alternatives
168	T. 29 N., R. 92 W., Sec. 1: NE $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$ 2: NE $\frac{1}{4}$ SW $\frac{1}{4}$, S1/2 SW $\frac{1}{4}$, SE $\frac{1}{4}$ 3: SE $\frac{1}{4}$ SE $\frac{1}{4}$ 11: NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$, SE $\frac{1}{4}$ 12: All 13: N $\frac{1}{2}$ 14: NE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$ T. 29 N., R. 91 W., Sec. 6: NW $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$ SEC $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$ 7: SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$ 18: N $\frac{1}{2}$ NW $\frac{1}{4}$ 3,240 ac.	Alternative D

Parcel No.	Legal Description	Identified for Disposal in Alternatives:
169	T. 33 N., R. 90 W., Sec. 9: Lots 1 and 2, and NE$\frac{1}{4}$SE$\frac{1}{4}$; 10: Lots 1-3, inclusive, NW$\frac{1}{4}$, W$\frac{1}{2}$SE$\frac{1}{4}$, and the unpatented portion of Mineral Survey No. 644 lying within Sec. 10; 15: Lots 1-8, inclusive, S$\frac{1}{2}$NE$\frac{1}{4}$, NW$\frac{1}{4}$NE$\frac{1}{4}$, N$\frac{1}{2}$SE$\frac{1}{4}$, SE$\frac{1}{4}$SE$\frac{1}{4}$, and the unpatented portions of Mineral Survey Nos. 587 and 644 lying within Sec. 15; 21: E$\frac{1}{2}$NE$\frac{1}{4}$, and NE$\frac{1}{4}$SE$\frac{1}{4}$; 22: Lots 1-4, inclusive, NE$\frac{1}{4}$NE$\frac{1}{4}$, and the unpatented portions of Mineral Survey Nos. 582, 584, and 587 lying within the N$\frac{1}{2}$, NW$\frac{1}{4}$SW$\frac{1}{4}$, and N$\frac{1}{2}$SE$\frac{1}{4}$ 1,091 ac.	Alternative D
170	T. 32 N., R. 85 W., Section 15: NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ 2.5 ac.	Alternative D
171	T. 32 N., R. 85 W., Sec. 15: W$\frac{1}{2}$NW$\frac{1}{4}$NW$\frac{1}{4}$NW$\frac{1}{4}$SE $\frac{1}{4}$ 1.25 ac.	Alternative D

Appendix T. Surface Disturbance and Reasonable Foreseeable Actions

This appendix includes information on surface disturbance and reasonable foreseeable actions within the planning area. Table T.1, “Summary of Projected Acres of Surface Disturbance by Resource” (p. 1642) provides projected acres of surface disturbance by resource. Table T.2, “Oil and Gas Reasonable Foreseeable Development Assumptions” (p. 1649) provides foreseeable development assumptions for oil and gas; the projected surface disturbances for oil and gas in Table T.1, “Summary of Projected Acres of Surface Disturbance by Resource” (p. 1642) are based on the project assumptions in Table T.2, “Oil and Gas Reasonable Foreseeable Development Assumptions” (p. 1649). Assumptions for all other resources are provided in each resource section in Table T.1, “Summary of Projected Acres of Surface Disturbance by Resource” (p. 1642).

Table T.1. Summary of Projected Acres of Surface Disturbance by Resource

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Mineral Resources – Leasable Oil and Gas (includes CBNG)				
Acres Short-Term Disturbance from BLM Actions	15,405	10,720	15,473	14,473
Acres Reclaimed from BLM Actions	7,410	5,242	7,441	6,978
Acres Long-Term Disturbance from BLM Actions	7,995	5,478	8,032	7,495
Acres Short-Term Disturbance from Non-BLM Actions	7,070	7,060	7,070	7,060
Acres Reclaimed from Non-BLM Actions	3,359	3,354	3,359	3,354
Acres Long-Term Disturbance from Non-BLM Actions	3,711	3,706	3,711	3,706
Mineral Resources - Locatable				
Acres Short-Term Disturbance from BLM Actions	2,169.2	2,169.2	2,169.2	2,169.2
Assumptions	Assumes that historical use will continue for the 20 years of the plan. Notice level activities: assumes 13.46 acres of surface disturbance per year over the 20 years of the plan, based upon 282 acres total over the period 1989-2009. Plan of Operations level activities: Assumes 95 acres of surface disturbance per year based on 1,995.3 total acres over the last 21 years.			
Acres Reclaimed from BLM Actions	269.2	269.2	269.2	269.2
Assumptions	Assumes that the 13.46 acres per year of short-term disturbance from actions under a Notice are reclaimed within two years.			
Acres Long-Term Disturbance from BLM Actions	1,900	1,900	1,900	1,900
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Assumptions	BLM manages almost all locatable minerals (see Chapter 3) and it is speculative as to how much development will occur.			
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Mineral Resources – Mineral Material Disposals				
Acres Short-Term Disturbance from BLM Actions	3,660	3,660	3,660	3,660
Acres Reclaimed from BLM Actions	3,660	3,660	3,660	3,660
Assumptions	Assumes that historical averages of 183 acres per year will continue at past rate, which reflects the use of mineral materials for extensive AML reclamation. Assumes that area will be reclaimed upon completion of the removal of the material.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Assumptions	Assumes demand for mineral material is flat. Therefore, either there will be no mineral materials disposals on state and private land or if there are, the federal disturbance would be reduced by an equal amount.			
Acres Short-Term Disturbance from Non-BLM Actions	0	0	0	0
Acres Reclaimed from Non-BLM Actions	0	0	0	0

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Fire and Fuels Management ¹				
<i>Prescribed Fire</i>				
Acres Short-Term Disturbance from BLM Actions	6,000	20,000	6,000	10,000
Assumptions	Assumes 300 acres per year for 20 years.	Assumes 1,000 acres per year for 20 years.	Assumes 300 acres per year for 20 years.	Assumes 500 acres per year for 20 years.
Acres Reclaimed from BLM Actions	6,000	20,000	6,000	10,000
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Assumptions	BLM considers this too speculative to quantify.			
<i>Mechanical Fuels Treatment</i>				
Acres Short-Term Disturbance from BLM Actions	10,000	30,000	10,000	10,000
Assumptions	Assumes 500 acres per year.	Assumes 1,500 acres per year.	Assumes 500 acres per year.	Assumes 500 acres per year.
Acres Reclaimed from BLM Actions	10,000	30,000	10,000	10,000
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions ²	8,500	8,500	8,500	8,500
Assumptions	Assumes 425 acres per year.	Assumes 425 acres per year.	Assumes 425 acres per year.	Assumes 425 acres per year.
Acres Reclaimed from Non-BLM Actions	8,500	8,500	8,500	8,500
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Assumptions	The number of acres of treatment may be low as it includes estimates from USFS which may increase in the future as pine beetle damaged areas are treated. In addition, WGFD and private parties conduct treatments which have short-term disturbance but limited long-term disturbance.			
Forest, Woodlands, and Forest Products				
Acres Short-Term Disturbance from BLM Actions	375	550	550	600
Assumptions	Assumes historic patterns will continue.	Assumes small increase because of beetle kill.	Assumes small increase because of beetle kill.	Assumes small increase because of beetle kill plus more cutting for safety.
Acres Reclaimed from BLM Actions	375	550	550	600
Assumptions	Assumes all acres will be reclaimed.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Assumptions	BLM considers this too speculative to quantify. Substantial potential exists for forest product removal from the Shoshone National Forest. In Fiscal Year 2010, the Shoshone National Forest had American Recovery and Reinvestment Act related stimulus funds and treated approximately 5,000 acres. Generally, this number is very low.			
Invasive Species				
Acres Short-Term Disturbance from BLM Actions	0	0	0	0
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	10,000	10,000	10,000	10,000
Assumptions	Assumes 500 acres per year.	Assumes 500 acres per year.	Assumes 500 acres per year.	Assumes 500 acres per year.
Acres Reclaimed from Non-BLM Actions	10,000	10,000	10,000	10,000
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Assumptions	Assumes consistent treatment by WGFD on non-BLM surface, treatment by Firewise, and private services. Assumes brush-type treatments which are fully reclaimed.			
Renewable Energy - Wind-Energy Development				
Acres Short-Term Disturbance from BLM Actions	2,250	0	108,000	2,250
Assumptions	1 project with 50 turbines over 20 years	No projects	2,400 turbines, averaged to 5,400 acres per year	1 project with 50 turbines over 20 years
Acres Reclaimed from BLM Actions	1,250	0	60,000	1,250
Assumptions	Assumes that 25 acres/turbine will be reclaimed within 2 years and that 20 acres/turbine will be long-term surface disturbance.			
Acres Long-Term Disturbance from BLM Actions	1,000	0	48,000	1,000
Rights-of-Way (ROW)				
Telephone and Fiber Optics				
Acres Short-Term Disturbance from BLM Actions	269	54	277	144
Assumptions	13.43 per year (historic trend)	2.68 per year (historic trend reduced by percent based on areas excluded to ROW)	13.83 per year (historic trend increased by percentage reduced areas excluded to ROW)	7.22 per year (historic trend reduced by percentage areas excluded to ROW)
Acres Reclaimed from BLM Actions	269	54	277	144
Assumptions	Assumes that any disturbance is reclaimed within 2 years.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
<i>Pipelines (oil and gas)</i>				
Acres Short-Term Disturbance from BLM Actions	8,950	7,017	9,208	8,555
Assumptions	Assumes historic average will continue.	Assumes historic average reduced by percent fewer wells.	Assumes historic average increased by percent more wells.	Assumes historic average reduced by percent fewer wells.
Acres Reclaimed from BLM Actions	8,950	7,017	9,208	8,555
Assumptions	Assumes pipelines will be reclaimed within 2 years.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Roads²</i>				
Acres Short-Term Disturbance from BLM Actions	231.80	36.36	237.93	115.5
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	231.80	36.36	237.93	115.5
Assumptions	Assumes historic average will continue.	Assumes historic average reduced by percent excluded to ROW.	Assumes historic average increased by percent open to ROW.	Assumes historic average reduced by percent excluded to ROW.
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Powerlines (power and telephone)</i>				
Acres Short-Term Disturbance from BLM Actions	1,969.2	393.84	2,028	984.6
Assumptions	Assumes historic average will continue.	Assumes historic average reduced by percent excluded to ROW.	Assumes historic average increased by percent open to ROW.	Assumes historic average reduced by percent excluded to ROW.
Acres Reclaimed from BLM Actions	1,969.2	393.84	2,028	984.6
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Communication Sites</i>				
Acres Short-Term Disturbance from BLM Actions	412.8	15	425.18	57.84

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Assumptions	Assumes historic average of 20.64 acres per year will continue.	Assumes minor expansion of designated sites will be disturbed at a rate lower than historical average.	Assumes historic average increased by percent open to ROW.	Assumes minor expansion of designated sites will be disturbed at a rate lower than historical average.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	412.8	57.84	425.18	57.84
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Other Facilities³</i>				
Acres Short-Term Disturbance from BLM Actions	39	30.6	40	37.32
Assumptions	Assumes historic average of 1.95 acres per year will continue.	Assumes 1.53 acres (historic average reduced by percent fewer wells).	Assumes 2 acres per year acres (historic average increased by percent more wells).	Assumes 1.87 acres (historic average reduced by percent fewer wells).
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	39	30.6	40	37.32
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Livestock Grazing				
<i>Spring Development</i>				
Acres Short-Term Disturbance from BLM Actions	82.4	0	88.4	45.76
Assumptions	Assumes 4.12 acres per year.	Assumes 0 acres per year.	Assumes 4.42 acres per year.	Assumes 2.29 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	82.4	0	88.4	45.76
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Reservoir/Pit Development</i>				
Acres Short-Term Disturbance from BLM Actions	220	0	240	121
Assumptions	Assumes 11 acres per year.	Assumes 0 acres per year.	Assumes 12 acres per year.	Assumes 6 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	220	0	240	121
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Fence Development</i>				
Acres Short-Term Disturbance from BLM Actions	443.8	0	1,432	620
Assumptions	Assumes 22.19 acres per year.	Assumes no fences.	Assumes 71.6 acres per year.	Assumes 31 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	443.8	0	1,432	620
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Well Development</i>				
Acres Short-Term Disturbance from BLM Actions	113.8	0	236	60.4
Assumptions	Assumes 5.69 acres per year.	Assumes no wells.	Assumes 11.80 per year.	Assumes 3.02 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	113.8	0	236	60.4
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Cumulative Disturbance				
Total Acres Short-Term Disturbance from BLM Actions	52,591	74,689	160,065	53,894
Total Acres Reclaimed from BLM Actions	40,152	67,186	99,433	42,441
Total Acres Long-Term Disturbance from BLM Actions	12,439	7,502	60,631	11,453
Total Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Total Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Total Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Cumulative Long-Term Acres of Disturbance	Unknown	Unknown	Unknown	Unknown
¹ Areas disturbed by mechanical fuels treatment will naturally be reclaimed within 3 to 5 years; areas disturbed by prescribed fire will naturally be reclaimed within 3 to 5 years. ² Approximately 50 percent of roads would be oil and gas related (based on the <i>Reasonable Foreseeable Development Scenario for Oil and Gas, Lander Field Office, Wyoming</i>). ³ Historically, these facilities are oil and gas. AML abandoned mine land BLM Bureau of Land Management CBNG coalbed natural gas ROW right-of-way USFS United States Forest Service WGFD Wyoming Game and Fish Department				

Table T.2. Oil and Gas Reasonable Foreseeable Development Assumptions

Well Projections	Alternative A	Alternative B	Alternative C	Alternative D
Well Projections on BLM-Administered Land for Existing Active Wells and All New Wells (short-term)				
Existing Wells (total)	887	887	887	887
Non-coalbed Exploratory	113	113	113	113
Non-coalbed Development	722	722	722	722
CBNG	5	5	5	5
Deep	47	47	47	47
New Wells (total)	2,274	1,528	2,284	2,125
Non-coalbed Exploratory	237	189	237	227
Non-coalbed Development	1,511	1,209	1,516	1,447
CBNG	480	93	484	406
Deep	46	37	47	45
Well Projections on BLM-Administered Land for All New Producing Wells and Existing Active Wells Less Abandonments (long-term)				
Existing Wells (total)	675	675	675	675
Non-coalbed Exploratory	85	85	85	85
Non-coalbed Development	545	545	545	545
CBNG	5	5	5	5
Deep	40	40	40	40
New Wells (total)	1,820	1,194	1,828	1,695
Non-coalbed Exploratory	142	113	142	136
Non-coalbed Development	1,209	967	1,213	1,158
CBNG	432	84	436	365
Deep	37	30	38	36
Well Projections on Non-BLM-Administered Land for Existing Active Wells and All New Wells (short-term)				
Existing Wells	1,377	1,377	1,377	1,377
Non-coalbed Exploratory	180	180	180	180
Non-coalbed Development	1,148	1,148	1,148	1,148
CBNG	23	23	23	23
Deep	26	26	26	26
New Wells	1,060	1,060	1,060	1,060
Non-coalbed Exploratory	94	94	94	94
Non-coalbed Development	596	597	596	597
CBNG	343	343	343	343
Deep	27	26	27	26
Well Projections on Non-BLM-Administered Land for All New Producing Wells and Existing Active Wells Less Abandonments (long-term)				
Existing Wells	1,102	1,102	1,102	1,102
Non-coalbed Exploratory	145	145	145	145

Well Projections	Alternative A	Alternative B	Alternative C	Alternative D
Non-coalbed Development	926	926	926	926
CBNG	11	11	11	11
Deep	20	20	20	20
New Wells	864	864	864	864
Non-coalbed Exploratory	56	56	56	56
Non-coalbed Development	477	478	477	478
CBNG	309	309	309	309
Deep	22	21	22	21
Assumptions	Surface disturbance resulting from the well projections above assume the following acres of surface disturbance for each type of well from well pads, access roads, and flow lines: • Short-term well projections (new wells): ○ Non-coalbed exploratory (12.5 acres of surface disturbance per well) ○ Non-coalbed development (6 acres of surface disturbance per well) ○ CBNG (5.5 acres of surface disturbance per well) ○ Deep (16 acres of surface disturbance per well) • Long-term well projections: ○ Non-coalbed exploratory (9 acres of surface disturbance per well) ○ Non-coalbed development (4 acres of surface disturbance per well) ○ CBNG (3.5 acres of surface disturbance per well) ○ Deep (10 acres of surface disturbance per well)			
Source: Reasonable Foreseeable Development Scenario for Oil and Gas, Lander Field Office, Wyoming (BLM 2009c)				
BLM Bureau of Land Management CBNG coalbed natural gas				

Appendix U. Technical Support Document for Air Resources

U.1. Introduction

This air resources technical support document describes the data and methodology used to conduct and serve as the basis for the air quality impact analysis included in Chapter 4 of the Lander Resource Management Plan (RMP) and Environmental Impact Statement (EIS).

U.1.1. Study Area

The study area for this analysis is focused on the Lander Field Office planning area and includes cumulative emission sources and potential impacts to Class I areas within 100 kilometers of the planning area. Federal Prevention of Significant Deterioration (PSD) Class I areas are afforded special protection under the 1970 Clean Air Act (CAA). This study includes the following Class I areas, which were selected due to their close proximity to the Lander Field Office.

- Bridger Wilderness Area
- Fitzpatrick Wilderness Area
- Washakie Wilderness Area
- Yellowstone National Park
- Teton Wilderness Area
- Grand Teton National Park

U.1.2. Pollutants Addressed in the Analysis

The basic framework for controlling air pollutants in the United States is mandated by the CAA and its amendments and the 1999 Regional Haze Regulations. The CAA addresses criteria air pollutants, National Ambient Air Quality Standards (NAAQS) for criteria air pollutants, the PSD program, and emission standards for hazardous air pollutants (HAPs). The Regional Haze Regulations address visibility impairment.

Criteria pollutants are those for which NAAQS have been established. Ambient air concentrations of these constituents greater than the national standards represent a risk to human health. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone (O₃), particulate matter (PM₁₀, PM_{2.5}), and lead. Volatile organic compounds (VOCs) are a group of pollutants for which there is no established ambient air quality standard but which are regulated under the CAA. VOCs are organic compounds that participate in photochemical reactions in the atmosphere and are critical to O₃ formation. HAPs are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological impacts. The United States Environmental Protection Agency (EPA) has issued reference concentrations for evaluating the inhalation risk for cancerous and noncancerous health impacts for chronic inhalation. Pollutants that are responsible for degradation of visibility and atmospheric deposition include sulfur and nitrogen compounds and fine particulate matter (PM_{2.5}). Nitric acid and nitrate are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NO_x). Sulfate is formed in the atmosphere from industrial emissions of SO₂. Deposition

of these compounds can adversely impact terrestrial and aquatic vegetation, soil chemistry, and aquatic chemistry. Ambient concentrations of these pollutants can cause reduced visibility (haze). Greenhouse gases (GHGs) are those pollutants that are effective at trapping heat in the earth's atmosphere and have been attributed to climate change. These pollutants include carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

The air pollutants addressed in this analysis included criteria pollutants (NO_x, PM₁₀, PM_{2.5}, CO, SO₂, and O₃), VOCs, HAPs, and GHGs (specifically CO₂, CH₄, and N₂O). These pollutants were included in this analysis because: 1) they were identified as compounds that had potential to be emitted by management actions and activities within the planning area; 2) sufficient production and operational data was available to estimate emissions; and, 3) scientifically defensible or actual emission factors were available to quantify emissions. Lead, a criteria pollutant, was primarily a concern before the widespread use of unleaded gasoline and emissions from fuel combustion were a concern. Lead was not included in this analysis as emissions from projected activities would be negligible. Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the analysis of GHGs because the proposed management activities and actions are not typically sources of these pollutants and emissions would be negligible or zero.

U.1.3. Thresholds of Significance

Criteria Pollutants

In order to protect and enhance the quality of the nation's air resources, EPA established NAAQS. Wyoming Department of Environmental Quality (DEQ) has established Wyoming Ambient Air Quality Standards (WAAQS). Primary standards are set at the level required to protect human health with an "adequate margin of safety" and must safeguard the public as a whole. Secondary standards are set at the level that protects public welfare, which is defined to include all forms of environmental damage, including but not limited to impacts on visibility, water, soil, and climate. Table U.1, "National and Wyoming Ambient Air Quality Standards" (p. 1652) shows the current NAAQS and WAAQS. The Bureau of Land Management (BLM) cannot authorize any activity that would not conform to all applicable local, state, tribal, and federal air quality laws, regulations, standards.

Table U.1. National and Wyoming Ambient Air Quality Standards

Pollutant	Averaging Time	National Ambient Air Quality Standards						Wyoming Ambient Air Quality Standards		
		Primary			Secondary			Primary		
		(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)
Carbon Monoxide	1 hour	35 (a)	35,000	40,000	None			35	35,000	40 (mg/m³)
	8 hour	9 (a)	9,000	10,000	None			9	9,000	10 (mg/m³)
Lead	Rolling 3-month	---	---	0.15	Same as Primary			---	---	0.15
Nitrogen Dioxide	1 hour	0.1	100 (b)	189	None			---	---	---
	Annual (Arithmetic Mean)	0.053	53	100	Same as Primary			0.05	50	100

Pollutant	Averaging Time	National Ambient Air Quality Standards						Wyoming Ambient Air Quality Standards		
		Primary			Secondary			Primary		
		(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)	(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)	(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)
PM ₁₀	24 hour	---	---	150 (c)	Same as Primary			---	---	150 (c)
	Annual (Arithmetic Mean)	None			None			---	---	50
PM _{2.5}	24 hour	---	---	35 (d)	Same as Primary			---	---	35 (d)
	Annual (Arithmetic Mean)	---	---	15.0 (e)	Same as Primary			---	---	15.0 (e)
Ozone	8 hour	0.075 (f)	75	147	Same as Primary			0.08	80	157
Sulfur Dioxide	1 hour	0.075	75 (g)	197	None			---	---	---
	3 hour	None			0.5 (a)	500	1,300	0.50	500	1,300
	24 hour	None			None			0.10	100	260
	Annual (Arithmetic Mean)	None			None			0.02	20	60
Hydrogen Sulfide	1/2 hour average	---	---	---	---	---	---	0.05	50	70 (h)
	1/2 hour average	---	---	---	---	---	---	0.03	30	40 (i)

Note: **Bold** indicates the standard as written in the corresponding regulation. Other values are conversions.

(a) Not to be exceeded more than once per year. (b) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010). (c) Not to be exceeded more than once per year on average over 3 years. (d) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu\text{g}/\text{m}^3$ (effective December 17, 2006). (e) To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu\text{g}/\text{m}^3$. (f) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective March 27, 2008). (g) To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (effective June 22, 2010). (h) Not to be exceeded more than two times per year. (i) Not to be exceeded more than two times in any five consecutive days.

PM_{2.5} particulate matter less than 2.5 microns in diameter

ppb parts per billion

ppm parts per million

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter

mg/m³ milligrams per cubic meter

The CAA includes provisions for the PSD in designated areas. The goal of the PSD program is “to preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores and other areas of special national or regional natural, recreation, scenic or historic value.” A classification system was established identifying allowable amounts of additional air quality degradation (increments) which would be allowed above legally established baseline levels (Table U.2, “Prevention of Significant Deterioration Increments” (p. 1654)). PSD Class I areas have the greatest limitations, with a very limited amount of additional degradation allowed, primarily national parks and wilderness areas. The remainder of the nation (outside non-attainment and maintenance areas) was designated as PSD Class II areas, where moderate deterioration and controlled growth is allowed. In its project specific EISs, BLM may compare cumulative concentrations of air pollutants to the PSD increments as an indication of a level of concern.

Table U.2. Prevention of Significant Deterioration Increments

Pollutant	Averaging Period	PSD Increment – Class I ($\mu\text{g}/\text{m}^3$)	PSD Increment – Class II ($\mu\text{g}/\text{m}^3$)
Sulfur Dioxide (SO_2)	3 hour	25	512
	24 hour	5	91
	Annual	21	20
Particulate Matter (PM_{10})	24 hour	8	30
	Annual	4	17
Nitrogen Dioxide (NO_2)	Annual	2.5	25
Carbon Monoxide (CO)	1 hour	None	None
	8 hour	None	None
Lead 3 months	3 months	None	None
Source: 40 CFR 51.166(c)			
PSD Prevention of Significant Deterioration $\mu\text{g}/\text{m}^3$ micrograms per cubic meter			

Hazardous Air Pollutants

Section 112 of the CAA lists more than 180 chemicals as HAPs. In addition, Sections 112(d) and 112(g) require regulatory agencies to establish Maximum Achievable Control Technology (MACT) Standards for sources that emit HAPs. Any source that emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs is considered a major source and will require a Title V, Part 70, operating permit review and permit. In addition to MACT standards, EPA has listed (on its Air Toxics Database) Reference Exposure Levels (RELs) for many of the HAPs. RELs are defined as concentrations at or below which no adverse health effects are expected.

Visibility

Changes in visibility or regional haze are caused by fine particles and gases scattering and absorbing light. A 1.0 deciview (dv) change in light extinction is considered potentially significant in mandatory Federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 Code of Federal Regulations [CFR] §51.300 et seq.). A 1.0-dv change is defined as approximately a 10 percent change in the extinction coefficient (corresponding to a 2 to 5 percent change in contrast, for a black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory Federal Class I areas. For multi-source projects located within range of a Class I area, changes in extinction of less than 5 percent (0.5 dv) are generally considered unlikely to result in adverse impacts to visibility. Changes in extinction greater than 10 percent (1.0 dv) are generally considered unacceptable and will likely require additional more refined impact analysis typically including an evaluation of mitigation measures.

Atmospheric Deposition

The National Park Service (NPS) and United States Fish and Wildlife Service (USFWS) have established thresholds to evaluate nitrogen and sulfur deposition within Class I areas. These deposition analysis thresholds are defined as 0.005 kilogram per hectare per year (kg/ha/yr) in the western United States for both nitrogen and sulfur. These thresholds are typically used to analyze project alone impacts. Cumulative impacts are typically compared to the level of concern, which is defined by the NPS and USFWS as 3 kg/ha/yr for N and 5 kg/ha/yr for sulfur (Fox et al.1989)

in Rocky Mountain regions. Deposition rates that are below the level of concern are believed to cause no adverse impacts.

Lake Chemistry

The USFWS considers lake chemistry changes to be potentially significant if the screening methodology predicts decreases in acid neutralizing capacity (ANC) of more than defined limits of acceptable change (LAC). A lake's LAC depends on its background ANC value. The LAC is defined as a 10 percent change for lakes with ANC background values greater than 25 microequivalents per liter (meq/l) and is defined as a change of 1 meq/l for lakes with ANC background values less than 25 meq/l. If a lake's ANC is predicted to decrease by more than the applicable LAC then potential changes to lake chemistry may cause adverse effects and a more detailed analysis of lake chemistry impacts would be required.

U.1.4. Emissions Generating Activities Included in Analysis

Air pollutant emissions were estimated for 11 different types of management actions or activities that were identified as having the potential to generate emissions of the specified pollutants. The following is a list summarizing the 11 sectors and the specific activities under each sector for which potential emissions were quantified.

Leasable Minerals – Conventional Oil and Gas Development

- Well pad and compressor station pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well completion flares
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors
- Dehydrator, separator, and water tank heaters
- Dehydrator vents
- Tank venting, flashing, and loadout
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

Leasable Minerals – Coalbed Natural Gas Development

- Well pad, compressor station pad, and water disposal well pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors

- Dehydrator and tank heaters
- Dehydrator vents
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

Locatable Minerals – Bentonite Mining

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Exploratory drilling
- Exploratory excavation and reclamation
- Mine development excavation and reclamation
- Product handling, transfer, and storage

Locatable Minerals – Gold Mining

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Exploratory drilling
- Exploratory excavation and reclamation
- Mine development excavation and reclamation
- Product handling, transfer, and storage

Locatable Minerals – Uranium Mining

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Injection well, production well, and monitoring well construction
- Well drilling and workovers
- Road and pipeline construction
- Road and well pad maintenance and reclamation
- Transport of resin

Salable Minerals – Sand, Gravel, and other Mineral Development

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Product handling, transfer, and storage
- Wind erosion

Fire Management and Ecology – Planned and Prescribed Fire

- Heavy equipment exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Mechanical equipment (chainsaws, etc.) exhaust
- Smoke from prescribed fire

Vegetation – Forests, Woodlands, and Aspen Communities Management

- Heavy equipment and mechanical equipment exhaust and fugitive dust associated with tree harvesting, pole and post harvesting, firewood collection, tree salvaging, and weed control
- Commuting vehicle exhaust and fugitive dust

Land Resources – Renewable Energy, Rights-of-Way, and Corridor Projects

- Heavy equipment and mechanical equipment exhaust and fugitive dust associated with the construction of wind energy projects, telephone and fiber optics sites, pipelines, roads, powerlines, and communication sites.
- Commuting vehicle exhaust and fugitive dust

Land Resources – Comprehensive Trails and Travel Management

- Recreation trail and road maintenance
- Off-highway vehicles (OHVs)

Land Resources – Livestock Grazing

- Heavy equipment exhaust and fugitive dust associated with construction of springs, reservoirs, wells, pipelines, fences, and reservoir maintenance
- Commuting vehicle exhaust and fugitive dust
- Enteric fermentation and manure

There were some management activities that emissions were not estimated for because development potential was low, emissions were considered to be minor, or insufficient data was available to calculate emissions. Emissions from the following management actions were not estimated because the potential for development was considered low: coal mining, phosphate mining, oil shale development, geothermal development, gemstones and lapidary materials development. Emissions from the following management actions were not estimated because: (1) the level of activity is not expected to change between alternatives, (2) the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or (3) sufficient operational or production data was not available to quantify emissions: wildfires, invasive species and pest management, grassland and shrub land management, wild horse management and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

U.2. Methodology

The air quality impact analysis included compiling an emissions inventory for existing conditions within the planning area as well as for projected future development. Emissions were estimated for each alternative and a comparative analysis was conducted. Emissions were based on reasonable future actions that were identified as having the potential to result in increased emissions of air pollutants. Emission estimates calculated for this analysis should not be assumed to be a definitive representation of future emissions. Depending on future economic conditions, mining and drilling methods, air pollution control technologies, and other factors that influence the pace of development, actual future emissions could be considerably different than presented. In addition, the size, location, and pace of development for future projects are not well known at this planning stage. For these reasons, it was determined that air quality modeling would not be included in this analysis. The input data required to conduct a modeling analysis was not available

and although “surrogate” input data could be used to force model results, those results would not be valuable to the decision maker or the public. As part of the National Environmental Policy Act (NEPA) analysis for actual development projects, the BLM will conduct an air quality analysis that will include air dispersion modeling of both project and cumulative impacts for those projects that may have a significant impact on air quality within the planning area.

For this analysis, air pollutant emissions were estimated over the 20 year life of project (LOP) for three specific years. The base year selected was 2008 because actual production, operational, and development data was most recently available for this year. The year 2018 was selected for the short-term year as development and construction projections for this year were the greatest across all resources. The year 2027 was selected as being representative of operational emissions over the long term. This section gives specific details on how emissions were estimated for the air resources analysis. The tables located in Section U.4, “Summary of Emissions” (p. 1665), at the end of this appendix summarize the projected total annual emissions by resource for 2008, 2018, and 2027.

U.2.1. Emission Calculations by Category

Leasable Minerals – Conventional Oil and Gas Development and Coalbed Natural Gas Development

The basis for emission calculations for conventional oil and gas development was the Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas, Lander Field Office (BLM 2009c). According to the RFD up to 2,517 new conventional oil and natural gas wells and 827 coalbed natural gas (CBNG) wells may be drilled within the Lander Field Office planning area during the next 20 years. These numbers reflect the maximum level of development that can be expected during this time period. Table U.3, “Number of Existing and Proposed Wells by Alternative” (p. 1658) shows the number and types of wells for each alternative for both BLM wells and for non-BLM (private, state, or other federal) wells.

Table U.3. Number of Existing and Proposed Wells by Alternative

	Conventional Wells (Non-BLM)	Conventional Wells (BLM)	CBNG Wells (Non-BLM)	CBNG Wells (BLM)
Existing	2,236	882	28	5
Year – 2018				
Alternative A	2,511	1,794	823	480
Alternative B	2,152	1,435	436	93
Alternative C	2,517	1,800	827	484
Alternative D	2,436	1,719	749	406
Year – 2027				
Alternative A	1,942	1,388	741	432
Alternative B	1,665	1,110	392	84
Alternative C	1,948	1,392	744	436
Alternative D	1,885	1,330	674	365
Source: BLM 2009c				
BLM Bureau of Land Management CBNG coalbed natural gas				

The following list identifies the assumptions and sources of information used in the calculations of emissions for this category:

Appendix U Technical Support Document for Air Resources
Emission Calculations by Category

February 2013

- Emission factors for drill rig engines, diesel powered heavy (construction) equipment, generator engines, and other oil field equipment were obtained from EPA NONROADS 2008a Emissions Model (EPA 2009c).
- Emission factors for natural gas fired compressor engines were based on NSPS Emission Standards for Spark Ignition Engines 40 CFR Part 60 JJJJ, recent Best Available Control Technology (BACT) determinations by Wyoming DEQ, EPA's AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995a), and American Petroleum Institute's (API) Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).
- Emission factors for on-road vehicles were obtained from EPA's MOBILE6.2 Motor Vehicle Emission Factor Model (EPA 2006).
- Emission factors for VOC and HAPs emissions oil and gas sources were based on EPA's AP-42, EPA's Protocol for Equipment Leak Emissions Estimates (EPA 1995b), Gas Technology Institute GRI-GLYCalc 4.0 emissions estimating software (GTI 2000), EPA's Natural Gas STAR Program (EPA No Date), Wyoming DEQ's Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2 revised March 2010 (Wyoming DEQ 2010b), and field gas analyses from the planning area.
- Activity and equipment data were obtained from resource specialists in the Lander Field Office, existing operator experience from producing fields in the planning area, and professional judgment.
- It was assumed that (1) natural gas fired engines would be equipped with non-selective catalytic reduction technology, (2) VOC and HAP emissions from dehydrators, tank flashing, pneumatic pumps, and produced water tanks would be controlled to 98 percent efficiency per Wyoming DEQ BACT, (3) and drill rig engines would comply with Tier II or better emission standards.
- It was assumed that water application as a best management practice (BMP) would reduce fugitive dust emissions from ground-disturbing activities during construction and reclamation activities and maintenance of roads by 50 percent from uncontrolled levels.

Locatable Minerals – Bentonite Mining

Emissions estimates for future bentonite mining were based on operating data from the one existing bentonite mine in the planning area and development potential estimated in the Final Mineral Occurrence and Development Potential Report (BLM 2009b). Because alternatives A and C would include the fewest restrictions on potential bentonite mining, it was assumed that in addition to the existing mine, two additional mines with similar operational characteristics would be operational in 2018 and 2027. Because of the additional restrictions on mineral development and the location of designated Areas of Critical Environmental Concern under Alternative B, it was assumed that only the existing mine would operate in the future. For Alternative D it was assumed that the existing mine and one additional mine would be operational in 2018 and 2027. Emission factors for this category were obtained from EPA's AP-42 (EPA 1995a), EPA's NONROADS 2008a Emissions model (EPA 2009c), EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2006), and API's Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).

Locatable Minerals – Gold Mining

Emissions estimates for future gold mining were based on the Decision Record and Environmental Assessment for the Rattlesnake Hills Gold Exploration Drilling Project, (BLM 2010l) located in the planning area, development potential estimated in the Final Mineral Occurrence and

Development Potential Report (BLM 2009b), and existing exploratory operations. It was assumed that the gold mining operations in the planning area consist of typical surface mining techniques and all processing is done offsite outside of the planning area. It was assumed that gold mining operations would be similar for all alternatives. Future emissions were based on the assumption that exploratory operations would continue and one mine similar to the proposed Rattlesnake Hills Project would be operational in 2018 and 2027. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, and EPA's MOBILE6.2 motor vehicle emission factor model.

Locatable Minerals – Uranium Mining

Emission estimates for future uranium mining were based on the Plan of Operations for the proposed Gas Hills project, development potential estimated in the Final Mineral Occurrence and Development Potential Report (BLM 2009b), and existing exploratory operations. The assumptions for uranium mining were predicated on in-situ recovery mining. It is likely that open pit and underground conventional mines will be proposed and approved. However, the air emissions associated with those future projects will be analyzed on a site-specific basis. As of 2011, the BLM had begun preparing an EIS for a Plan of Operations for a conventional mine. Air emissions, including those associated with the Heap Leach Mill operation, are being analyzed. Those data are not yet available for inclusion in this document. Future emissions were based on the assumption that exploratory operations would continue and two mines similar to the proposed Gas Hills Project would be operational in 2018 and 2027 for alternatives. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, EPA's MOBILE6.2 motor vehicle emission factor model, and API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry.

Salable Minerals – Sand, Gravel, and other Mineral Development

Emissions were estimated for this category primarily for sand and gravel sales and free use permits but also included moss rock, limestone, and soil and fill permits and sales. Existing emission calculations were based on the average of permit and sales records from 1989 – 2009. Future emission calculations were based on the permit and sales records and the Final Mineral Occurrence and Development Potential Report (BLM 2009b). Future emissions were calculated using estimated tons of material to be processed for each alternative. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, and EPA's MOBILE6.2 motor vehicle emission factor model.

Fire Management and Ecology – Planned and Prescribed Fire

Emission estimates for fire management were based on the number of acres of disturbance projected for each alternative for mechanical treatments and for prescribed burning. Emissions factors for mechanical treatments (heavy equipment, all terrain vehicles, and chain saws) were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. Emission factors for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, CH₄, and N₂O from smoke were obtained from Western Governors Association/Western Regional Air Partnership (WRAP) 2002 Fire Emission Inventory for the WRAP Region-Phase II (WRAP 2005).

Vegetation – Forests, Woodlands, and Aspen Communities Management

Appendix U Technical Support Document for Air Resources

Emission Calculations by Category

February 2013

Emissions were estimated for this category for activities related to forest management (silviculture, insect control, and forest products harvesting) and were based on the numbers of acres of surface disturbance projected for each alternative. Emission factors for heavy equipment and logging equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model.

Land Resources – Renewable Energy, Rights-of-Way, and Corridor Projects

Emissions were estimated for this category for several surface-disturbing projects under Land Resources. Table U.4, "Basis for Emissions Calculations for Land Resources Projects" (p. 1661) shows the key criteria projected under each alternative that were used to as the basis for emissions calculations. Emission factors for surface-disturbing activities were obtained from EPA's AP-42. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model.

Table U.4. Basis for Emissions Calculations for Land Resources Projects

Type of Project	Alternative A	Alternative B	Alternative C	Alternative D
Wind energy projects - acres of disturbance for life of project (20 years)	2,250	0	108,000	2,250
Wind energy projects - number of turbines	50	0	2,400	50
Telephone and fiber optics projects - acres of disturbance per year	13.43	2.68	13.83	7.22
Pipelines projects - acres of disturbance per year	447	351	460	427
Roads (non-mineral) projects - acres of disturbance per year	231.8	46.36	237.93	115.5
Powerline projects - acres of disturbance per year	98.46	19.69	101.41	49.23
Communication sites - acres of disturbance per year	20.64	9.64	21.46	9.64
Other - acres of disturbance per year	39	30.61	40	37.32

Land Resources – Comprehensive Trails and Travel Management

Emission sources under this category included road maintenance within the planning area (recreational roads only, mineral development roads were included in those categories), trail maintenance (including cross-country ski trail grooming), and OHV use within the planning area. Road and trail maintenance emissions were estimated using historical data on miles maintained per year and equipment use. Future emissions were based on the number of miles to be maintained for each alternative. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were

*Appendix U Technical Support Document
for Air Resources
Emission Calculations by Category*

obtained from EPA's MOBILE6.2 motor vehicle emission factor model. OHV emissions were estimated using EPA's NONROADS 2008a Emissions model which calculated annual emissions based on EPA's National Emissions Inventory and county population for 2005. Emissions were then projected for 2008, 2018, and 2027. It was assumed that OHV use would not change by alternative. Emission factors for surface-disturbing activities were obtained from EPA's AP-42.

Land Resources – Livestock Grazing

Emissions were estimated for six construction activities related to livestock grazing: springs, wells, fence, reservoir, and pipeline construction and reservoir maintenance. Emission estimates for these activities were based on the number of acres of disturbance projected for each activity under each alternative. In addition, CH₄ emissions related to animal enteric fermentation and manure deposits were calculated for estimated head of cattle, sheep, and horses projected for each alternative based on current livestock grazing permits. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. Emission factors for enteric fermentation and manure management were obtained from the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2006).

U.3. Mitigation and BMPs

The following table (Table U.5, "Emission Reduction Strategies for Oil and Gas Development" (p. 1662)) outlines emission reduction strategies for oil and gas development in the planning area.

Table U.5. Emission Reduction Strategies for Oil and Gas Development

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Control Strategies for Drilling and Compression			
Directional Drilling	Reduces construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and CO ₂ and nitrogen flux). Reduces habitat fragmentation	Could result in higher air impacts in one area with longer sustained drilling times.	Depends on geological strata
Improved engine technology (Tier 2 or better) for diesel drill rig engines	Reduced NO _x , PM, CO, and VOC emissions		Dependent on availability of technology from engine manufacturers
SCR for drill rig engines and/or compressors	NO _x emissions reduction and decreased formation of visibility impairing compounds. NO _x control efficiency of 95% achieved on drill rig engines. NO _x emission rate of 0.1 g/hp-hr achieved for compressors	Potential NH ₃ emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste	Not applicable to 2-stroke engines

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
NSCR for drill rig engines and/or compressors	NO _x emissions reduction and decreased formation of visibility impairing compounds. NO _x control efficiency of 80-90% achieved for drill rig engines. NO _x emission rate of 0.7 g/hp-hr achieved for compressor engines greater than 100 hp.	Regeneration/disposal of catalysts can produce hazardous waste	Not applicable to lean burn or 2-stroke engines
Natural gas fired drill rig engines	NO _x emissions reduction and decreased formation of visibility impairing compounds		Requires onsite processing of field gas.
Electrification of drill rig engines and/or compressors	Decreased emissions at the source. Transfers emissions to more efficiently controlled source	Displaces emissions to EGU	Depends on availability of power and transmission lines
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines	Reduced NO _x , PM, CO, and VOC emissions		Dependent on availability of technology from engine manufacturers
Green (a.k.a. closed loop or flareless) completions	Reduction in VOC and CH ₄ emissions. Reduces or eliminate flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere.	Temporary increase in truck traffic and associated emissions	Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Availability of sales line. Green completion permits required by Wyoming BACT in some areas
Green workovers	Same as above	Same as above	Same as above
Minimize or eliminate venting and/or use closed loop process where possible during "blow downs"	Same as above		Best Management Practices required by Wyoming BACT
Eliminate open pits	Reduces VOC and GHG emissions. Reduces potential for soil and water contamination. Reduces odors.	May increase truck traffic and associated emissions.	Requires tank and/or pipeline infrastructure.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source.	Displaces emissions to EGU	Depends on availability of power and transmission lines
Wind (or other renewable) generated power for compressors	Low or no emissions.	May require construction of infrastructure. Visual impacts. Potential wildlife impacts.	Depends on availability of power and transmission lines
Control Strategies Utilizing Centralized Systems			
Centralization (or consolidation) of gas processing facilities (separation, dehydration, sweetening, etc.)	Reduced long-term truck traffic and associated emissions. Reduced VOC and GHG emissions from individual dehydrator/separator units.	Temporary increase in construction associated emissions.	Requires pipeline infrastructure.

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Liquids Gathering systems (for condensate and produced water)	Reduced long-term truck traffic and associated emissions. Reduced VOC and GHG emissions from tanks.	Temporary increase in construction associated emissions.	Requires pipeline infrastructure.
Water and/or fracturing liquids delivery system	Reduced long-term truck traffic and associated emissions.	Temporary increase in construction associated emissions unless place above ground.	Requires pipeline infrastructure. Not feasible for some terrain.
Control Strategies for Tanks, Separators, and Dehydrators			
Eliminate use of open top tanks	Reduced VOC and GHG emissions		Required by Wyoming BACT for produced water tanks in some areas.
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.	Reduces VOC and GHG emissions.		98% VOC control if ≥ 10 TPY required statewide by Wyoming BACT
Capture and control of produced water tank emissions.	Reduces VOC and GHG emissions.		98% VOC control and no open top tanks required by Wyoming DEQ in some areas
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion	Reduces VOC, HAP, and GHG emissions		Still vent condensers required and 98% VOC control if ≥ 8 TPY required statewide and in CDA by Wyoming BACT. All dehydration emissions controlled at 98% in JPAD (no 8 TPY threshold)
Control Strategies for Misc. Fugitive VOC Emissions			
Install and maintain low VOC emitting seals, valves, hatches on production equipment	Reduces VOC and GHG emissions.		
Initiate an equipment leak detection and repair program (including use of FLIR cameras, grab samples, organic vapor detection devices, visual inspection, etc.)	Reduction in VOC and GHG emissions		
Install or convert gas operated pneumatic devices to electric, solar, or instrument (or compressed) air driven devices/controllers	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	
Use "low" or "no bleed" gas operated pneumatic devices/controllers	Reduces VOC and GHG emissions.		Or closed loop required statewide by Wyoming BACT
Use closed loop system or thermal combustion for gas operated pneumatic pumps.	Reduces VOC and GHG emissions.		Required statewide by Wyoming BACT (98% VOC control or closed loop)

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Install or convert gas operated pneumatic pumps to electric, solar, or instrument (or compressed) air driven pumps	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	Required statewide by Wyoming BACT if no thermal combustion used.
Install vapor recovery on truck loading/unloading operations at tanks	Reduces emissions of VOC and GHG emissions.		Wyoming BACT analysis required if VOC $\geq$ 8 TPY or HAP $\geq$ 5 TPY.
Control Strategies for Fugitive Dust and Vehicle Emissions			
Unpaved surface treatments including watering, chemical suppressants, and gravel.	20% - 80% control of fugitive dust (particulates) from vehicle traffic.	Potential impacts to water and vegetation from runoff of suppressants.	
Use remote telemetry and automation of wellhead equipment	Reduces vehicle traffic and associated emissions.		
Speed limit control and enforcement on unpaved roads	Reduction of fugitive dust emissions		
Reduce commuter vehicle trips through car pools, commuter vans or buses, innovative work schedules, or work camps	Reduced combustion emissions, reduced fugitive dust emissions, reduced ozone formation, reduced impacts to visibility		
Miscellaneous Control Strategies			
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates		Fuel not readily available in some areas.
Reduce unnecessary vehicle idling	Reduced combustion emissions, reduced ozone formation, reduced impacts to visibility, reduced fuel consumption		
Reduced pace of (phased) development	Peak emissions of all pollutants reduced	Emissions generated at a lower rate but for a longer period	May not be economically viable.
BACT Best Available Control Technology CH ₄ methane CO Carbon Monoxide CO ₂ Carbon Dioxide DEQ Department of Environmental Quality EGU electric generating unit FLIR Forward Looking Infrared Radiometer g/hp-hr gallons per horsepower hour GHG greenhouse gas HAP Hazardous Air Pollutant		JPAD Joint Precision Airdrop System Misc. Miscellaneous NH ₃ Ammonia NO _x Nitrogen Oxides PM particulate matter SCR Selective Catalytic Reduction TPY tons per year VOC Volatile Organic Compound	

U.4. Summary of Emissions

The following tables summarize the projected total annual emissions for each alternative by resource for years 2008, 2018, and 2027.

Table U.6. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	7	7	134	3	36	10	1	15,524	0	0	15,576	14,090
Well Completion Flaring	0	0	2	0	11	63	6	2	0	0	2	2
Commuting Vehicles - Construction	28	3	1	0	1	0	0	280	0		281	255
Wind Erosion	6	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	59	13	137	3	49	73	7	15,806	0	0	15,859	14,347
Natural Gas Compression - Operations a	11	11	308	1	154	154	46	123,032	257	1	128,778	117,047
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	172	0	0	172	156
Dehy Venting and Flashing	---	---	---	---	---	241	91	2,623	160		5,981	5,738
Station Visits - Operations	23	2	0	0	1	1	0	81	0		81	73
Well Workover - Operations	0	0	2	0	1	0	0	317	0	0	318	287
Well & Pipeline Visits for Inspection & Repair - Operations	29	3	0	0	1	0	0	49	0		49	45
Tanks Condensate and Loadout	---	---	---	---	---	282	28	20	47		1,005	1,003
Wellhead Fugitives	---	---	---	---	---	430	43	254	3,947		83,149	83,125
Pneumatic Devices	---	---	---	---	---	316	32	186	2,899		61,066	61,049
Sub-total: Operations	63	16	311	1	157	1,425	240	126,733	7,311	1	280,599	268,524
Road Maintenance	2	0	0	0	0	0	0	60	0		60	54
Sub-total: Maintenance	2	0	0	0	0	0	0	60	0	0	60	54
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	38	0		38	34

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	1	0	0	0	0	0	0	39	0	0	39	35
Total Emissions	125	29	449	4	206	1,498	247	142,638	7,311	1	296,557	282,961
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.7. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	31	31	904	2	452	452	136	361,003	755	3	377,862	343,440
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	505	0	0	506	458
Dehy Venting and Flashing	---	---	---	---	---	709	266	7,696	469		17,549	16,836
Station Visits - Operations	69	7	1	0	4	2	0	237	0		237	215
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	84	8	1	0	2	1	0	145	0		145	132
Tanks Condensate and Loadout	---	---	---	---	---	826	83	57	138		2,950	2,944
Wellhead Fugitives	---	---	---	---	---	1,263	126	744	11,582		243,975	243,907
Pneumatic Devices	---	---	---	---	---	928	93	546	8,506		179,182	179,131
Sub-total: Operations	185	47	913	2	460	4,181	703	371,883	21,451	3	823,358	787,926
Road Maintenance	5	1	1	0	0	0	0	176	0		176	159
Sub-total: Maintenance	5	1	1	0	0	0	0	176	0	0	176	159
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	110	0		110	100

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	4	0	0	0	0	0	0	114	0	0	114	103
Total Emissions	371	87	1,325	11	607	4,401	725	419,580	21,451	4	871,212	831,219
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.8. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	24	24	696	1	348	348	104	277,632	581	2	290,598	264,126
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	388	0	0	389	353
Dehy Venting and Flashing	---	---	---	---	---	545	204	5,918	361		13,496	12,948
Station Visits - Operations	53	5	1	0	3	1	0	183	0		183	166
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	65	6	1	0	2	1	0	111	0		111	101
Tanks Condensate and Loadout	---	---	---	---	---	636	64	44	106		2,269	2,264
Wellhead Fugitives	---	---	---	---	---	971	97	572	8,908		187,631	187,578
Pneumatic Devices	---	---	---	---	---	713	71	420	6,542		137,801	137,762
Sub-total: Operations	143	36	704	2	354	3,215	541	286,219	16,497	3	633,431	606,160
Road Maintenance	4	0	0	0	0	0	0	135	0		135	123
Sub-total: Maintenance	4	0	0	0	0	0	0	135	0	0	135	123
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	84	0		84	76

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	87	0	0	87	79
Total Emissions	326	76	1,115	11	501	3,435	563	333,848	16,497	3	681,217	649,391
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.9. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric Tonnes
Well Pad & Station Construction - Fugitive Dust	42	4	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	18	17	322	7	87	24	2	37,272	0	0	37,397	33,830
Well Completion Flaring	1	0	5	0	27	151	15	5	0	0	5	5
Commuting Vehicles - Construction	68	7	3	0	3	1	0	676	0		676	614
Wind Erosion	16	2	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	143	31	329	7	117	176	18	37,953	0	0	38,078	34,448
Natural Gas Compression - Operations a	27	27	783	2	392	392	117	312,573	654	3	327,169	297,366
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	437	0	0	438	397
Dehy Venting and Flashing	---	---	---	---	---	613	230	6,663	406		15,194	14,578
Station Visits - Operations	60	6	1	0	3	1	0	206	0		206	187
Well Workover - Operations	1	0	5	0	2	0	0	760	0	0	762	690
Well & Pipeline Visits for Inspection & Repair - Operations	73	7	1	0	2	1	0	126	0		126	114
Tanks Condensate and Loadout	---	---	---	---	---	716	72	50	119		2,554	2,549
Wellhead Fugitives	---	---	---	---	---	1,094	109	644	10,029		211,245	211,185
Pneumatic Devices	---	---	---	---	---	803	80	473	7,365		155,143	155,100
Sub-total: Operations	160	41	790	2	398	3,620	609	321,931	18,573	3	712,838	682,165
Road Maintenance	4	0	1	0	0	0	0	152	0		152	138
Sub-total: Maintenance	4	0	1	0	0	0	0	152	0	0	152	138
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	95	0		95	86

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric Tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	98	0	0	98	89
Total Emissions	312	73	1,120	9	516	3,796	627	360,134	18,573	3	751,166	716,840
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.10. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	42	4	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	18	17	322	7	87	24	2	37,272	0	0	37,397	33,830
Well Completion Flaring	1	0	5	0	27	151	15	5	0	0	5	5
Commuting Vehicles - Construction	68	7	3	0	3	1	0	676	0		676	614
Wind Erosion	16	2	---	---	---	---	---	---	---		---	---
Sub-total: Construction	143	31	329	7	117	176	18	37,953	0	0	38,078	34,448
Natural Gas Compression - Operations a	21	21	602	1	301	301	90	240,129	502	2	251,343	228,447
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	336	0	0	337	305
Dehy Venting and Flashing	---	---	---	---	---	471	177	5,119	312		11,673	11,199
Station Visits - Operations	46	5	1	0	2	1	0	158	0		158	143
Well Workover - Operations	1	0	5	0	2	0	0	760	0	0	762	690
Well & Pipeline Visits for Inspection & Repair - Operations	56	6	1	0	1	1	0	96	0		96	88
Tanks Condensate and Loadout	---	---	---	---	---	550	55	38	92		1,962	1,959
Wellhead Fugitives	---	---	---	---	---	840	84	495	7,704		162,286	162,240
Pneumatic Devices	---	---	---	---	---	617	62	363	5,658		119,187	119,153
Sub-total: Operations	123	31	608	1	306	2,781	468	247,494	14,268	2	547,803	524,222
Road Maintenance	3	0	0	0	0	0	0	117	0		117	106
Sub-total: Maintenance	3	0	0	0	0	0	0	117	0	0	117	106
Road Reclamation	0	0	0	0	0	0	0	2	0		2	2
Well Reclamation	3	0	0	0	0	0	0	73	0		73	66

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	75	0	0	75	68
Total Emissions	273	63	938	9	424	2,957	485	285,639	14,269	3	586,074	558,845
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.11. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	31	31	906	2	453	453	136	361,813	757	3	378,709	344,210
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	506	0	0	507	459
Dehy Venting and Flashing	---	---	---	---	---	710	266	7,713	470		17,588	16,874
Station Visits - Operations	69	7	1	0	4	2	0	238	0		238	216
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	84	8	1	0	2	1	0	145	0		145	132
Tanks Condensate and Loadout	---	---	---	---	---	828	83	58	138		2,956	2,951
Wellhead Fugitives	---	---	---	---	---	1,266	127	746	11,608		244,522	244,453
Pneumatic Devices	---	---	---	---	---	930	93	548	8,526		179,583	179,533
Sub-total: Operations	186	47	915	2	461	4,190	705	372,715	21,499	3	825,202	789,691
Road Maintenance	5	1	1	0	0	0	0	176	0		176	160
Sub-total: Maintenance	5	1	1	0	0	0	0	176	0	0	176	160
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	110	0		110	100

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	4	0	0	0	0	0	0	114	0	0	114	103
Total Emissions	371	87	1,328	11	608	4,410	727	420,412	21,499	4	873,057	832,984
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.12. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	24	24	697	1	348	348	105	278,172	582	3	291,162	264,639
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	389	0	0	390	353
Dehy Venting and Flashing	---	---	---	---	---	546	205	5,930	362		13,522	12,973
Station Visits - Operations	53	5	1	0	3	1	0	183	0		183	166
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	65	6	1	0	2	1	0	112	0		112	101
Tanks Condensate and Loadout	---	---	---	---	---	637	64	44	106		2,273	2,269
Wellhead Fugitives	---	---	---	---	---	973	97	573	8,925		187,996	187,943
Pneumatic Devices	---	---	---	---	---	715	71	421	6,555		138,069	138,030
Sub-total: Operations	143	36	705	2	355	3,222	542	286,774	16,529	3	634,660	607,337
Road Maintenance	4	0	0	0	0	0	0	135	0		135	123
Sub-total: Maintenance	4	0	0	0	0	0	0	135	0	0	135	123
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	84	0		84	76

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	87	0	0	87	79
Total Emissions	327	76	1,117	11	501	3,442	564	334,403	16,529	3	682,447	650,568
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.13. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	48	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	21	21	384	9	104	29	3	44,498	0	0	44,647	40,389
Well Completion Flaring	1	1	6	0	32	180	18	6	0	0	6	6
Commuting Vehicles - Construction	81	8	3	0	3	1	0	803	0		804	730
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	169	37	393	9	140	210	21	45,308	0	0	45,458	41,124
Natural Gas Compression - Operations a	30	30	879	2	440	440	132	350,885	734	3	367,271	333,815
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	491	0	0	492	446
Dehy Venting and Flashing	---	---	---	---	---	689	258	7,480	456		17,057	16,364
Station Visits - Operations	67	7	1	0	4	2	0	231	0		231	209
Well Workover - Operations	1	0	6	0	2	0	0	907	0	0	911	824
Well & Pipeline Visits for Inspection & Repair - Operations	82	8	1	0	2	1	0	141	0		141	128
Tanks Condensate and Loadout	---	---	---	---	---	803	80	56	134		2,867	2,862
Wellhead Fugitives	---	---	---	---	---	1,228	123	723	11,258		237,138	237,071
Pneumatic Devices	---	---	---	---	---	902	90	531	8,268		174,160	174,110
Sub-total: Operations	180	46	888	2	447	4,064	684	361,445	20,849	3	800,267	765,829
Road Maintenance	5	1	1	0	0	0	0	171	0		171	155
Sub-total: Maintenance	5	1	1	0	0	0	0	171	0	0	171	155
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	107	0		107	97

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	4	0	0	0	0	0	0	111	0	0	111	100
Total Emissions	358	84	1,282	11	588	4,274	705	407,034	20,850	4	846,006	807,208
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.14. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	48	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	21	21	384	9	104	29	3	44,498	0	0	44,647	40,389
Well Completion Flaring	1	1	6	0	32	180	18	6	0	0	6	6
Commuting Vehicles - Construction	81	8	3	0	3	1	0	803	0		804	730
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	169	37	393	9	140	210	21	45,308	0	0	45,458	41,124
Natural Gas Compression - Operations a	23	23	676	1	338	338	101	269,808	564	2	282,408	256,682
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	377	0	0	378	343
Dehy Venting and Flashing	---	---	---	---	---	530	199	5,752	351		13,116	12,583
Station Visits - Operations	51	5	1	0	3	1	0	177	0		177	161
Well Workover - Operations	1	0	6	0	2	0	0	907	0	0	911	824
Well & Pipeline Visits for Inspection & Repair - Operations	63	6	1	0	2	1	0	108	0		108	98
Tanks Condensate and Loadout	---	---	---	---	---	618	62	43	103		2,205	2,201
Wellhead Fugitives	---	---	---	---	---	944	94	556	8,657		182,343	182,292
Pneumatic Devices	---	---	---	---	---	693	69	408	6,358		133,917	133,880
Sub-total: Operations	139	35	684	2	344	3,125	526	278,137	16,032	2	615,563	589,063
Road Maintenance	4	0	0	0	0	0	0	131	0		131	119
Sub-total: Maintenance	4	0	0	0	0	0	0	131	0	0	131	119
Road Reclamation	0	0	0	0	0	0	0	3	0		3	2
Well Reclamation	3	0	0	0	0	0	0	82	0		82	74

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	84	0	0	84	76
Total Emissions	315	73	1,077	10	484	3,335	547	323,661	16,032	3	661,237	630,382
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.15. Leasable Minerals – CBNG Development – Federal Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	116	0	0	117	106
Commuting Vehicles - Construction	0	0	0	0	0	0	0	7	0		7	6
Sub-total: Construction	1	0	1	0	0	0	0	123	0	0	123	112
Natural Gas Compression - Operations a	0	0	2	0	1	1	0	964	2	0	1,009	915
Dehydrators	0	0	0	0	0	0	0	132	0	0	132	120
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	0	0	0	12		244	221
Pneumatics	---	---	---	---	---	0	0	6	91		1,907	1,730
Station Visits - Operations	2	0	0	0	0	0	0	3	0		3	3
Well Workover - Operations	0	0	0	0	0	0	0	8	0	0	8	8
Well & Pipeline Visits for Inspection & Repair - Operations	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Operations	2	0	3	0	2	2	0	2,104	104	0	4,296	3,898
Road Maintenance	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Reclamation	0	0	0	0	0	0	0	0	0	0	0	0

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	4	1	4	0	2	2	0	2,228	104	0	4,420	4,011
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.16. Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,718	0	0	2,726	2,474
Commuting Vehicles - Construction	10	1	1	0	1	0	0	149	0		149	135
Sub-total: Construction	26	4	21	1	8	2	0	2,866	0	0	2,875	2,609
Natural Gas Compression - Operations a	8	8	232	0	116	116	35	92,506	194	1	96,828	87,866
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	41	1,112		23,401	21,235
Pneumatics	---	---	---	---	---	43	4	556	8,689		183,032	166,091
Station Visits - Operations	11	1	0	0	1	0	0	40	0		40	36
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	12	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	32	10	235	1	119	172	44	95,282	9,995	1	305,445	277,174
Road Maintenance	1	0	0	0	0	0	0	31	0		31	28
Sub-total: Maintenance	1	0	0	0	0	0	0	31	0	0	31	28
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	60	15	256	1	126	173	44	98,200	9,995	1	308,372	279,829
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.17. Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,718	0	0	2,726	2,474
Commuting Vehicles - Construction	10	1	1	0	1	0	0	149	0		149	135
Sub-total: Construction	26	4	21	1	8	2	0	2,866	0	0	2,875	2,609
Natural Gas Compression - Operations a	7	7	209	0	104	104	31	83,255	174	1	87,145	79,079
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	37	1,001		21,061	19,112
Pneumatics	---	---	---	---	---	39	4	500	7,820		164,729	149,482
Station Visits - Operations	11	1	0	0	0	0	0	18	0		18	16
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	19	0		19	18
Sub-total: Operations	29	9	212	0	107	154	39	85,817	8,996	1	274,963	249,513
Road Maintenance	1	0	0	0	0	0	0	28	0		28	26
Sub-total: Maintenance	1	0	0	0	0	0	0	28	0	0	28	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	57	14	233	1	114	156	40	88,729	8,996	1	277,884	252,164
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.18. Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0	0	4	0	1	0	0	569	0	0	571	518
Commuting Vehicles - Construction	2	0	0	0	0	0	0	31	0		31	29
Sub-total: Construction	6	1	4	0	2	0	0	601	0	0	603	547
Natural Gas Compression - Operations	2	2	45	0	22	22	7	17,923	37	0	18,760	17,024
Dehydrators	0	0	0	0	0	2	1	264	0	0	265	240
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	1	0	8	216		4,534	4,114
Pneumatics	---	---	---	---	---	8	1	108	1,684		35,463	32,180
Station Visits - Operations	3	0	0	0	0	0	0	10	0		10	9
Well Workover - Operations	0	0	0	0	0	0	0	42	0	0	42	39
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	4
Sub-total: Operations	7	2	46	0	24	33	9	19,350	1,937	0	60,071	54,511
Road Maintenance	0	0	0	0	0	0	0	6	0		6	6
Sub-total: Maintenance	0	0	0	0	0	0	0	6	0	0	6	6
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	4	0		4	3
Sub-total: Reclamation	0	0	0	0	0	0	0	4	0	0	4	3
Total Emissions	13	3	51	0	25	34	9	19,960	1,937	0	60,683	55,066

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.19. Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	4	0	1	0	0	569	0	0	571	518
Commuting Vehicles - Construction	2	0	0	0	0	0	0	31	0		31	29
Sub-total: Construction	6	1	4	0	2	0	0	601	0	0	603	547
Natural Gas Compression - Operations a	1	1	41	0	20	20	6	16,189	34	0	16,945	15,376
Dehydrators	0	0	0	0	0	2	1	264	0	0	265	240
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	1	0	7	195		4,095	3,716
Pneumatics	---	---	---	---	---	8	1	97	1,521		32,031	29,066
Station Visits - Operations	3	0	0	0	0	0	0	5	0		5	4
Well Workover - Operations	0	0	0	0	0	0	0	42	0	0	42	39
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	3
Sub-total: Operations	7	2	42	0	21	30	8	17,599	1,749	0	54,379	49,346
Road Maintenance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Maintenance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	3	0		3	3
Sub-total: Reclamation	0	0	0	0	0	0	0	3	0	0	3	3

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	13	3	46	0	23	30	8	18,208	1,749	0	54,991	49,901
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.20. Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	20	1	7	2	0	2,724	0	0	2,732	2,479
Commuting Vehicles - Construction	10	1	1	0	1	0	0	150	0		150	136
Sub-total: Construction	27	4	21	1	8	2	0	2,874	0	0	2,882	2,615
Natural Gas Compression - Operations	8	8	234	0	117	117	35	93,277	195	1	97,635	88,598
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	42	1,122		23,596	21,412
Pneumatics	---	---	---	---	---	43	4	561	8,762		184,558	167,475
Station Visits - Operations	12	1	0	0	1	0	0	43	0		43	39
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	13	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	33	11	237	1	120	173	44	96,062	10,079	1	307,976	279,470
Road Maintenance	1	0	0	0	0	0	0	32	0		32	29
Sub-total: Maintenance	1	0	0	0	0	0	0	32	0	0	32	29
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18
Total Emissions	61	15	258	1	127	175	44	98,987	10,079	1	310,910	282,132

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.21. Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,724	0	0	2,732	2,479
Commuting Vehicles - Construction	10	1	1	0	1	0	0	150	0		150	136
Sub-total: Construction	27	4	21	1	8	2	0	2,874	0	0	2,882	2,615
Natural Gas Compression - Operations a	7	7	211	0	105	105	32	84,026	176	1	87,952	79,811
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	38	1,010		21,256	19,289
Pneumatics	---	---	---	---	---	39	4	505	7,893		166,254	150,866
Station Visits - Operations	11	1	0	0	0	0	0	18	0		18	16
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	20	0		20	18
Sub-total: Operations	29	9	214	0	107	156	40	86,593	9,079	1	277,491	251,806
Road Maintenance	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Maintenance	1	0	0	0	0	0	0	29	0	0	29	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	57	14	235	1	115	158	40	89,513	9,079	1	280,419	254,464
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.22. Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	17	0	6	1	0	2,271	0	0	2,278	2,067
Commuting Vehicles - Construction	9	1	0	0	1	0	0	125	0		125	113
Sub-total: Construction	22	3	18	0	6	2	0	2,396	0	0	2,403	2,181
Natural Gas Compression - Operations	7	7	196	0	98	98	29	78,245	164	1	81,900	74,320
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	35	941		19,794	17,962
Pneumatics	---	---	---	---	---	36	4	470	7,350		154,815	140,485
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	169	0	0	170	154
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	18	0		18	17
Sub-total: Operations	28	9	199	0	100	145	37	80,756	8,454	1	258,520	234,591
Road Maintenance	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Maintenance	1	0	0	0	0	0	0	27	0	0	27	24
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	16	0		16	15
Sub-total: Reclamation	1	0	0	0	0	0	0	17	0	0	17	15
Total Emissions	52	12	217	1	107	147	37	83,196	8,454	1	260,966	236,811

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.23. Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	17	0	6	1	0	2,271	0	0	2,278	2,067
Commuting Vehicles - Construction	9	1	0	0	1	0	0	125	0		125	113
Sub-total: Construction	22	3	18	0	6	2	0	2,396	0	0	2,403	2,181
Natural Gas Compression - Operations a	6	6	176	0	88	88	26	70,343	147	1	73,629	66,814
Dehydrators	0	0	1	0	0	7	3	660	0	0	662	600
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	2	0	31	846		17,795	16,148
Pneumatics	---	---	---	---	---	33	3	423	6,608		139,181	126,298
Station Visits - Operations	10	1	0	0	0	0	0	17	0		17	15
Well Workover - Operations	0	0	1	0	0	0	0	169	0	0	170	154
Well & Pipeline Visits for Inspection & Repair - Operations	9	1	0	0	0	0	0	16	0		16	15
Sub-total: Operations	25	8	179	0	90	130	33	72,650	7,601	1	232,462	210,946
Road Maintenance	1	0	0	0	0	0	0	24	0		24	22
Sub-total: Maintenance	1	0	0	0	0	0	0	24	0	0	24	22
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	15	0		15	13
Sub-total: Reclamation	1	0	0	0	0	0	0	15	0	0	15	14

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	49	12	196	1	96	132	33	75,085	7,601	1	234,904	213,162
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.24. Locatable Minerals – Bentonite Mining (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	0	0	---	---	---	---	---	---	---		---	---
Unpaved Roads	0	0	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	0	0	0	0	0	0	0		0	0
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	0	0	0	0	0	0	0		0	0
Total	101	11	0	0	0	0	0	61	0	0	61	56
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.25. Locatable Minerals – Bentonite Mining (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	8	0	3	1	0	2,391	0		2,392	2,170
Total	542	59	10	0	12	2	0	3,141	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.26. Locatable Minerals – Bentonite Mining (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	2	0	1	1	0	2,392	0		2,392	2,170
Total	542	59	5	0	10	1	0	3,142	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.27. Locatable Minerals – Bentonite Mining (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	0	0	0	0	0	0	0	0	0	0	0	0
Product Handling, Transfer, and Storage	125	13	---	---	---	---	---	---	---		---	---
Unpaved Roads	22	2	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	3	0	0	230	0		230	209
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	3	0	1	0	0	797	0		797	723
Total	147	16	3	0	4	1	0	1,027	0	0	1,027	932
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.28. Locatable Minerals – Bentonite Mining (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	0	0	0	0	0	0	0	0	0	0	0	0
Product Handling, Transfer, and Storage	125	13	---	---	---	---	---	---	---		---	---
Unpaved Roads	22	2	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	3	0	0	230	0		230	209
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	0	0	0	797	0		797	723
Total	147	16	1	0	3	0	0	1,027	0	0	1,027	932
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.29. Locatable Minerals – Bentonite Mining (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	8	0	3	1	0	2,391	0		2,392	2,170
Total	542	59	10	0	12	2	0	3,141	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.30. Locatable Minerals – Bentonite Mining (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	2	0	1	1	0	2,392	0		2,392	2,170
Total	542	59	5	0	10	1	0	3,142	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.31. Locatable Minerals – Bentonite Mining (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	249	27	---	---	---	---	---	---	---		---	---
Unpaved Roads	43	4	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	6	0	0	459	0		460	417
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	5	0	2	1	0	1,594	0		1,594	1,447
Total	395	43	7	0	8	1	0	2,115	0	0	2,116	1,920
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.32. Locatable Minerals – Bentonite Mining (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	249	27	---	---	---	---	---	---	---		---	---
Unpaved Roads	43	4	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	6	0	0	459	0		460	417
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	1	0	0	1,594	0		1,595	1,447
Total	395	43	3	0	7	1	0	2,115	0	0	2,116	1,920
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.33. Locatable Minerals – Gold Mining (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5} a	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	1	0	0	0	0	0	0	37	0	0	37	34
Mine Development	0	0	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	0	0	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	0	0	0	0	0	0	0		0	0
Heavy Equipment - Combustive	0	0	0	0	0	0	0	0	0		0	0
Total	1	0	0	0	0	0	0	37	0	0	37	34
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.34. Locatable Minerals – Gold Mining (All Alternatives – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5} a	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	5	1	1	0	1	0	0	149	0	0	150	137
Mine Development	220	67	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	88	9	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	2	1	0	396	0		396	359
Heavy Equipment - Combustive	1	1	6	0	2	1	0	1,865	0		1,865	1,693
Total	314	77	8	0	5	1	0	2,410	0	0	2,412	2,188
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.35. Locatable Minerals – Gold Mining (All Alternatives – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5} a	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	5	1	1	0	1	0	0	149	0	0	150	136
Mine Development	216	66	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	88	9	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	2	1	0	396	0		396	359
Heavy Equipment - Combustive	1	1	6	0	2	1	0	1,865	0		1,865	1,693
Total	310	76	8	0	5	1	0	2,410	0	0	2,411	2,188
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.36. Locatable Minerals – Uranium Mining (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	28	1	11	3	0	634	0	0	637	578
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	12	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	15	3	28	1	12	3	0	634	0	0	637	578
Transport of Ion Exchange Resin	7	1	0	0	0	0	0	0	0		0	0
Well Workover - Operations	2	0	1	0	0	0	0	114	0	0	114	103
Well & Pipeline Visits for Inspection & Repair - Operations	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Operations	10	1	1	0	0	0	0	114	0	0	114	104
Road Maintenance	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	0	0	0	0	0	0	0	4	0		4	4
Sub-total: Reclamation	0	0	0	0	0	0	0	4	0	0	4	4
Total Emissions	25	4	30	1	13	3	0	752	0	0	755	685

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1

Table U.37. Locatable Minerals – Uranium Mining (All Alternatives – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	117	3	45	10	1	2,620	0	0	2,626	2,383
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	50	5	1	0	6	0	0	0	0	---	---	---
Sub-total: Construction	64	14	118	3	51	11	1	2,620	0	0	2,626	2,383
Transport of Ion Exchange Resin	142	14	2	0	1	1	0	2,370	0		2,372	2,152
Well Workover - Operations	43	5	8	0	2	1	0	2,198	0	0	2,205	2,001
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	5	0		5	4
Sub-total: Operations	187	19	10	0	4	1	0	4,573	0	0	4,582	4,158
Road Maintenance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Maintenance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	3	0	0	0	0	0	0	80	0		80	72
Sub-total: Reclamation	3	0	0	0	0	0	0	80	0	0	80	72
Total Emissions	254	34	128	3	55	12	1	7,278	1	0	7,293	6,618

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1

Table U.38. Locatable Minerals – Uranium Mining (All Alternatives – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	117	3	45	10	1	2,620	0	0	2,626	2,383
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	50	5	1	0	6	0	0	0	0	---	---	---
Sub-total: Construction	64	14	118	3	51	11	1	2,620	0	0	2,626	2,383
Transport of Ion Exchange Resin	85	9	1	0	1	1	0	2,371	0		2,373	2,153
Well Workover - Operations	25	3	1	0	0	0	0	1,310	0	0	1,315	1,193
Well & Pipeline Visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	3	0		3	3
Sub-total: Operations	112	11	2	0	1	1	0	3,685	0	0	3,691	3,349
Road Maintenance	0	0	0	0	0	0	0	3	0		3	3
Sub-total: Maintenance	0	0	0	0	0	0	0	3	0	0	3	3
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	2	0	0	0	0	0	0	47	0		47	43
Sub-total: Reclamation	2	0	0	0	0	0	0	47	0	0	47	43
Total Emissions	177	26	120	3	52	12	1	6,355	0	0	6,367	5,777

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1

Table U.39. Salable Minerals – Sand & Gravel (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5a}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} - metric tonnes
Product Handling, Transfer, and Storage	2	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	234	23	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	4	0	5	2	0	1,028	0	1,029	934
Heavy Equipment - Dust	10	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	11	10	170	4	76	11	1	17,704	0	17,707	16,068
Wind Erosion	24	4	---	---	---	---	---	---	---	---	---
Total	282	39	174	4	81	13	1	18,732	0	18,736	17,002
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.40. Salable Minerals – Sand & Gravel (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	74	4	33	7	1	21,151	0	21,153	19,195
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	330	41	79	4	39	9	1	22,361	0	22,364	20,294
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.41. Salable Minerals – Sand & Gravel (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	6	5	23	3	11	6	1	21,155	0	21,157	19,199
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	313	37	27	3	17	8	1	22,365	0	22,368	20,298
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.42. Salable Minerals – Sand & Gravel (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	265	26	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,162	0	1,163	1,055
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	72	4	32	7	1	20,304	0	20,307	18,427
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	319	40	76	4	38	9	1	21,466	0	21,469	19,482
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.43. Salable Minerals – Sand & Gravel (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	265	26	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,162	0	1,163	1,055
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	5	5	22	3	11	6	1	20,309	0	20,311	18,431
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	301	36	26	3	16	8	1	21,471	0	21,473	19,486
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.44. Salable Minerals – Sand & Gravel (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} met- ric tonnes
Product Handling, Transfer, and Storage	4	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	331	33	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	6	0	7	3	0	1,452	0	1,453	1,319
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	9	9	89	5	40	9	1	25,381	0	25,383	23,034
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	387	49	95	5	47	11	1	26,833	0	26,837	24,353
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.45. Salable Minerals – Sand & Gravel (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	331	33	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	6	0	7	3	0	1,452	0	1,453	1,319
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	6	27	4	14	7	1	25,386	0	25,388	23,038
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	370	44	33	4	21	9	1	26,838	0	26,842	24,357
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.46. Salable Minerals – Sand & Gravel (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	74	4	33	7	1	21,151	0	21,153	19,195
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	330	41	79	4	39	9	1	22,361	0	22,364	20,294
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.47. Salable Minerals – Sand & Gravel (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	6	5	23	3	11	6	1	21,155	0	21,157	19,199
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	313	37	27	3	17	8	1	22,365	0	22,368	20,298
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.48. Fire Management and Ecology (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	65	29	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	23	0		23	21
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0		20	18
Total	71	30	8	2	271	14	1	44	14	2	985	894
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.49. Fire Management and Ecology (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	55	27	8	2	271	14	1	37	14	2	978	888
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.50. Fire Management and Ecology (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	55	27	8	2	271	14	1	37	14	2	978	888
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.51. Fire Management and Ecology (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	161	88	25	7	899	46	5	0	48	7	3,139	2,849
Heavy Equipment Exhaust	0	0	0	0	3	1	0	67	0		68	61
Commuting Vehicles - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	61	0		62	56
Total	178	90	25	7	902	47	5	129	48	7	3,268	2,966
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.52. Fire Management and Ecology (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	161	88	25	7	899	46	5	0	48	7	3,139	2,849
Heavy Equipment Exhaust	0	0	0	0	3	1	0	67	0		68	61
Commuting Vehicles - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	61	0		62	56
Total	178	90	25	7	902	47	5	129	48	7	3,268	2,966
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.53. Fire Management and Ecology (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	32	0		32	29
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	25	0		25	22
Total	58	28	8	2	271	14	1	57	14	2	999	906
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.54. Fire Management and Ecology (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	32	0		32	29
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	25	0		25	22
Total	58	28	8	2	271	14	1	57	14	2	999	906
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.55. Fire Management and Ecology (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	70	43	13	3	450	23	2	0	24	3	1,570	1,424
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	75	43	13	3	450	23	2	37	24	3	1,606	1,458
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.56. Fire Management and Ecology (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	70	43	13	3	450	23	2	0	24	3	1,570	1,424
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	75	43	13	3	450	23	2	37	24	3	1,606	1,458
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.57. Vegetation – Forest and Woodlands (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	32	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	32	3	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	38	4	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.58. Vegetation – Forest and Woodlands (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	131	13	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	131	13	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	138	14	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.59. Vegetation – Forest and Woodlands (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	131	13	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	131	13	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	138	14	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.60. Vegetation – Forest and Woodlands (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	193	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	193	19	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	199	20	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.61. Vegetation – Forest and Woodlands (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	193	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	193	19	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	199	20	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.62. Vegetation – Forest and Woodlands (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	263	26	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	263	26	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	269	27	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.63. Vegetation – Forest and Woodlands (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	263	26	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	263	26	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	269	27	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.64. Vegetation – Forest and Woodlands (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	210	21	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	210	21	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	217	22	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.65. Vegetation – Forest and Woodlands (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	210	21	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	210	21	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	217	22	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.66. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Base Year – 2008)

Activity	Annual Emissions (Tons)										CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	
Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	189	0	189	171
Sub-total: Heavy Equipment	10	1	2	0	1	0	0	189	0	189	171
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	13	1	2	0	1	0	0	202	0	202	183
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.67. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	37	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	504	0	504	457
Sub-total: Heavy Equipment	37	4	2	0	1	0	0	504	0	504	457
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	2	0	1	0	0	543	0	543	493
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.68. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	37	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	514	0	514	466
Sub-total: Heavy Equipment	37	4	1	0	0	0	0	514	0	514	466
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	1	0	1	0	0	553	0	553	502
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.69. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	218	0	218	198
Sub-total: Heavy Equipment	16	2	1	0	0	0	0	218	0	218	198
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	19	2	1	0	1	0	0	231	0	231	210
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.70. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	220	0	220	200
Sub-total: Heavy Equipment	16	2	0	0	0	0	0	220	0	220	200
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	19	2	0	0	0	0	0	233	0	233	212
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.71. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	408	41	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	2	2	25	1	11	2	0	6195	0	6196	5623
Sub-total: Heavy Equipment	411	43	25	1	11	2	0	6195	0	6196	5623
Commuting Vehicles - Fugitive Dust	129	13	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	1	0	3	1	0	779	0	779	707
Sub-total: Commuting Vehicles	129	13	1	0	3	1	0	779	0	779	707
Total	539	56	26	1	14	4	0	6974	0	6976	6330
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.72. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	408	41	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	2	2	7	1	3	2	0	6203	0	6204	5629
Sub-total: Heavy Equipment	410	42	7	1	3	2	0	6203	0	6204	5629
Commuting Vehicles - Fugitive Dust	129	13	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	1	0	3	1	0	779	0	779	707
Sub-total: Commuting Vehicles	129	13	1	0	3	1	0	779	0	779	707
Total	539	55	9	1	6	3	0	6982	0	6983	6337
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.73. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	418	0	418	379
Sub-total: Heavy Equipment	31	3	2	0	1	0	0	418	0	418	379
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	34	0	34	31
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	34	0	34	31
Total	37	4	2	0	1	0	0	452	0	452	410
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.74. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2027)

Activity	Annual Emissions (Tons)										CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	
Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	423	0	423	384
Sub-total: Heavy Equipment	30	3	0	0	0	0	0	423	0	423	384
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	34	0	34	31
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	34	0	34	31
Total	37	4	1	0	0	0	0	456	0	456	414
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.75. Land Resources – Comprehensive Trails and Travel Management (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	1	0	0	0	0	101	0	101	92
Motorized Recreation	7	6	5	1	472	191	19	2,607	3	2,668	2,421
Total	9	6	6	1	472	191	19	2,708	3	2,769	2,513
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Lander Proposed RMP and Final EIS

1751

Table U.77. Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,898	4	3,978	3,610
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.78. Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	90	0	90	82
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	6	4	7	1	526	119	12	3,649	2	3,698	3,356
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.79. Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	90	0	90	82
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	5	3	8	1	522	88	9	3,886	4	3,966	3,599
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.80. Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	3	0	0	0	0	0	0	127	0	127	115
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,685	2	3,735	3,389
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.81. Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	3	0	0	0	0	0	0	127	0	127	115
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,923	4	4,003	3,632
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.82. Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,661	2	3,710	3,367
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.83. Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,898	4	3,978	3,610
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.84. Land Resources – Livestock Grazing (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	60	0	60	54
Sub-total: Construction	3	0	1	0	0	0	0	60	0	60	54
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	5	0	86	4	0	1,816	1,187	26,740	24,265
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.85. Land Resources – Livestock Grazing (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	62	0	62	56
Sub-total: Construction	3	0	0	0	0	0	0	62	0	62	56
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.86. Land Resources – Livestock Grazing (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	62	0	62	56
Sub-total: Construction	3	0	0	0	0	0	0	62	0	62	56
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.87. Land Resources – Livestock Grazing (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Sub-total: Construction	0	0	0	0	0	0	0	0	0	0	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Enteric Fermentation and Manure	---	---	---	---	---	---	---		0	0	0
Sub-total: Operations and Maintenance	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.88. Land Resources – Livestock Grazing (Alternative B – 2027)

Activity	Annual Emissions (Tons)										CO ₂ eq metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO ₂ eq	
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Sub-total: Construction	0	0	0	0	0	0	0	0	0	0	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Enteric Fermentation and Manure	---	---	---	---	---	---	---		0	0	0
Sub-total: Operations and Maintenance	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.89. Land Resources – Livestock Grazing (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.90. Land Resources – Livestock Grazing (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.91. Land Resources – Livestock Grazing (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.92. Land Resources – Livestock Grazing (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.93. Leasable Minerals – Conventional Oil and Gas Development – Total (BLM and Non-BLM) Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	32	3	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	8	7	136	3	37	10	1	15,705	0	0	15,757	14,254
Well Completion Flaring	0	0	2	0	11	63	6	2	0	0	2	2
Commuting Vehicles - Construction	30	3	1	0	1	0	0	315	0		315	286
Wind Erosion	6	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	77	15	139	3	50	73	7	16,022	0	0	16,074	14,542
Natural Gas Compression - Operations a	26	26	766	2	383	383	115	305,692	639	3	319,968	290,821
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	428	0	0	428	388
Dehy Venting and Flashing	---	---	---	---	---	600	225	6,516	397		14,860	14,257
Station Visits - Operations	58	6	1	0	3	1	0	201	0		201	182
Well Workover - Operations	0	0	2	0	1	0	0	317	0	0	318	287
Well & Pipeline visits for Inspection & Repair - Operations	71	7	1	0	2	1	0	123	0		123	111
Tanks Condensate and Loadout	---	---	---	---	---	700	70	49	117		2,498	2,493
Wellhead Fugitives	---	---	---	---	---	1,070	107	630	9,808		206,595	206,537
Pneumatic Devices	---	---	---	---	---	785	79	463	7,203		151,728	151,686
Sub-total: Operations	156	40	770	2	389	3,540	596	314,418	18,164	3	696,719	666,762
Road Maintenance	4	0	1	0	0	0	0	149	0		149	135
Sub-total: Maintenance	4	0	1	0	0	0	0	149	0	0	149	135
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	93	0		93	85

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	96	0	0	96	87
Total Emissions	240	55	910	5	439	3,614	603	330,685	18,164	3	713,038	681,527
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.94. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	55	55	1,604	3	802	802	241	640,389	1,339	6	670,295	609,234
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	896	0	0	898	813
Dehy Venting and Flashing	---	---	---	---	---	1,257	471	13,651	832		31,130	29,866
Station Visits - Operations	122	12	2	0	6	3	0	421	0		421	382
Well Workover - Operations	2	1	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	149	15	1	0	4	2	0	257	0		257	233
Tanks Condensate and Loadout	---	---	---	---	---	1,466	147	102	244		5,233	5,223
Wellhead Fugitives	---	---	---	---	---	2,241	224	1,320	20,546		432,792	432,670
Pneumatic Devices	---	---	---	---	---	1,646	165	969	15,090		317,853	317,763
Sub-total: Operations	328	83	1,618	4	816	7,416	1,248	659,335	38,052	6	1,460,212	1,397,393
Road Maintenance	9	1	1	0	1	0	0	312	0		312	283
Sub-total: Maintenance	9	1	1	0	1	0	0	312	0	0	312	283
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	195	0		195	177

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	202	0	0	202	183
Total Emissions	604	141	2,196	17	1,022	7,725	1,279	726,368	38,052	6	1,527,466	1,458,236
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.95. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	43	43	1,251	3	626	626	188	499,550	1,045	4	522,878	475,246
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	699	0	0	700	634
Dehy Venting and Flashing	---	---	---	---	---	980	368	10,649	649		24,284	23,298
Station Visits - Operations	95	10	2	0	5	2	0	329	0		329	298
Well Workover - Operations	2	0	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	116	12	1	0	3	1	0	201	0		201	182
Tanks Condensate and Loadout	---	---	---	---	---	1,144	114	79	191		4,082	4,074
Wellhead Fugitives	---	---	---	---	---	1,748	175	1,029	16,028		337,609	337,513
Pneumatic Devices	---	---	---	---	---	1,284	128	756	11,771		247,948	247,878
Sub-total: Operations	257	65	1,264	3	637	5,785	973	514,621	29,683	5	1,139,364	1,090,332
Road Maintenance	7	1	0	0	0	0	0	243	0		243	221
Sub-total: Maintenance	7	1	0	0	0	0	0	243	0	0	243	221
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	151	0		151	137

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	156	0	0	156	142
Total Emissions	528	122	1,841	16	843	6,094	1,004	581,540	29,684	5	1,206,503	1,151,072
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.96. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	73	7	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	27	26	483	11	132	36	4	56,027	1	1	56,215	50,853
Well Completion Flaring	1	1	7	0	40	227	23	8	0	0	8	7
Commuting Vehicles - Construction	103	11	4	0	4	1	0	1,036	0		1,037	941
Wind erosion	23	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	227	48	495	11	176	264	26	57,072	1	1	57,260	51,802
Natural Gas Compression - Operations a	51	51	1,483	3	741	741	222	591,959	1,238	5	619,603	563,160
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	828	0	0	830	752
Dehy Venting and Flashing	---	---	---	---	---	1,162	436	12,619	769		28,776	27,608
Station Visits - Operations	113	11	2	0	6	3	0	389	0		389	353
Well Workover - Operations	2	1	8	0	2	1	0	1,140	0	0	1,144	1,034
Well & Pipeline Visits for Inspection & Repair - Operations	138	14	1	0	4	2	0	238	0		238	216
Tanks Condensate and Loadout	---	---	---	---	---	1,355	136	94	226		4,837	4,828
Wellhead Fugitives	---	---	---	---	---	2,071	207	1,220	18,992		400,061	399,948
Pneumatic Devices	---	---	---	---	---	1,521	152	896	13,949		293,815	293,732
Sub-total: Operations	303	77	1,495	3	754	6,855	1,153	609,382	35,174	5	1,349,692	1,291,631
Road Maintenance	8	1	1	0	0	0	0	288	0		288	261
Sub-total: Maintenance	8	1	1	0	0	0	0	288	0	0	288	261
Road Reclamation	0	0	0	0	0	0	0	6	0		6	5
Well Reclamation	6	1	1	0	1	0	0	180	0		181	164

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	186	0	0	187	169
Total Emissions	545	127	1,991	14	931	7,120	1,180	666,928	35,175	6	1,407,426	1,343,864
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.97. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	73	7	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	27	26	483	11	132	36	4	56,027	1	1	56,215	50,853
Well Completion Flaring	1	1	7	0	40	227	23	8	0	0	8	7
Commuting Vehicles - Construction	103	11	4	0	4	1	0	1,036	0		1,037	941
Wind Erosion	23	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	227	48	495	11	176	264	26	57,072	1	1	57,260	51,802
Natural Gas Compression - Operations a	40	40	1,158	2	579	579	174	462,181	966	4	483,765	439,696
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	646	0	0	648	587
Dehy Venting and Flashing	---	---	---	---	---	907	340	9,852	601		22,467	21,555
Station Visits - Operations	88	9	2	0	5	2	0	304	0		304	276
Well Workover - Operations	2	0	8	0	2	1	0	1,140	0	0	1,144	1,034
Well & Pipeline Visits for Inspection & Repair - Operations	107	11	1	0	3	1	0	186	0		186	168
Tanks Condensate and Loadout	---	---	---	---	---	1,058	106	73	176		3,776	3,770
Wellhead Fugitives	---	---	---	---	---	1,617	162	952	14,829		312,354	312,266
Pneumatic Devices	---	---	---	---	---	1,188	119	699	10,891		229,401	229,336
Sub-total: Operations	237	60	1,169	3	589	5,353	900	476,034	27,463	4	1,054,044	1,008,688
Road Maintenance	6	1	0	0	0	0	0	225	0		225	204
Sub-total: Maintenance	6	1	0	0	0	0	0	225	0	0	225	204
Road Reclamation	0	0	0	0	0	0	0	5	0		5	4
Well Reclamation	5	0	0	0	0	0	0	140	0		140	127

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	144	0	0	144	131
Total Emissions	475	109	1,664	14	766	5,617	927	533,475	27,463	5	1,111,673	1,060,825
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.98. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	55	55	1,606	3	803	803	241	641,199	1,341	6	671,142	610,004
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	897	0	0	899	814
Dehy Venting and Flashing	---	---	---	---	---	1,258	472	13,669	833		31,169	29,904
Station Visits - Operations	122	12	2	0	6	3	0	422	0		422	383
Well Workover - Operations	2	1	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	149	15	1	0	4	2	0	257	0		257	234
Tanks Condensate and Loadout	---	---	---	---	---	1,468	147	102	245		5,239	5,230
Wellhead Fugitives	---	---	---	---	---	2,243	224	1,321	20,572		433,339	433,217
Pneumatic Devices	---	---	---	---	---	1,648	165	970	15,109		318,255	318,165
Sub-total: Operations	329	83	1,620	4	817	7,426	1,249	660,166	38,100	6	1,462,056	1,399,157
Road Maintenance	9	1	1	0	1	0	0	312	0		312	283
Sub-total: Maintenance	9	1	1	0	1	0	0	312	0	0	312	283
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	195	0		196	177

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	202	0	0	202	183
Total Emissions	604	141	2,199	17	1,023	7,734	1,280	727,201	38,100	6	1,529,311	1,460,002
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.99. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	43	43	1,254	3	627	627	188	500,359	1,046	5	523,725	476,017
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	700	0	0	701	635
Dehy Venting and Flashing	---	---	---	---	---	982	368	10,666	650		24,323	23,336
Station Visits - Operations	95	10	2	0	5	2	0	329	0		329	299
Well Workover - Operations	2	0	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	116	12	1	0	3	1	0	201	0		201	182
Tanks Condensate and Loadout	---	---	---	---	---	1,145	115	80	191		4,088	4,081
Wellhead Fugitives	---	---	---	---	---	1,751	175	1,031	16,054		338,156	338,060
Pneumatic Devices	---	---	---	---	---	1,286	129	757	11,790		248,350	248,280
Sub-total: Operations	257	65	1,266	3	638	5,795	975	515,452	29,731	5	1,141,208	1,092,096
Road Maintenance	7	1	0	0	0	0	0	243	0		243	221
Sub-total: Maintenance	7	1	0	0	0	0	0	243	0	0	243	221
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	151	0		151	137

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	156	0	0	156	142
Total Emissions	529	122	1,843	16	844	6,103	1,006	582,373	29,732	5	1,208,348	1,152,837
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.100. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	79	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	31	30	546	12	148	41	4	63,249	1	1	63,461	57,408
Well Completion Flaring	1	1	8	0	46	256	26	9	0	0	9	8
Commuting Vehicles - Construction	115	12	4	0	5	2	0	1,163	0		1,164	1,056
Wind Erosion	26	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	252	54	559	12	199	298	30	64,421	1	1	64,634	58,472
Natural Gas Compression - Operations a	54	54	1,579	3	789	789	237	630,271	1,318	6	659,705	599,609
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	882	0	0	883	800
Dehy Venting and Flashing	---	---	---	---	---	1,237	464	13,436	819		30,638	29,394
Station Visits - Operations	120	12	2	0	6	3	0	414	0		415	376
Well Workover - Operations	2	1	9	0	3	1	0	1,287	0	0	1,292	1,168
Well & Pipeline Visits for Inspection & Repair - Operations	146	15	1	0	4	2	0	253	0		253	230
Tanks Condensate and Loadout	---	---	---	---	---	1,443	144	100	240		5,150	5,141
Wellhead Fugitives	---	---	---	---	---	2,205	221	1,299	20,222		425,954	425,834
Pneumatic Devices	---	---	---	---	---	1,620	162	954	14,851		312,831	312,743
Sub-total: Operations	323	82	1,592	4	803	7,299	1,228	648,896	37,450	6	1,437,121	1,375,295
Road Maintenance	9	1	1	0	0	0	0	307	0		307	278
Sub-total: Maintenance	9	1	1	0	0	0	0	307	0	0	307	278
Road Reclamation	0	0	0	0	0	0	0	6	0		6	6
Well Reclamation	7	1	1	0	1	0	0	192	0		192	174

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	199	0	0	199	180
Total Emissions	591	138	2,153	16	1,003	7,598	1,258	713,822	37,451	6	1,502,260	1,434,226
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.101. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	79	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	31	30	546	12	148	41	4	63,249	1	1	63,461	57,408
Well Completion Flaring	1	1	8	0	46	256	26	9	0	0	9	8
Commuting Vehicles - Construction	115	12	4	0	5	2	0	1,163	0		1,164	1,056
Wind Erosion	26	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	252	54	559	12	199	298	30	64,421	1	1	64,634	58,472
Natural Gas Compression - Operations a	42	42	1,232	3	616	616	185	491,860	1,028	4	514,829	467,931
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	688	0	0	689	625
Dehy Venting and Flashing	---	---	---	---	---	965	362	10,485	639		23,910	22,939
Station Visits - Operations	94	9	2	0	5	2	0	323	0		323	294
Well Workover - Operations	2	0	9	0	3	1	0	1,287	0	0	1,292	1,168
Well & Pipeline Visits for Inspection & Repair - Operations	114	11	1	0	3	1	0	197	0		198	179
Tanks Condensate and Loadout	---	---	---	---	---	1,126	113	78	188		4,019	4,012
Wellhead Fugitives	---	---	---	---	---	1,721	172	1,014	15,781		332,412	332,318
Pneumatic Devices	---	---	---	---	---	1,264	126	744	11,590		244,131	244,063
Sub-total: Operations	253	64	1,244	3	627	5,696	958	506,677	29,226	4	1,121,804	1,073,529
Road Maintenance	7	1	0	0	0	0	0	239	0		239	217
Sub-total: Maintenance	7	1	0	0	0	0	0	239	0	0	239	217
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	149	0		149	135

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	154	0	0	154	139
Total Emissions	517	119	1,803	15	826	5,995	988	571,491	29,227	5	1,186,830	1,132,357
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.102. Leasable Minerals – CBNG Development – Total (BLM and Non-BLM) Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	129	0	0	129	117
Commuting Vehicles - Construction	1	0	0	0	0	0	0	9	0		9	8
Sub-total: Construction	2	0	1	0	0	0	0	137	0	0		125
Natural Gas Compression - Operations a	0	0	14	0	7	7	2	5,396	11	0	5,648	5,125
Dehydrators	0	0	0	0	0	1	0	132	0	0	132	120
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	0	0	2	65		1,365	1,239
Pneumatics	---	---	---	---	---	3	0	32	507		10,677	9,689
Station Visits - Operations	6	1	0	0	0	0	0	10	0		10	9
Well Workover - Operations	0	0	0	0	0	0	0	8	0	0	8	8
Well & Pipeline Visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	1	0		1	1
Sub-total: Operations	7	1	15	0	8	10	3	6,573	583	0	18,835	17,091
Road Maintenance	0	0	0	0	0	0	0	2	0		2	2
Sub-total: Maintenance	0	0	0	0	0	0	0	2	0	0	2	2
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	1	0		1	1
Sub-total: Reclamation	0	0	0	0	0	0	0	1	0	0	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	9	1	16	0	8	10	3	6,713	583	0	18,838	17,219
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.103. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	35	1	12	3	0	4,646	0	0	4,660	4,229
Commuting Vehicles - Construction	18	2	1	0	1	0	0	255	0		255	231
Sub-total: Construction	45	7	36	1	13	3	0	4,900	0	0	4,915	4,460
Natural Gas Compression - Operations	14	14	397	1	199	199	60	158,609	332	1	166,019	150,653
Dehydrators	0	0	1	0	1	15	8	1,453	0	0	1,456	1,321
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	1	71	1,907		40,124	36,410
Pneumatics	---	---	---	---	---	74	7	953	14,899		313,824	284,777
Station Visits - Operations	20	2	0	0	1	0	0	69	0		69	63
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	21	2	0	0	1	0	0	37	0		37	34
Sub-total: Operations	56	18	402	1	203	294	75	162,530	17,138	1	522,870	474,473
Road Maintenance	1	0	0	0	0	0	0	54	0		54	49
Sub-total: Maintenance	1	0	0	0	0	0	0	54	0	0	54	49
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	33	0		33	30
Sub-total: Reclamation	1	0	0	0	0	0	0	34	0	0	34	31

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	103	25	438	2	216	297	75	167,518	17,138	1	527,873	479,013
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.104. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	35	1	12	3	0	4,646	0	0	4,660	4,229
Commuting Vehicles - Construction	18	2	1	0	1	0	0	255	0		255	231
Sub-total: Construction	45	7	36	1	13	3	0	4,900	0	0	4,915	4,460
Natural Gas Compression - Operations a	12	12	358	1	179	179	54	142,806	299	1	149,478	135,642
Dehydrators	0	0	1	0	1	14	7	1,321	0	0	1,323	1,201
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	64	1,717		36,126	32,782
Pneumatics	---	---	---	---	---	67	7	858	13,414		282,556	256,403
Station Visits - Operations	18	2	0	0	0	0	0	31	0		31	28
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	19	2	0	0	1	0	0	33	0		33	30
Sub-total: Operations	50	16	362	1	182	265	68	146,451	15,430	1	470,889	427,304
Road Maintenance	1	0	0	0	0	0	0	48	0		48	44
Sub-total: Maintenance	1	0	0	0	0	0	0	48	0	0	48	44
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28

Activity	Annual Emissions (Tons)											CO ₂ eq metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	
Total Emissions	97	23	398	2	195	268	68	151,431	15,430	1	475,883	431,836
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.105. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	19	0	6	1	0	2,491	0	0	2,499	2,268
Commuting Vehicles - Construction	10	1	1	0	1	0	0	136	0		137	124
Sub-total: Construction	24	4	19	0	7	2	0	2,628	0	0	2,635	2,392
Natural Gas Compression - Operations	7	7	211	0	105	105	32	84,026	176	1	87,952	79,811
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	38	1,010		21,256	19,289
Pneumatics	---	---	---	---	---	39	4	505	7,893		166,254	150,866
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	186	0	0	187	169
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	20	0		20	18
Sub-total: Operations	29	9	214	0	108	156	40	86,594	9,079	1	277,492	251,807
Road Maintenance	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Maintenance	1	0	0	0	0	0	0	29	0	0	29	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	55	13	233	1	115	158	40	89,268	9,079	1	280,174	254,241
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.106. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	19	0	6	1	0	2,491	0	0	2,499	2,268
Commuting Vehicles - Construction	10	1	1	0	1	0	0	136	0		137	124
Sub-total: Construction	24	4	19	0	7	2	0	2,628	0	0	2,635	2,392
Natural Gas Compression - Operations a	6	6	189	0	95	95	28	75,547	158	1	79,076	71,757
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	34	908		19,111	17,342
Pneumatics	---	---	---	---	---	35	4	454	7,096		149,477	135,641
Station Visits - Operations	10	1	0	0	0	0	0	17	0		17	15
Well Workover - Operations	0	0	1	0	0	0	0	186	0	0	187	169
Well & Pipeline Visits for Inspection & Repair - Operations	10	1	0	0	0	0	0	18	0		18	16
Sub-total: Operations	27	9	192	0	97	140	36	78,038	8,163	1	249,671	226,562
Road Maintenance	1	0	0	0	0	0	0	26	0		26	23
Sub-total: Maintenance	1	0	0	0	0	0	0	26	0	0	26	23
Road Reclamation	0	0	0	0	0	0	0	1	0		1	0
Well Reclamation	1	0	0	0	0	0	0	16	0		16	14
Sub-total: Reclamation	1	0	0	0	0	0	0	16	0	0	16	15

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq} metric tonnes
Total Emissions	52	12	211	1	104	142	36	80,707	8,163	1	252,348
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression											

Table U.107. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	13	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	34	1	12	3	0	4,596	0	0	4,610	4,183
Commuting Vehicles - Construction	17	2	1	0	1	0	0	247	0		247	225
Sub-total: Construction	41	7	35	1	13	3	0	4,843	0	0	4,858	4,408
Natural Gas Compression - Operations	8	8	234	0	117	117	35	93,277	195	1	97,635	88,598
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	42	1,122		23,596	21,412
Pneumatics	---	---	---	---	---	43	4	561	8,762		184,558	167,475
Station Visits - Operations	12	1	0	0	1	0	0	43	0		43	39
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	13	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	34	11	238	1	120	173	44	96,206	10,079	1	308,120	279,601
Road Maintenance	1	0	0	0	0	0	0	32	0		32	29
Sub-total: Maintenance	1	0	0	0	0	0	0	32	0	0	32	29
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	76	17	274	1	133	176	45	101,100	10,079	1	313,030	284,056
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.108. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	13	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	34	1	12	3	0	4,596	0	0	4,610	4,183
Commuting Vehicles - Construction	17	2	1	0	1	0	0	247	0		247	225
Sub-total: Construction	41	7	35	1	13	3	0	4,843	0	0	4,858	4,408
Natural Gas Compression - Operations a	12	12	359	1	180	180	54	143,384	300	1	150,083	136,192
Dehydrators	0	0	1	0	1	14	7	1,321	0	0	1,323	1,201
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	64	1,724		36,272	32,915
Pneumatics	---	---	---	---	---	67	7	862	13,469		283,700	257,441
Station Visits - Operations	18	2	0	0	0	0	0	31	0		31	28
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	19	2	0	0	1	0	0	33	0		33	30
Sub-total: Operations	50	16	364	1	183	266	68	147,033	15,493	1	472,784	429,024
Road Maintenance	1	0	0	0	0	0	0	49	0		49	44
Sub-total: Maintenance	1	0	0	0	0	0	0	49	0	0	49	44
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	94	23	399	2	196	269	68	151,955	15,493	1	477,721	433,504
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.109. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	12	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	7	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	32	1	11	2	0	4,253	0	0	4,266	3,871
Commuting Vehicles - Construction	16	2	1	0	1	0	0	228	0		228	207
Sub-total: Construction	37	6	33	1	12	3	0	4,481	0	0	4,495	4,079
Natural Gas Compression - Operations	7	7	196	0	98	98	29	78,245	164	1	81,900	74,320
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	35	941		19,794	17,962
Pneumatics	---	---	---	---	---	36	4	470	7,350		154,815	140,485
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	1	0	2	0	1	0	0	321	0	0	323	293
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	18	0		18	17
Sub-total: Operations	28	9	200	0	101	145	37	80,909	8,454	1	258,672	234,730
Road Maintenance	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Maintenance	1	0	0	0	0	0	0	27	0	0	27	24
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	16	0		16	15
Sub-total: Reclamation	1	0	0	0	0	0	0	17	0	0	17	15

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq} metric tonnes
Total Emissions	67	15	233	1	113	148	37	85,433	8,454	1	263,210
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression											

Table U.110. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											CO _{2eq} metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	
Well Pad & Station Construction - Fugitive Dust	12	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	7	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	32	1	11	2	0	4,253	0	0	4,266	3,871
Commuting Vehicles - Construction	16	2	1	0	1	0	0	228	0		228	207
Sub-total: Construction	37	6	33	1	12	3	0	4,481	0	0	4,495	4,079
Natural Gas Compression - Operations a	11	11	325	1	163	163	49	129,894	272	1	135,962	123,378
Dehydrators	0	0	1	0	1	12	6	1,189	0	0	1,191	1,081
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	58	1,562		32,859	29,818
Pneumatics	---	---	---	---	---	61	6	781	12,201		257,008	233,220
Station Visits - Operations	16	2	0	0	0	0	0	28	0		28	25
Well Workover - Operations	1	0	2	0	1	0	0	321	0	0	323	293
Well & Pipeline Visits for Inspection & Repair - Operations	18	2	0	0	0	0	0	30	0		30	28
Sub-total: Operations	46	15	330	1	166	241	62	133,292	14,035	1	428,394	388,743
Road Maintenance	1	0	0	0	0	0	0	44	0		44	40
Sub-total: Maintenance	1	0	0	0	0	0	0	44	0	0	44	40
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Reclamation	1	0	0	0	0	0	0	28	0	0	28	25

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq} metric tonnes
Total Emissions	85	21	363	2	178	244	62	137,845	14,035	1	432,961
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression											

This page intentionally
left blank

Appendix V. Wild Horse Management in the Lander Planning Area

The Bureau of Land Management (BLM) monitors wild horse populations to comply with population management objectives set in the land use plan. The BLM has been conducting ongoing monitoring of wild horses and their habitat in Herd Management Areas (HMA) for many years.

The monitoring program, although not exclusive to the wild horse program, includes collection and monitoring of the following types of information carried out by BLM range, wildlife, and wild horse staff in the planning area:

- Precipitation data
- Rangeland trends (uplands and riparian)
- Forage utilization data
- Permitted use by livestock
- Wildlife actual use and forage requirements
- Wild horse population data, including but not limited to –
 - Population counts
 - Reproductive rates
 - Age/sex structure
 - Observation sightings
 - Determining areas of highest horse use, or concentration areas

If an evaluation of monitoring data were to indicate that wild horse management objectives in the land use plan were not being met, population adjustments in land use plans and Herd Management Area Plans (HMAPs) could be necessary. Population adjustments would be analyzed prior to initiating management actions in applicable HMAPs and Resource Management Plans (RMPs). Monitoring and adjusting the appropriate management level, as necessary, would ensure a thriving, natural ecological balance is maintained.

More information on specific management direction used in managing wild horse populations in the planning area can be found in the *Wild Horses and Burros Management Handbook (H-4700-1)*. This handbook is an assemblage of all relevant policy and technical guidance that must be considered in developing and implementing Wild Horse Management Plans (WHMPs) and actions.

Establishment and Modification of Herd Management Areas and Appropriate Management Levels

The current appropriate management levels were established in 1993 and 1994 from a process that included five years of focused, intensive monitoring of wild horse herd areas, use areas, and grazing allotments. Evaluation of data, public input, and environmental analysis were utilized to establish the appropriate management level for each herd. Appropriate management levels were established for the Lander Field Office by two National Environmental Policy Act analyses. In 1993, Environmental Assessment (EA) # WY-036-EA3-010 identified five HMAs: Conant Creek, Muskrat Basin, Rock Creek Mountain, Dishpan Butte, and Green Mountain. An EA developed by the Rawlins Field Office, EA# WY-037-EA4-122, identified two HMAs and appropriate management levels for Crooks Mountain and Antelope Hills.

Appropriate Management Level/Population Expression in the Planning Area

The existing Lander Field Office appropriate management levels are expressed as the number of adults and yearlings, including unweaned foals of the year. At the time these appropriate management levels were developed, traditional inventory periods were in late winter or very early in the year, typically in February or March.

This period included foals from the previous year that had perished or survived to approach their first birthday, and the foals of the year had not yet been born. Therefore, the number counted represented what the adult population would be for the following year, not considering subsequent mortality.

Lately, there has been a shift in inventory times to favor the months of July and August. When a herd is counted at this time, most of the foals of the year have been born and many are 2 months of age or older. Therefore, an inventory of the same herd in the same calendar year will yield a higher number, barring some unusual late-winter event resulting in unusually high mortality, than would have occurred earlier in the year.

At one time a “Minimum Viable Population” was a widely accepted term among scientists and behaviorists. The concept can best be described in terms of genetic material and its diversity rather than as a specific number of horses. Blood typing was necessary to determine the genetic characteristics of a given population. The identification of a specific population level for an area that represents a Minimum Viable Population is also influenced by the amount and frequency of interaction with other populations. It is generally agreed that 50 competent breeding animals will constitute a Minimum Viable Population under most circumstances.

Inventory practices are under review by the National Program Office. Inventory practices might be standardized, and any such standardization could include a uniform method of counting a population. Increased interest in the genetic character of a particular herd has caused some differing views on the expression of population sizes and objectives.

Geneticists usually define a population in terms of the effective population, which consists of the number of competent breeding-age animals. Therefore, colts of the year, yearlings, a portion of the 2-year olds, and the very old would not be included as part of the effective population count. The appropriate management level necessary to maintain an effective breeding population of 100 would be approximately 165 adult animals, not including unweaned foals. The exact number would vary depending on the age and sex distribution of the particular herd.

Implications of Wild Horse Genetic Research

Wild horses managed on public lands have a variety of histories and originate from a variety of backgrounds. Advances in genetic research have enabled the BLM to identify the specific genetic stock from which a wild horse population originates, thereby assisting in identifying the history of a population. The genetic roots of most of the horses are predominantly American, and some have beginnings as recent as the period following World War II when horses that had been used by the U.S. Army Cavalry were released on public lands. Occasionally, populations have been encountered whose genetic roots can be traced to the Spanish exploration period through the identification of genotypes associated with the New World Iberian (Spanish Colonial) breeds. Populations with this distinctive genotype provide a genetic resource that the majority of wild horses on public lands do not provide. The wild horses in the Lander Field Office’s Antelope Hills HMA are such a population.

In 2001, blood samples from wild horses were taken from the Cyclone Rim area in the Antelope Hills HMA and were provided to Dr. E. Gus Cothran of the Equine Parentage Testing and Research Laboratory at the University of Kentucky. Results from the genetic analysis of these samples identified a clear contribution from New World Iberian breeds. The highest average genetic association of the blood samples provided were the Spanish Colonial breeds. The next highest average genetic association was with North American Gaited breeds, most likely from the routine escape of domestic saddle stock from the surrounding areas. A report of the results of this genetic analysis is available at the Lander Field Office.

As genetic testing continues with the wild horse populations throughout the Red Desert meta-population, the necessity of maintaining the population of wild horses in the Antelope Hills HMA in genetic isolation could vary. If populations adjacent to the Antelope Hills HMA share the prevalence of New World Iberian genomes, inter-mingling these populations would be beneficial to maintain the genetic resource; therefore, isolating and maintaining an internally viable population in the Antelope Hills HMA would not be required. However, if the New World Iberian genes are prevalent only in Antelope Hills, further intermingling could cause this genetic resource to disappear. Continued monitoring and research could result in adjustments to management decisions for the Antelope Hills HMA. Adjustments would be implemented following appropriate analysis and maintenance of management documents.

Wild Horse Management History in the State Of Wyoming and the Planning Area

In 1971, in response to the passage of the Wild Free-Roaming Horses and Burros Act, Wyoming BLM identified the existing wild horse habitats and populations in the state that would likely be subject to the provisions of the act. These identifications were made using the best information and understanding available at the time. The result was 30 areas in the State of Wyoming with populations totaling 4,411 horses. Of those, 1,049 were estimated to be privately owned horses that would be claimed and removed from the range under the provisions of the act. Those 30 areas comprised a total of 6,557,160 acres of public lands, 389,112 acres of land owned by the State of Wyoming, and 2,479,096 acres of privately owned lands. The 30 areas varied greatly in size and land ownership.

As soon as the act passed, a number of activities that had served to limit the growth in horse numbers and the expansion of their ranges ceased. Horse populations in Wyoming began to grow.

Following passage of the act, BLM personnel began to accumulate additional information about the horses and their habitats. Area boundaries were refined as more was learned about the seasonal needs and habits of horses. By 1974, the list of 30 areas had increased to 40 areas, comprising a total of 6,820,749 acres of public lands, 406,103 acres of land owned by the State of Wyoming, and 2,355,852 acres of privately owned lands. As before, the 40 areas varied greatly in size and land ownership.

The period of 1976 to 1984 saw a great deal of activity in land use planning. For Wyoming, this can be called the Management Framework Plan Era. During this period, the 40 areas previously identified were combined into 24 areas. The Management Framework Plan process resulted in identifying 14 of those 24 areas that, in one way or another, failed to meet suitability requirements for maintaining a long-term healthy population of horses in accordance with the intent of the Act. One of the two most important criteria was that the area contained substantial amounts of private land. The other was that the horse population was too small to continue to thrive when isolated from customary sources of new genetic stock. The remaining 10 areas were then designated as HMAs. The HMAs comprised 3,322,776 public acres, 152,551 acres of land owned by the State

of Wyoming, and 861,022 acres of privately owned land. This process also identified population objectives for these herds, totaling 2,673 horses.

With respect to horses in Wyoming, this has resulted in the 16 HMAs currently recognized in the state. These 16 areas comprise 3,664,002 acres of public land, 154,737 acres of land owned by the State of Wyoming, and 846,243 acres of privately owned lands. The 16 areas still vary in size and land ownership, although not to the extent that they once did. Particularly worthy of note is the substantial amount of private land now included in designated HMAs. Much of the private acreage consists of land owned or controlled by the Rock Springs Grazing Association of southwestern Wyoming. It has made its lands available to an agreed-upon number of wild horses since 1979. Without access to those lands, approximately 1.5 million acres of adjoining and commingled public lands would be unavailable for inclusion in HMAs. This would, in effect, eliminate one-third of the free-roaming horses in Wyoming. The current, combined population objective (appropriate management level) for wild, free-roaming horses in Wyoming is 3,263, or 18 percent more than it was in 1980. Without the access to the private lands, the combined appropriate management level would be only 2,038.

If an effective breeding population of 100 horses is necessary to maintain a genetically viable herd of wild horses, 9 of the 16 HMAs in Wyoming do not have appropriate management levels that would indicate genetically stable long-term populations. However, wild horse herds in these HMAs are usually part of a larger meta-population comprising adjacent HMAs through migration and animals exchanging. The meta-population is the entire gene pool available to a specific herd.

When originally identified and reviewed through planning, HMA boundaries were designated to reflect common herd location, as well as to simplify administration and management of wild horses. As a result, several HMAs could be designated adjacent to one another in different BLM field office planning areas, or simply separated by geographic features such as watersheds. The individual populations in each HMA might be separated for most of the year, but both could share the same winter range. Sharing resources allows for regular interaction between the two populations. Interaction allows for horses from each herd to be recruited by and assimilated into the other. Therefore, although the appropriate management level of the individual HMAs would appear to be genetically deficient, each population is periodically infused with new genetic material and the genetic diversity of both herds is enhanced. In any given year, only a very few bands from each herd might actually exchange members. However, over time, the normal behaviors of each herd cause the mixing to become widespread.

From the standpoint of genetic viability, the required level of exchange of animals and the related introduction of new genetic material is not high. In small populations of less than 150 animals, the introduction of one or two competent breeding animals per generation (i.e., approximately 10 years) will ensure the maintenance of the genetic resource. Table V.1, "Wild Horse Regional Meta-populations Associated with the Planning Area" (p. 1809), identifies the wild horse HMAs in the planning area, and the meta-populations in which the horses of the HMAs interact.

Table V.1. Wild Horse Regional Meta-populations Associated with the Planning Area

HMAs in the Planning Area		Meta-population		HMA(s) in the Meta-population	Type of Interaction	Points of Contact
Name	Appropriate Management Level	Name	Appropriate Management Level			
Antelope Hills ¹	60-82	Red Desert includes Divide Basin	895-1324	Stewart Creek Lost Creek Antelope Hills Divide Basin Crooks Mountain	Male migration, female exchange	Hay Reservoir Bare Ring Hadsell Osborne Draw
Green Mountain ¹	170-300	Red Desert includes Divide Basin	895-1324	Stewart Creek Lost Creek Antelope Hills Divide Basin Crooks Mountain	Male migration, female exchange	Hay Reservoir Bare Ring Hadsell Osborne Draw
Crooks Mountain ¹	65-85	Red Desert includes Divide Basin	895-1324	Stewart Creek Lost Creek Antelope Hills Divide Basin Green Mountain	Male migration, female exchange	Hay Reservoir Bare Ring Hadsell Osborne Draw
Conant Creek ²	60-100	North Lander	320-535	Dishpan Butte Muskrat Open Rock Creek Mountain	Male migration, female exchange	Beaver Rim Lower Conant Creek Upper Conant Creek
Dishpan Butte ²	50-100	North Lander	320-535	Muskrat Open Rock Creek Mountain Conant Creek	Male migration, female exchange	East Fork of Long Creek Beaver Rim
Muskrat Basin ²	160-250	North Lander	320-535	Rock Creek Mountain Conant Creek Dishpan Butte	Male migration, female exchange	Beaver Rim Lower Conant Creek Upper Conant Creek
Rock Creek Mountain ²	50-85	North Lander	320-535	Muskrat Basin Conant Creek Dishpan Butte	Male migration, female exchange	Beaver Rim Above and Below Conant Creek Drainage
¹ Portions of the Antelope Hills, Crooks Mountain, Green Mountain, and Lost Creek HMA boundaries have no fences. Therefore, horses are free to migrate and exchange. Horses in the Stewart Creek and Divide Basin HMAs are fenced off from neighboring HMAs and must negotiate a fence in order to mix. ² Horses in the North Lander Complex Meta-population occasionally mix. These animals must negotiate fences in order to exchange with one another. HMA Herd Management Area						

The following trends have emerged in Wyoming since the passage of the Wild Free-Roaming Horses and Burros Act:

1. The average herd size has increased from 147 to 197.
2. The area of public land available for use by horses has increased slightly since 1980.
3. The area of private land occupied has decreased from 2.5 million to 846,243 acres.

4. Of the 16 herds, 14 are part of meta-populations greater than 300.

These same trends are representative of the changes that have occurred in the planning area since the passage of the act. In 1971, an estimated 435 horses subject to management under the act occupied 2,116,095 acres in 6 areas. Today, an estimated 1,540 horses subject to management under the act occupy approximately 929,000 acres in 3 areas.

It should be noted that the BLM has routinely removed excess and stray horses from the range since 1978. During that period, more than 27,000 horses have been removed from Wyoming rangelands and placed through the BLM's Adopt-a-Horse-or-Burro program. Nonetheless, the population is still in excess of 4,000 animals, an important indicator that the cornerstone principle of the act, a thriving natural ecological balance, is not imperiled by BLM management of the horses.

Population Management Actions in the Planning Area

Population management actions in the planning area take place as part of a state and national undertaking to allocate scarce resources, and equally scarce space, for the removal of horses from public rangelands. This is necessary so that effective planning and scheduling can occur BLM-wide. No single office controls the fiscal and logistical resources necessary to affect the desired management of horses in its jurisdiction. Instead, each office is part of the BLM-wide wild horse management program. A key part of this program is the identification of a gather cycle for a state, which can result in gathers taking place in less than ideal conditions in a particular HMA. Once established, the gather cycle needs to be followed as closely as possible.

Appropriate management levels were established to allow for a range of fluctuation in the population, while still meeting the criteria for a valid appropriate management level. In evaluating the appropriate management level, a lower limit was identified and then examined to ensure that the particular herd will remain genetically viable if periodically reduced to that level. This is a crucial consideration in many of the smaller herds in the state. Concurrently, the upper limit is evaluated to determine that, under normal climatic conditions, resource damage or other substantial conflicts would not be likely to occur if the population were allowed to increase to this level cyclically. The appropriate management level will equate to the average population level during a management cycle. Analysis of various gather cycles (occurring outside the scope of this RMP) is occurring as part of the statewide wild horse management strategy. Three- and 4-year gather cycles for the state are being evaluated and compared. Cycles longer than 4 years are also being evaluated as part of a management scheme that would employ fertility control to limit population increases.

When a gather cycle is chosen for implementation in the state, part of the evaluation leading to the choice will be the ability of the Wyoming BLM to remain in substantial conformance with the consent decree of August 28, 2003, and all other relevant law and policy. The upper and lower limits would be reevaluated and adjusted to ensure maintenance of a thriving ecological balance. Because the appropriate management levels were evaluated considering the potential for adverse effects from a 4-year gather cycle and the associated level of population fluctuation, a shorter cycle and lower average population levels would still serve the purposes of the appropriate management level determination process.

Fertility control has become a widely used tool for restraining reproduction. Currently, the most widely used method is Porcine Zona Pellucida (PZP). Most herds for which the BLM implements PZP vaccination are administered a 22-month controlled release formula in conjunction with a

gather. Some analysis indicates that this 22-month formula provides infertility at 94 percent for year one, 82 percent for year two, and 68 percent for year three. Fertility returns to normal on the fourth year. The BLM issued an instruction memorandum in March of 2009 to direct and guide the implementation of fertility control in the field. It is the policy of BLM to apply fertility control as a component of all gathers unless there is a compelling management reason not to do so. For the Lander Field Office, all HMAs have been fertility treated using the PZP-22 fertility control vaccine. The North Lander Complex was treated for the first time in July 2009. Herds in three of the five HMAs in the Red Desert Complex (three managed by Lander and two by Rawlins) were treated in 2006, 2009, and 2011.

Inventory Practices in the Planning Area

Inventory practices in the planning area have developed over time. At present, all inventories in the planning area are conducted using a helicopter-type aircraft. Typically, east-west transects at 1 to 1 ½ mile intervals are employed, flight height is approximately 500 feet above ground level, and airspeed is approximately 80 miles per hour. These practices have been developed to minimize stress to horses and other animals and to comply with BLM aircraft safety guidelines. Some inventories have been completed using fixed-wing aircraft, as part of a research project involving the U.S. Geological Survey Biological Resources Discipline from Fort Collins, Colorado. These inventories employ two observers, including one representing the Wyoming Department of Agriculture. This approach yields an actual, independent double count of half of the area, and a constructed double count of the other half. These results are then analyzed statistically and evaluated. Other inventories typically employ a single or double observer using a direct count method.

Animal Health

Animal health issues are considered at two levels: Horses removed from the range and maintained in BLM facilities, and horses remaining on the range. Both levels are afforded appropriate attention through the Memorandum of Understanding (MOU) that BLM has with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS). This MOU provides BLM with access to a complete staff of federal veterinarians in each state. It also supplies access to a national program manager located in Fort Collins, Colorado, who can access the Veterinary Services Centers for Epidemiology and Animal Health, Veterinary Services Western Regional hub, and U.S. Department of the Interior Biological Resources Division of the U.S. Geological Survey. In addition, this ensures that APHIS will be able to incorporate the wild, free-roaming horses managed by BLM into its responsibility to ensure the health and safety of the nation's plants and animals.

At both levels, the staff of APHIS is involved with the State of Wyoming, private practitioners, and other federal agencies to ensure the appropriateness of all activities involving wild, free-roaming horses managed by BLM.

The Wild, Free-Roaming Nature (of Wild Horses)

There are approximately 30,000 wild horses in North America, and approximately 2,000,000 domestic horses. In the Lander RMP, the term "wild, free-roaming nature" is used to describe wild horses.

Currently, horses in all of the HMAs exhibit a wild, free-roaming nature. They are typically wary of humans, but do not display signs that would indicate an intense fear. They rely on their acute

senses, especially their sight, to enable them to maintain a feeling of safety. They use their speed and agility to quickly regain a “safe” distance when disturbed. They do not recognize or seek any dependence on humans for sustenance. One of the principle distinctions between domestic and wild horses is the ability of wild horses to make certain choices. They can choose their space, their diet, and their company. They can choose optimal behaviors for survival. In contrast, their domesticated cousins have only limited choices and depend on humans for sustenance.

The loss of a horse’s wild, free-roaming nature is not a fatal disease, but it does have consequences as well as causes. The wild, free-roaming nature takes a certain kind and amount of space to sustain. What is currently available to the horses in the HMAs satisfies both kinds of space. Changes introduced to either the kind or amount of space available will cause the horses to make different choices, with the choices becoming more varied as more change occurs. Change comes in a variety of forms, most of which are either a function of, or are accompanied by, increased human presence. New roads, structures, facilities, and fences are examples. As a consequence of these increased human interactions, wild horses can lose their wild nature. Wild horses seek out the most convenient foraging areas, and therefore can become more competitive with domestic livestock. Band structure and function could cease to provide a secure environment in which young horses can mature and learn successful wild horse behavior.

Appendix W. Travel Management Planning

General Planning Direction

All actions associated with the management of motorized vehicle areas and trails must meet the designation criteria contained below (43 Code of Federal Regulations [CFR] 8342.1):

The Authorized Officer shall designate all public lands as either open, limited, or closed to motorized vehicles. All designations shall be based on the protection of the resources of the public lands, the promotion of the safety of all the users of the public lands, and the minimization of conflicts among various uses of the public lands; and in accordance with the following criteria:

- (a) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, air, or other resources of the public lands, and to prevent impairment of wilderness suitability.
- (b) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats. Special attention will be given to protect endangered or threatened species and their habitats.
- (c) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.
- (d) Areas and trails shall not be located in officially designated wilderness areas or primitive areas. Areas and trails shall be located in natural areas only if the authorized officer determines that off-road vehicle use in such locations will not adversely affect their natural, esthetic, scenic, or other values for which such areas are established.

In addition, areas and trails for all types of conveyances must support the goals, objectives, and management actions contained in the Resource Management Plan (RMP), and applicable laws and policies.

Lander Field Office Area Designations and Decisions

Travel designations in the Lander RMP include “limited” and “closed,” as described below.

Limited designations restrict travel in specified areas and/or on designated routes, roads, vehicle ways, or trails. This designation is used where travel use must be restricted to meet specific resource management objectives. Examples of limitations include number or type of conveyance; time or season of use; permitted or licensed use only; use limited to designated roads and trails; or other limitations if restrictions are necessary to meet resource management objectives, including certain competitive- or intensive-use areas that have special limitations (see 43 CFR 8340.0-5).

There are three distinct uses of the limited designation in the Lander RMP, including “designated” roads and trails, which under earlier guidance was considered a separate designation from limited. The three types of limited designations are:

- Travel limited to designated roads and trails; areas where travel is restricted to designated roads and trails.

- Travel limited to designated roads and trails and limited seasonally; in these areas travel is restricted to seasonal use periods and to designated roads trails.
- Travel limited to existing roads and trails; areas where travel is restricted to existing roads and trails. This designation is an interim designation until route-specific planning can occur. At the point at which travel planning occurs, motorized travel in the area will be limited to designated roads and trails.

Closed designations identify areas where motorized vehicle travel is prohibited. Access by means other than motorized vehicle, such as mechanized (e.g., bicycle) or nonmotorized use (e.g. pedestrian or pack), is permitted. Areas are designated closed if closure to all vehicular use is necessary to protect resources, promote visitor safety, or reduce use conflicts (see 43 CFR 8340.0-5).

Future Implementation Planning

The designations defined above require an additional level of effort and planning prior to implementation. A Travel Management Plan (TMP) is the document that describes the decisions related to the selection and management of the transportation network. This document can be an appendix to an RMP, incorporated in an activity implementation plan (such as a Recreation Implementation Plan), or a stand-alone document after development of the RMP. Route-specific decisions in a TMP support the RMP goals, objectives, and management actions, and the designation criteria in 43 CFR 8342.1.

A complete TMP includes:

- Criteria to select or reject specific transportation linear features in the final travel management network; to add new roads, primitive roads or trails; and to specify limitations. The criteria must include those identified in 43 CFR 8342.1.
- A map of roads, primitive roads, and trails for all travel modes and uses, including motorized, nonmotorized, and mechanized travel.
- Definitions and additional limitations for specific roads, primitive roads, and trails.
- Guidelines for managing and maintaining the travel management system. This includes, at a minimum, the development of route-specific roads, primitive roads, and trail management objectives, a sign plan, an education/public information plan, an enforcement plan, and a process requiring the application of engineering best management practices.
- Indicators to guide future plan maintenance, amendments, or revisions related to the travel management network.
- Needed easements and rights-of-way (ROWS) (to be issued to the Bureau of Land Management [BLM] or others) to maintain the existing road, primitive road, and trail network providing public land access.
- Provisions for new route construction or adaptation/relocation of existing routes.
- A plan for decommissioning and rehabilitating closed or unauthorized routes.
- A monitoring plan.
- Classification of all roads, primitive roads, and trails, designated for travel in a TMP, as assets in the Facility Asset Management System. All roads, primitive roads, and trails will also be identified as such in the Ground Transportation Linear Feature geospatial database.

Document Purpose

To the extent practical, TMPs should be developed concurrent with the RMP. Possible reasons for deferring the development of a TMP might be size or complexity of the area, controversy, or

incomplete data. Travel management planning can either be completed concurrently with the RMP or deferred to an implementation plan. In either case, certain requirements must be met in the RMP.

Because the Lander Field Office final travel and transportation network is being deferred, the purpose of this appendix is to document the decision-making process used to develop the initial network, provide the basis for future implementation-level decisions, and provide guidelines for making transportation network adjustments throughout the life of the plan. The following items are contained within this appendix:

- A map of the known network of transportation linear features, including modes of travel;
- Long-term management goals and objectives for the transportation system;
- Management objectives for areas or sub-areas where route designations were not completed concurrent with the RMP;
- A process for moving from an interim designation of “limited to existing roads, primitive roads, and trails,” to a designation of “limited to designated roads, primitive roads, and trails upon completion of the TMP;”
- Identification of incomplete travel and transportation tasks including:
 - Additional data needs and a strategy to collect needed information;
 - Identification of a clear planning sequence for subsequent road and trail selection and identification, including the public involvement process (focusing on user groups and stakeholders), initial route selection criteria, and constraints; and
 - A schedule to complete the area or sub-area road, primitive road, and trail selection process.

Travel Management Areas

Map 142 displays the Travel Management Areas in the planning area. These areas represent potential TMP units, or areas where existing travel management decisions are different from the surrounding area. As such, and further discussed in this document, these areas will provide boundaries for the development and prioritization of future TMPs.

Travel Management Plans

Table W.1, “Travel Management Plan, Priority Rank, Timeframes for Completion, and Interim and Final Travel Restrictions” (p. 1815), lists TMPs, priority rankings, timeframes for completion, interim travel restrictions, and restrictions following development of a TMP.

Table W.1. Travel Management Plan, Priority Rank, Timeframes for Completion, and Interim and Final Travel Restrictions

Travel Management Plan Name	Priority Rank	Timeframe	Interim Travel Restrictions ¹	Final Restrictions After Development of a Travel Management Plan ²
Zone 1 – Twin Creek	1	Directly Following the ROD	Motorized travel limited to existing roads and trails identified in Map 112.	Motorized travel limited to designated roads and trails.
Zone 2 – Johnny Behind the Rocks	2		Closed to motorized travel. Administrative access will be available to administer	Closed to motorized travel. Administrative access will be available to

Travel Management Plan Name	Priority Rank	Timeframe	Interim Travel Restrictions ¹	Final Restrictions After Development of a Travel Management Plan ²
			livestock grazing permits, as well as for maintenance and development of the recreation area. Open to mechanized and nonmotorized travel.	administer livestock grazing permits, as well as for maintenance and development of the recreation area. Open to mechanized and nonmotorized travel.
Zone 3 – Lander Slope/Red Canyon (including Baldwin Creek WSR and Sinks Canyon Climbing Area)	3	Priority Deferred	All travel limited seasonally (dates and travel limitation are defined in Alternative D), overland motorized and mechanized travel is limited to existing roads and trails. Over-snow vehicle travel is open, subject to seasonal limitations. Baldwin Creek is closed to motorized and mechanized travel. Sinks Canyon is closed to motorized travel.	All travel limited seasonally (dates and travel limitation are defined in Alternative D), motorized and mechanized travel limited to designated roads and trails. Over-snow vehicle travel is open, subject to seasonal limitations. Baldwin Creek is closed to motorized and mechanized travel. Sinks Canyon is closed to motorized travel.
Zone 4 – Antelope Hills including Sweetwater Canyon WSA	4		Motorized travel limited to existing roads and trails identified in Map 112. In Sweetwater Canyon, motorized travel is limited to roads and trails contained on Map 112. Closed to over-snow motorized vehicle travel.	Motorized travel limited to designated roads and trails. Sweetwater Canyon is closed to over-snow motorized vehicle travel.
Zone 5 – The Bus @ Baldwin Creek	5		Closed to motorized travel, open to nonmotorized and mechanized travel. Closed to over-snow motorized vehicle travel.	Closed to motorized travel, open to nonmotorized and mechanized travel. Closed to over-snow motorized vehicle travel.
Zone 6 – Dubois Badlands WSA	6			
Zone 6 – Dubois (including East Fork ACEC, Whiskey Mountain ACEC, Whiskey Mountain WSA, and Little Red Creek area)	6		Motorized travel is limited to existing roads and trails. In the East Fork ACEC, motorized and mechanized travel is limited seasonally (as	Motorized travel limited to designated roads and trails. In the East Fork ACEC, motorized and mechanized travel is limited seasonally (as

Travel Management Plan Name	Priority Rank	Timeframe	Interim Travel Restrictions ¹	Final Restrictions After Development of a Travel Management Plan ²
			defined in Alternative D) to existing roads and trails. In the Whiskey Mountain ACEC, motorized and mechanized travel limited seasonally (as defined in Alternative D) to existing roads and trails. The Whiskey Mountain WSA and Little Red Creek area will be closed to motorized travel.	defined in Alternative D) to designated roads and trails. Motorized travel is limited to designated roads and trails. In the Whiskey Mountain ACEC, motorized and mechanized travel will be limited seasonally (as defined in Alternative D) to designated roads and trails. The Whiskey Mountain WSA and Little Red Creek area will be closed to motorized travel.
Zone 7 – Green Mountain	7	Priority Deferred	Motorized and mechanized travel limited seasonally to existing roads and trails.	Motorized and mechanized travel limited seasonally to designated roads and trails.
Zone 8 – Agate Flats	8		Motorized travel limited to existing roads and trails identified in Map 112.	Motorized travel limited to designated roads and trails.
Zone 9 – Sweetwater Rocks WSA	9	Deferred	Motorized travel limited to roads and trails contained on Map 112. Closed to over-snow motorized vehicle travel.	Motorized travel limited to designated roads and trails. Closed to over-snow motorized vehicle travel.
Zone 10 – Crooks	10		Motorized travel limited to existing roads and trails identified in Map 112.	Motorized travel limited to designated roads and trails.
Zone 11 – Copper Mountain WSA	11		Closed to motorized travel. Open to nonmotorized travel.	Closed to motorized travel. Open to nonmotorized travel.
Zone 11 – Bridger	11		Motorized travel limited to existing roads and trails identified in Map 112.	Motorized travel limited to designated roads and trails.
Zone 12 – Rattlesnake Hills	12			
Zone 13 – Moneta	13			

¹ Additional over-snow vehicle restrictions are discussed in the management actions in Chapter 2. These decisions are fully enforced upon the signing of the ROD.

Travel Management Plan Name	Priority Rank	Timeframe	Interim Travel Restrictions ¹	Final Restrictions After Development of a Travel Management Plan ²
² Additional restrictions and stipulations on travel might be applied at the TMP stage. These stipulations could include route-specific limitations, such as closing a route seasonally, limiting the type of vehicle or conveyance that can travel the route, and/or other supplementary rules necessary to address planning issues. ACEC Area of Critical Environmental Concern ROD Record of Decision WSA Wilderness Study Area WSR Wild and Scenic River				

Additional Data and Information Needs for all Lander Field Office TMPs

Travel management planning across the entire planning area is being deferred primarily due to the need for additional data and information. The following items are needed prior to completing Lander Field Office TMPs:

- Route identification and inventory has been completed for the entire Lander Field Office; however, most of this information was developed through Geographic Information System (GIS)-based layers. All TMPs will need to have some level of spot checking, internal review, and review from stakeholders and members of the general public. This spot-checking and review process is reflected in all TMP timeframes discussed in this document.
- Pursuant to Instruction Memorandum (IM) 2012-067; cultural resource inventory requirements, priorities, and strategies will vary depending on the quality of the existing information, the extent of potential change to the location, the expected density and nature of historic properties, and the potential direct, indirect, and cumulative effects of the route designation, in consultation with the State Historic Preservation Office (SHPO), tribes, and other interested parties. Prior to the development of a TMP, cultural resource specialists will develop an inventory strategy that addresses these factors.
- No area in the planning area has a partial or fully completed TMP. Therefore, all elements associated with a TMP need to be completed for the entire planning area.
- The areas identified for deferred travel planning are tentative planning units. It is possible that adjustments to the boundary of these planning units will be necessary to respond to new information, issues, or considerations. Any adjustments to the area boundaries will be a component of the TMP process, occur early in the planning process, and be subject to public review.
- Finally, all areas in the planning area have RMP objectives that will influence travel planning. Some areas (e.g., Areas of Critical Environmental Concern [ACECs] and Special Recreation Management Areas [SRMAs]) have area- and program-specific objectives. At a minimum, all areas have general travel planning objectives tiered to the designation criteria in 43 CFR §8342.1. It is possible that additional travel planning implementation objectives will need to be developed to respond to new information or considerations. The development of implementation objectives will be a component of the Lander Field Office TMP process, occur early in the planning process, and be subject to public review.

Detailed Description of TMPs ‘Directly Following the Record of Decision (ROD)’

The following TMPs are identified above for travel management planning directly following the finalization of the ROD (or within 2 years after the completion of the RMP process):

1. Twin Creek TMP

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9, LR 11, LR 12, and SD 25

Objectives: LR 6.1, LR 7.1, LR 8.1, LR 9.1, LR 12.1-12.3, and SD 25.1-25.4

Management Actions: 6044

Primary Travelers

Hunters (fall, winter, spring), antler hunters, livestock grazing permittee(s), and private land owners.

2. Johnny Behind the Rocks TMP

RMP goals, objectives, and management actions that will influence travel.

Goals: LR 6 and LR 7

Objectives: LR 6.1, LR 6.3, LR 7.1, LR 7.3, LR 11, LR 11.1, LR 12.1-12.3, LR 13.1-13.3, LR 25.1-25.5

Management Actions: 6040, 6041, 6081, and RMZ desired future setting descriptions contained in the Lander Community SRMA in Appendix C (p. 1453).

Primary Travelers

Upon finalization of the RMP, the primary travelers in this area will be hikers, mountain bikers, horseback riders, trail runners, and livestock grazing permittees.

Strategy and Task Schedule

The following is a strategy and general task schedule for the development of these TMPs:

A. Preplanning Information.

A.1. Identify area-specific RMP goals, objectives, and decisions that will influence travel. Identify implementation objectives necessary to respond to new information or considerations.

A.2. Identify primary travelers.

A.3. Develop purpose and need for each area based on A.2-A.3 and designation criteria contained in CFRs.

B. Issue and planning criteria development.

B.1. Develop planning issues associated with A.

B.1.1. Develop indicators in response to planning issues identified in B.1.

B.1.2. Develop route selection criteria (or standards) associated with B.1.1.

B.2. Identify and address data gaps.

C. Within a month after completion of the RMP process, cooperators and the public will have an opportunity to provide comment on the above, as well as the existing route inventory.

D. Evaluate and Refine.

D.1. Evaluate route selection criteria using existing routes as a test case.

D.1.1. Route selection criteria should provide meaningful insight into individual route parameters/impacts and demonstrate variation in the magnitude of route impact.

D.1.2. Route selection criteria should give a picture of the magnitude of the cumulative impact or overall network impact.

D.1.3. Route selection criteria should provide for adaptive responses and analysis parameters for future travel actions, such as, adding roads or trails, or actions to mitigate new issues.

D.2. Present route selection criteria and results, as well as general alternative themes, to cooperators and the public.

D.3. Refine route selection criteria and general alternative themes.

E. Develop impact analysis on No Action Alternative and resource conservation alternatives.

E.1. Route selection criteria applied to No Action Alternative (Alternative A - all routes designated open) and resource conservation alternative (Alternative B - all routes that do not meet selection criteria will be closed).

E.2. Develop impact analysis for alternatives A and B.

E.2.1. Do these alternatives meet the purpose and need?

E.2.2. Drop (considered but not analyzed in detail) alternatives that do not meet the purpose and need.

E.3. Develop and identify standardized mitigation measures (specific to selection criteria) to address impacts associated with routes not meeting criteria.

F. Develop Alternative C (All routes that do not meet route selection criteria are mitigated open) based on step E.3.

G. Develop impact analysis for Alternative C.

H. 30-day review for cooperators and interested public and 5-day workshops to provide input.

I. Develop Preferred Alternative (D).

J. Develop impact analysis for Alternative D.

K. Issue draft TMP with 30-day comment period for the public.

0 to 2 years after the signing of the ROD:

L. Respond to public comments.

M. Issue final and decision document.

N. Implementation.

Detailed Description of Priority Deferred Areas

The following TMPs are identified above as a priority deferred area for travel planning, meaning planning will be conducted within 3 to 9 years after the completion of the RMP process. The accompanying schedule assumes:

- The Bus @ Baldwin Creek area is being deferred specifically to provide time to resolve management inconsistencies associated with trail development/promotion on State of Wyoming-administered lands in the area. Resolution of this issue could come in the form of a land swap and/or Memorandum of Understanding between the BLM, interested parties, and the State of Wyoming.
- Existing staffing plus adequate staffing to address ID Team needs, as well as staffing to collect additional inventory information.
- Limited scope creep of TMP, public involvement, and/or National Environmental Policy Act (NEPA) process.
- Full completion of the Twin Creek and Johnny Behind the Rocks TMPs.

3. Lander Slope/Red Canyon (including Baldwin Creek Wild and Scenic River (WSR) and Sinks Canyon Climbing Area) TMP: year three (after signing of ROD) inventory, years three to four planning, year four implementation

This TMP does not include the Bus @ Baldwin Creek, which will be a separate TMP.

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6-9, LR 11-12, SD 1-5, SD 7, and SD 10 - 11

Objectives: LR 6.1, LR 7.1-7.3, LR 8.1, LR 9.1, LR 12.1-12.3, LR 13.1-13.4, SD 7.1, SD 10.1-10.6, and SD 11.1-11.3

Management Actions: 6034, 6043, 6081, 6087, 6098, 6099, 6119, 7032, and desired future setting descriptions for the Sinks Canyon Recreation Management Zone (RMZ) described in Appendix C (p. 1453).

Primary Travelers:

Hunters (fall, winter, spring), wood cutters, antler hunters, livestock grazing permittee(s), climbers, and private land owners.

4. Antelope Hills TMP: year four (after signing of ROD) inventory, years four to five planning, year six implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9, LR 11, LR 12, SD 1-5, and SD 16

Objectives: LR 6.1, 7.1, LR 8.1, LR 9.1, LR 12.1-12.3, SD 1.1-5.6, and SD 16.1-16.3

Management Actions: 6044 and 7004, and Congressionally Designated Trails, Sweetwater Mining District, Group Use, and Alkali Basin RMZs desired future setting descriptions contained in Appendix C (p. 1453)

Primary Travelers

Hunters (fall, winter, spring), antler hunters, livestock grazing permittee(s), wood cutters, mining operators, oil and gas developers, Continental Divide Trail National Scenic Trail users, handcart trekkers, National Historic Trails enthusiasts and private land owners.

4. Sweetwater Canyon WSA TMP: year four (after signing of ROD) inventory, years four to five planning, year six implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 11, LR 12, LR 13, and SD 6

Objectives: LR 6.1, LR 6.3, LR 7.1-7.3, LR 11.1, LR 11.2, LR 12.1-12.3, LR 13.1-13.4, SD: 6.1, and SD 6.2

Management Actions: 6039, 6047, 7022, and RMZ desired future setting descriptions contained in Appendix C (p. 1453).

Primary Travelers

Fisherman, hikers, backpackers, horseback riders, hunters, wildlife viewers, and livestock grazing permittee(s).

5. The Bus @ Baldwin Creek TMP: year four (after signing of ROD) inventory, years four to five planning, year six implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, and LR 7

Objectives: LR 6.1, LR 6.3, LR 7.1, LR 7.3, LR 11, LR 11.1, LR 12.1-12.3, LR 13.1-13.3, LR 25.1-25.5

Management Actions: 6040, 6041, 6081, and RMZ desired future setting descriptions contained in the Lander Community SRMA in Appendix C (p. 1453).

Primary Travelers

Hikers, mountain bikers, horseback riders, trail runners, and livestock grazing permittee(s).

6. Dubois Badlands WSA TMP: years six to seven (after signing of ROD) inventory, years seven to eight planning, year eight implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 11, LR 12, LR 13, and SD 6

Objectives: LR 6.1, LR 7.1-7.3, LR 12.1-12.3, LR 13.1-13.4, SD: 6.1, and SD 6.2

Management Actions: 6037 and 7022

Primary Travelers

Wildlife watchers, hunters (fall, winter, spring), mountain bikers, antler hunters, livestock grazing permittee(s), and private land owners.

6. Dubois TMP (including East Fork ACEC, Whiskey Mountain ACEC, Whiskey Mountain WSA, and Little Red Creek area): years six to seven (after signing of ROD) inventory, years seven to eight planning, year eight implementation

RMP goals, objectives, and decisions that will influence travel.

Goal: PR 8, LR 6-9 LR 11-12, SD 1-5, SD 6-7, SD 12, and SD 13

Objectives: PR 8.1, LR 6.1, LR 7.1-7.3, LR 8.1, LR 9.1, LR 12.1-12.3, LR 13.1-13.4, SD 6.1, SD 7.1, and SD 12.1-12.4

Management Actions: 6034, 6035, 6039, 6042, 6081, 6087, 6102, 6103, 7022, 7032, 1049 and Dubois Mill-Site RMZ desired future setting described in Appendix C (p. 1453).

Primary Travelers

Activities associated with management of bighorn sheep, wildlife watchers, hunters (fall, winter, spring), antler hunters, livestock grazing permittee(s), and private land owners.

7. Green Mountain TMP: years eight to nine (after signing of ROD) inventory, years nine to ten planning, year ten implementation.

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 11, LR 12, SD 15

Objectives: LR: 6.1, LR 7.1-7.3, LR 12.1-12.3, and SD 15.1-15.4

Management Actions: 6034

Primary Travelers

Hunters (fall, winter, spring), wood cutters, antler hunters, livestock grazing permittee(s), private land owners, mining operators, oil and gas developers, and Continental Divide National Scenic Trail hikers.

8. Agate Flats TMP: years ten to eleven inventory (after signing of ROD), years eleven to twelve planning, year twelve implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9, LR 11, LR 12, SD 1-5, SD 16, and SD 23

Objectives: LR 6.1, LR 7.1, LR 8.1, LR 9.1, LR 12.1-12.3, SD 1.1-5.6, SD 16.1-16.3, SD 23.1-23.3

Management Actions: 7004 and Sweetwater Rocks RMZ desired future setting descriptions contained in Appendix C (p. 1453).

Primary Travelers

Hunters (fall), livestock grazing permittee(s), mining operators, oil and gas developers, National Historic Trails enthusiasts, and private land owners.

9. Sweetwater Rocks WSA TMP: years ten to eleven inventory, years eleven to twelve planning, year twelve implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 11, LR 12, LR 13, and SD 6

Objectives: LR 6.1, LR 6.3, LR 7.1-7.3, LR 11.1, LR 11.2, LR 12.1-12.3, LR 13.1-13.4, SD 6.1-6.2, and SD 23.1-23.3

Management Actions: 6039, 6081, 7022, and Sweetwater Rocks RMZ desired future setting descriptions in Appendix C (p. 1453).

Primary Travelers

Fall hunters, hikers, backpackers, climbers, horseback riders, wildlife viewers, livestock grazing permittee(s), and access to private in-holdings.

Strategy and Task Schedule

The following is a strategy and general task schedule for the development of these TMPs:

A. Preplanning

A.1. Adjust TMP boundaries as necessary to respond to new information or considerations.

A.2. Identify existing RMP goals, objectives, and decisions that will influence travel.

A.3. Identify implementation objectives necessary to respond to new information or considerations.

A.4. Identify primary travelers.

A.5. Develop purpose and need based on A.2-A.3 and designation criteria contained in CFRs.

B. Issue and planning criteria development.

B.1. Develop planning issues associated with A.2-A.4.

B.1.1. Develop indicators in response to planning issues identified in B.1.

B.1.2. Develop route selection criteria (or standards) associated with B.1.1.

B.1.3. Identify and address data gaps.

C. Public comment on above and existing route inventory.

D. Evaluate and Refine.

D.1. Evaluate route selection criteria using existing routes as a test case.

D.1.1. Route selection criteria should provide meaningful insight into individual route parameters/impacts and demonstrate variation in the magnitude of route impact.

D.1.2. Route selection criteria should give a picture of the magnitude of the cumulative impact or overall network impact.

D.1.3. Route selection criteria should provide for adaptive responses and analysis parameters for future travel actions such as, adding roads or trails, or actions to mitigate new issues.

D.2. Present route selection criteria and results, as well as general alternative themes, to cooperators and the public.

D.3. Refine route selection criteria and general alternative themes.

E. Impact analysis on No Action Alternative and resource conservation alternatives.

E.1. Route selection criteria applied to No Action Alternative (Alternative A - all routes designated open) and resource conservation alternative (Alternative B - All routes that do not meet selection criteria will be closed).

E.2. Develop impact analysis for alternatives A and B.

E.2.1. Do these alternatives meet the purpose and need?

E.2.2. Drop (considered but not analyzed in detail) alternatives that do not meet the purpose and need.

E.3. Develop and identify standardized mitigation measures (specific to selection criteria) to address impacts associated with routes not meeting criteria.

F. Develop Alternative C (All routes that do not meet route selection criteria are mitigated open.) based on step E.3

G. Develop impact analysis for Alternative C.

H. 30-day review for cooperators and interested public, and 5-day workshops to provide input.

I. Develop Preferred Alternative (D)**J. Develop impact analysis for Alternative D.****K. Issue draft TMP and 30-day comment period for the public.****L. Respond to public comments.****M. Issue final and FONSI Decision Record.****Deferred Areas**

The following TMPs are identified above as a ‘deferred area’ for travel planning, meaning planning will be conducted 9 to 19 years after the completion of the RMP process. The accompanying schedule assumes:

- Existing staffing in addition to adequate staffing to address ID Team needs, as well as staffing to collect additional inventory information.
- Limited scope creep of TMP, public involvement, and/or NEPA process.
- Full completion of the higher priority TMPs.

10. Crooks TMP: years twelve to thirteen inventory (after signing of ROD), years thirteen to fourteen planning, year fourteen implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9, LR 11, LR 12, SD 1-5, and SD 16

Objectives: LR 6.1, LR 7.1, LR 8.1, LR 9.1, LR 12.1-12.3, SD 1.1-5.6, and SD 16.1-16.3

Management Actions: 6044

Primary Travelers

Hunters (fall, winter, spring), wood cutters, antler hunters, livestock grazing permittee(s), mining operators, oil and gas developers, Continental Divide National Scenic Trail hikers, and private land owners.

11. Copper Mountain WSA TMP: years fourteen to fifteen (after signing of ROD) inventory, years fifteen to sixteen planning, year sixteen implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 11, LR 12, LR 13, and SD 6

Objectives: LR 6.1, LR 7.1-7.3, LR 12.1-12.3, LR 13.1-13.4, SD 6.1, and SD 6.2

Management Actions: 6039 and 7022

Primary Travelers

Hunters and livestock grazing permittee(s).

11. Bridger TMP: years fourteen to fifteen (after signing of ROD) inventory, years fifteen to sixteen planning, year sixteen implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9, LR 11, and LR 12

Objectives: LR 6.1, LR 7.1, LR 8.1, LR 9.1, and LR 12.1-12.3

Management Actions: 6044

Primary Travelers

Hunters (fall, winter, spring), antler hunters, livestock grazing permittee(s), mining operators, oil and gas developers, and private land owners.

12. Rattlesnake Hills TMP: years sixteen to seventeen inventory (after signing of ROD), years seventeen to eighteen planning, year eighteen implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9, LR 11, and LR 12

Objectives: LR 6.1, LR 7.1, LR 8.1, LR 9.1, and LR 12.1-12.3

Management Actions: 6044

Primary Travelers

Hunters (fall, winter, spring), wood cutters, antler hunters, livestock grazing permittee(s), mining operators, oil and gas developers, and private land owners.

13. Moneta TMP: years eighteen to nineteen inventory (after signing of ROD), years nineteen to twenty planning, year twenty-one implementation

RMP goals, objectives, and decisions that will influence travel.

Goals: LR 6, LR 7, LR 8, LR 9 LR 11, and LR 12

Objectives: LR 6.1, LR 7.1, LR 8.1, LR 9.1, and LR 12.1-12.3

Management Actions: 6044

Primary Travelers

Hunters (fall, winter, spring), livestock grazing permittee(s), mining operators, oil and gas developers, and private land owners.

Strategy and Task Schedule

The strategy and task schedule for these areas will be the same as that identified for the priority deferred areas.

This page intentionally
left blank

Appendix X. Comment Analysis

X.1. Introduction

On September 9, 2011, the Bureau of Land Management (BLM) published the Notice of Availability (NOA) in the Federal Register announcing the release of the Draft Resource Management Plan (RMP) and Environmental Impact Statement (EIS) for the Lander Field Office planning area. The NOA initiated the 90-day public comment period. At the request of the public and cooperating agencies, the BLM extended the comment period by 45 days, for a total comment period of 135 days. The public comment period ended on January 20, 2012. During the public comment period, the BLM hosted three commenting workshops in September 2011 and five public meetings in October 2011 in towns and cities throughout the planning area. The commenting workshops informed readers how to navigate the Draft RMP and EIS, and how to prepare and submit substantive comments. At the October public meetings, the BLM gathered public comments on the Draft RMP and EIS, and agency representatives were available at the meetings to answer questions from the public.

During the public comment period, the BLM received 262 unique comment documents and more than 25,000 form letters. This report summarizes the full range of issues and concerns as submitted by the public during the comment period. The submitted comments and summaries presented in this report do not necessarily represent the sentiments of the public as a whole. However, this summary does attempt to provide fair representation of the wide range of views submitted during the public comment period. In consideration of these views, it is important for the public and decision makers to understand that this process does not attempt to treat input as if it were a vote. Instead, comment analysis is a process that allows the BLM to review and consider received comments, develop appropriate responses, revise the Draft RMP and EIS in response to comments, and support the BLM's decision-making process.

The remainder of this report is organized as follows:

- **Comment Analysis Process** – Describes how the BLM received, recorded, and categorized comment documents and comments.
- **Commenter Demographics** – Presents demographic information associated with submitted comment documents, including geography and affiliation of commenters.
- **Analysis of Comments** – Provides a breakdown of the number of comments received by issue category, a summary of comments received, and a summary of the BLM's response to comments received.

This report refers to two attachments which are available on the RMP project website (<http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html>):

- **Attachment A: Commenter Index** – Includes instructions on how to use the tables in Attachment A and Attachment B. It also includes an index listing the names of all commenters and their associated comment document number.
- **Attachment B: Individual Comments and Index to Summary Comments and Summary Responses** – Includes all substantive public comments received during the public comment period along with an index to help users find their associated summary comments and response.

X.2. Comment Analysis Process

The BLM used a systematic process to compile, categorize, and evaluate written comments from individuals, federal and state agencies, tribal governments, elected representatives, and other organizations on the Draft RMP and EIS to identify substantive issues for review and response by BLM decision-makers. The comment analysis process provides a methodical approach for the BLM to revise text in the Draft RMP and EIS based on comments provided during the public comment period. Additionally, through the comment analysis process, the BLM supplemented the project mailing list, and compiled demographic information on the geographic distribution of commenters.

Public comment documents include hardcopy comments received at the public meetings, and electronic or written comment documents postmarked within the 135-day public comment period. Methods of comment document submittal included U.S. mail, e-mail, fax, and public meetings. All individuals attending public meetings were encouraged to submit comments in writing. The entire written submission from a commenter (e.g., full letter or e-mail) is referred to as a "public comment document"; an individual and identifiable substantive expression of interest or issue statement included in a public comment document is referred to as a "comment." For example, a letter (i.e., public comment document) received within the public comment period might have included one or more separate comments. "Commenter" refers to the individual or organization who submitted the comment document.

X.2.1. Analysis Process

The BLM comment analysis team used the software program CommentWorks®, an online comment tracking and analysis platform, to catalogue, number, review, categorize, and respond to public comments on the Draft RMP and EIS.

Upon receipt of a public comment document, a member of the comment analysis team logged the comment document into a comment tracking spreadsheet, assigned the document a unique identifier (e.g., Document 10001), and converted the comment document to a searchable electronic (i.e., PDF) document. The analysis team then added all pertinent commenter information (e.g., name, affiliation, address, and type of comment document) into CommentWorks® and uploaded the electronic documents to the system.

The first step in the analysis process was to identify individual substantive comments within a public comment document. The comment analysis team identified each substantive comment based on guidance in the BLM National Environmental Policy Act (NEPA) Handbook (H-1790-1). Substantive comments are those that do one or more of the following:

- Question, with reasonable basis, the accuracy of information in the RMP and EIS
- Question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis
- Present new information relevant to the analysis
- Present reasonable alternatives other than those analyzed in the RMP and EIS
- Cause changes or revisions in one or more of the alternatives

Comments not considered substantive included the following:

- Comments in favor of or against the Proposed Action or alternatives without reasoning that meet the substantive comment criteria listed above

- Comments that only agree or disagree with BLM policy or resource decisions without justification or supporting data that meet the substantive criteria listed above
- Comments that do not pertain to the planning area or scope of the RMP and EIS
- Comments that take the form of vague, open-ended questions

Based on the comments respondents received and on legal guidance, the analysis team established an issue coding structure for all substantive comments within CommentWorks® and used the coding structure to bracket and sort comments into logical groups or issue categories (e.g., air quality, cumulative impacts, and cultural resources). Table X.1, “Issue Categories” (p. 1831) lists all issue categories identified for the Draft RMP and EIS.

Table X.1. Issue Categories

Issue Categories		
Air Resources	Invasive Species	Salable Minerals
Areas of Critical Environmental Concern	Lands and Realty	Socioeconomic
Climate Change	Laws, Regulations, Guidance, Process	Soil
Congressionally Designated Trails	Livestock Grazing Management	Special Status Species
Cultural Resources	Leasable Minerals – Geothermal	Trails and Travel Management
Cumulative Impacts	Leasable Minerals – Oil and Gas	Vegetation
Editorial, Readability, and Data Issues	Leasable Minerals – Oil Shale	Visual Resource Management
Environmental Justice	Leasable Minerals – Other Solid Leasable Minerals	Water
Extension and Hard Copy Request	Locatable Minerals	Wild and Scenic Rivers
Fire and Fuels Management	Recreation	Wild Horses
Fish	Renewable Energy	Wilderness Characteristics
Greater Sage-Grouse	Rights-of-Way and Corridors	Wilderness Study Areas
Health and Safety	Riparian-Wetland	Wildlife

The BLM Interdisciplinary Team reviewed individual comments after the comments were assigned to an issue category, and provided direction to develop a response. The comment analysis team then used the individual comments and Interdisciplinary Team direction to analyze, group, and summarize comments, and to develop responses to the summary comments.

When reviewing comments, the analysis team looked not only for each action or change requested by the public, but also for any supporting information to capture the comment and its context in its entirety. In doing so, paragraphs within a comment document might have been divided into several comments because the paragraphs contained more than one comment; conversely, multiple sections of a comment document might have been combined to form one coherent comment.

It is important to note that during the process of identifying individual comments and concerns, the BLM treated all comments equally. The BLM did not weight comments based on organizational affiliation or status of commenters, and the number of duplicate comments did not increase the priority or merit of one comment over another. The process was not one of "counting votes," and the BLM did not make any effort to tabulate the exact number of people for or against any given aspect of the Draft RMP and EIS. Rather, the BLM focused on an understanding of the content of a comment, how it related to the Draft RMP and EIS, and appropriate responses and revisions to the Draft RMP and EIS.

X.3. Commenter Demographics

This section summarizes commenter demographics based on information provided in comment documents. Demographic analysis allows the BLM to form an overall picture of issues, and a

better understanding of who is submitting comments, the geographic distribution of commenters, their affiliations, and the format of the public comment documents.

X.3.1. Geographic Representation

The BLM tracked the geographic representation for each comment document that included such information. Table X.2, “Number of Commenters by Geographic Location” (p. 1832) identifies the number of comment documents received from individual geographic locations (excluding form letters). Figure X.1, “Number of Comment Documents by Geography” (p. 1833) depicts the geographic distribution of comment documents received from within the planning area, from outside the planning area but within the State of Wyoming, and from outside Wyoming. The BLM received the most comment documents from commenters within the planning area.

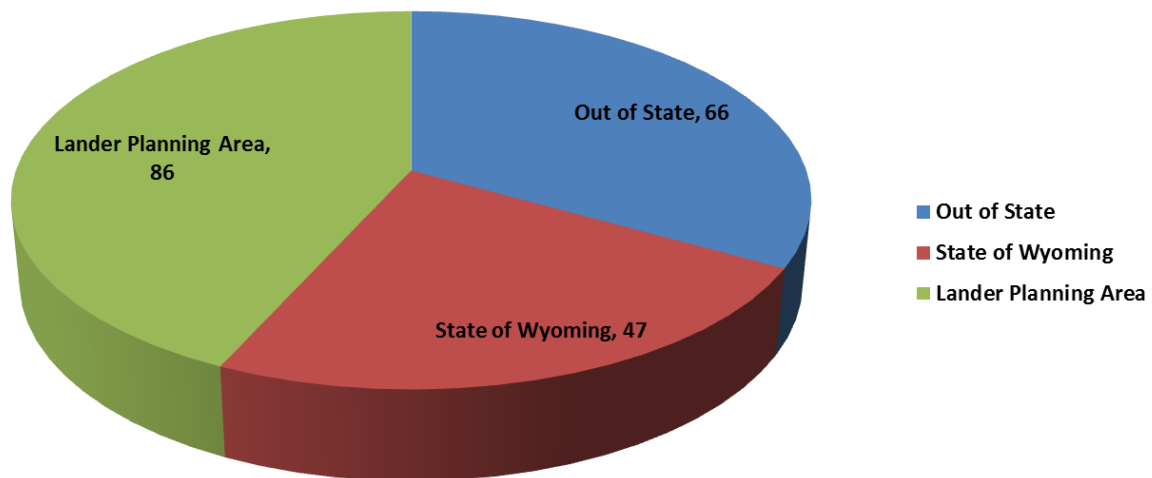
Table X.2. Number of Commenters by Geographic Location

State	City	Number of Commenters
Alaska	Anchorage	2
Arizona	Apache Junction	1
California	Healdsburg	1
California	Los Angeles	1
California	Oroville	1
California	Santa Rosa	1
California	Santa Ynez	1
California	West Hollywood	1
Colorado	Colorado Springs	1
Colorado	Denver	8
Colorado	Fort Collins	1
Colorado	Golden	1
Colorado	Lakewood	1
Colorado	LaSalle	1
Colorado	Loveland	1
District of Columbia	Washington	1
Florida	Miami	2
Iowa	Monticello	1
Idaho	Idaho City	1
Idaho	McCall	1
Illinois	Bartelso	1
Illinois	Chicago	1
Massachusetts	Millville	1
Massachusetts	Tewksbury	1
Maryland	Baltimore	2
Maryland	Chevy Chase	1
Maine	Fredericton	1
Missouri	Independence	2
Montana	Helena	1
Montana	Missoula	1
New Mexico	Albuquerque	3
New Mexico	Deming	1
Nevada	Las Vegas	1
New York	Canadaigua	2
Ohio	Cutler	1
Ohio	Willoughby	1
Oklahoma	Oklahoma City	1

State	City	Number of Commenters
Oregon	Klamath Falls	1
Pennsylvania	Pottstown	1
Tennessee	Knoxville	1
Texas	Austin	1
Texas	Dallas	1
Texas	Midland	1
Utah	Logan City	1
Utah	Salt Lake City	1
Virginia	Arlington	1
Washington	Camano Island	1
Washington	Deer Park	1
Washington	Monroe	1
Wisconsin	Delafield	1
Wisconsin	Madison	1
Wisconsin	Sturgeon Bay	1
Wyoming	Alcova	1
Wyoming	Atlantic City	1
Wyoming	Bairoil	2
Wyoming	Basin	1
Wyoming	Casper	2
Wyoming	Cheyenne	13
Wyoming	Cody	4
Wyoming	Dubois	8
Wyoming	Green River	1
Wyoming	Jackson	1
Wyoming	Jeffrey City	2
Wyoming	Lander	62
Wyoming	Laramie	8
Wyoming	Moose	1
Wyoming	Moran	1
Wyoming	Pinedale	2
Wyoming	Powell	2
Wyoming	Rawlins	4
Wyoming	Reliance	1
Wyoming	Riverton	11
Wyoming	Sheridan	1
Wyoming	Shoshoni	2
Wyoming	Thermopolis	1
Wyoming	-	1
Total		199

Note: Comments received through e-mail that did not include mailing addresses or geographic representation accounted for 63 submissions.

Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.



Note: Comments received through e-mail that did not include mailing addresses or geographic representation accounted for 63 submissions.

Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.

Figure X.1. Number of Comment Documents by Geography

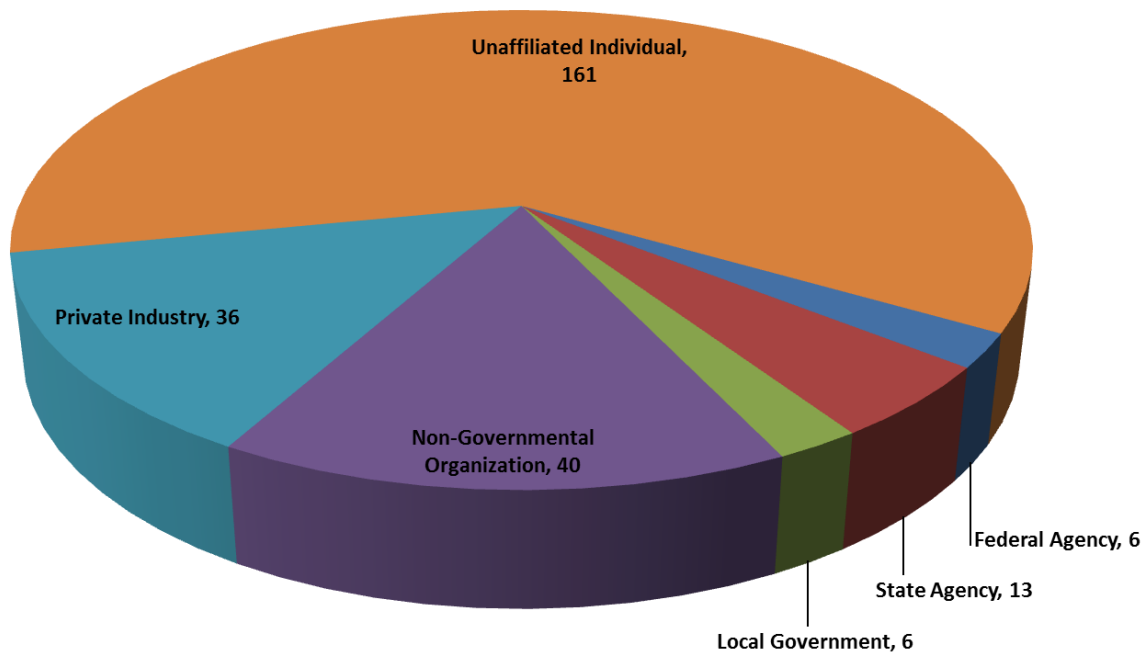
X.3.2. Organizational Affiliation

The BLM received comments from a range of entities, as listed in Table X.3, “Number of Comment Documents by Affiliation (excluding form letters)” (p. 1834) and shown on Figure X.1, “Number of Comment Documents by Geography” (p. 1833). The BLM affiliated comment documents with a government or non-governmental organization if the comment document was received on official letterhead or was received through an official agency or organization e-mail address. The BLM classified all other comment documents as unaffiliated individuals. The BLM received the most comment documents from unaffiliated individuals.

Table X.3. Number of Comment Documents by Affiliation (excluding form letters)

Affiliation	Number of Public Response Documents
Federal Agency	6
State Agency	13
Local Government	6
Non-Governmental Organization	40
Private Industry	36
Unaffiliated Individual	161
Total	262

Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.



Note: Form letters were counted once based on the geographic location of the originating entity for the master form letter.

Figure X.2. Number of Comment Documents by Affiliation

X.3.3. Public Comment Document Method of Delivery

The BLM received comment documents through a variety of delivery methods, as listed in Table X.4, “Number of Public Comment Documents by Method of Delivery” (p. 1835). The BLM received the most comment documents through e-mail (190) and U.S. Mail (69).

Table X.4. Number of Public Comment Documents by Method of Delivery

Method of Delivery	Number
E-mail	190
U.S. Mail	69
Fax	3
Total	262

X.3.4. Form Letters

The BLM received approximately 25,000 form letters. Form letters are standardized and duplicated letters that contain the same text or portions of text and comments. The BLM reviewed the form letters and extracted and analyzed any comments unique and supplemental to the form letter; however, the BLM considered comments with the same text as one comment. The BLM designated the first form letter from each originating entity as the “master” comment document and reviewed each subsequent form letter to ensure the content was identical to the master comment document. The BLM received form letters from the Greater Yellowstone Coalition,

Sierra Club, and two unknown entities, for a total of four master comment documents. The BLM received seven form letters via U.S. mail; all other form letters arrived via e-mail. When form letters included additional text, the BLM reviewed and processed them if they contained substantive individual comments.

X.4. Analysis of Comments

The 262 public comment documents contained substantive and non-substantive comments. Representative non-substantive comments included requests to be added to the project mailing list, requests for a copy of the Draft RMP and EIS, personal preference or opinion, unsupported comments and questions, and comments outside the scope of the Draft RMP and EIS.

In accordance with the BLM NEPA Handbook (H-1790-1), the BLM analyzed and responded to comments on the Lander Draft RMP and EIS if they were substantive and related to inadequacies or inaccuracies in the analysis or methodologies used; identified new impacts or recommended reasonable new alternatives or mitigation measures; or involved substantive disagreements on interpretations of significance. (See 40 Code of Federal Regulation 1502.19, 1503.3, 1503.4, 1506.6, and 516 DM 4.17). BLM NEPA Handbook (H-1790-1) identifies the following comment category examples and appropriate responses:

Substantive Comments

- **Question, with a reasonable basis, the accuracy of the information in the EIS.** Factual corrections should be made in the Proposed RMP and Final EIS in response to comments that identify inaccuracies or discrepancies in factual information, data, or analysis.
- **Question, with a reasonable basis, the adequacy of environmental analysis as presented.** Comments that express a professional disagreement with the conclusions of the analysis or assert that the analysis is inadequate might or might not lead to changes in the EIS. Interpretations of analyses should be based on professional expertise. Where there is disagreement within a professional discipline, a careful review of the various interpretations is warranted. In some cases, public comments might necessitate an evaluation of analytical conclusions. If, after reevaluation, the manager responsible for preparing the EIS does not think a change is warranted, the response should provide the rationale for that conclusion.
- **Identify New Impacts, Alternatives, or Mitigation Measures.** If public comments on a Draft RMP and EIS identify impacts, alternatives, or mitigation measures that were not addressed in the draft, the manager responsible for preparing the RMP and EIS should determine if they warrant further consideration. If they do, that manager must determine whether the new impacts, new alternatives, or new mitigation measures should be analyzed in either the Proposed RMP and Final EIS, a supplement to the Draft RMP and EIS, or a completely revised and recirculated Draft RMP and EIS.
- **Disagree with Significance Determinations.** Comments might directly or indirectly question determinations regarding the significance or severity of impacts. A reevaluation of these determinations could be warranted and might lead to changes in the Proposed RMP and Final EIS. If, after reevaluation, the manager responsible for preparing the EIS does not think a change is warranted, the response should provide the rationale for that conclusion.

Non-Substantive Comments

- **Express Personal Preferences.** Comments that express personal preferences or opinions on the proposal do not require further agency action. They are summarized whenever possible and brought to the attention of the manager responsible for preparing the RMP and EIS.

Although personal preferences and opinions might influence the final selection of the agency's preferred action, they generally will not affect the analysis.

- **Other.** In addition to the five categories from the NEPA Handbook described above, the BLM added a sixth category named “other” which includes requests for copies of the Draft RMP and EIS, requests to be added to the project mailing list, and comments outside the scope of the RMP and EIS. These comments are considered non-substantive and do not require further agency action.

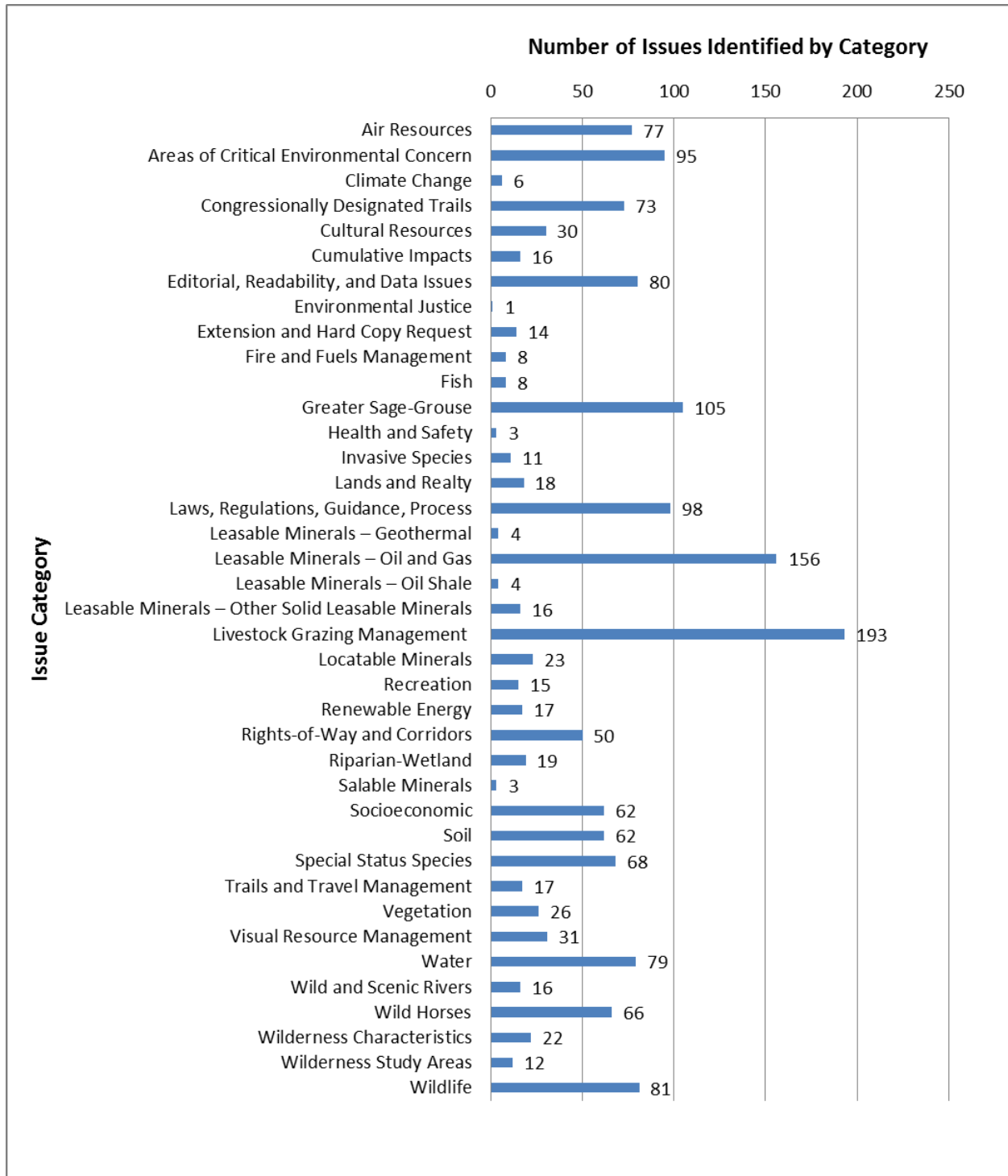
X.4.1. Comment Submittals by Issue Category

Within the 262 received comment documents, the BLM identified 1,685 individual substantive comments covering a broad range of issue categories. The greatest number of substantive comments was associated with livestock grazing management (193), oil and gas (156), and greater sage-grouse (105). Attachment A includes an index for users to identify their comment documents, and Attachment B includes all individual substantive comments and an index for users to identify the corresponding BLM summary comments and responses (available on the Lander RMP project website <http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html>). Table X.5, “Number of Comments per Issue Category” (p. 1837) and Figure X.3, “Number of Individual Comments by Issue Category” (p. 1838) identify the number of comments submitted by issue category.

Table X.5. Number of Comments per Issue Category

Issue Category	Number of Comments Per Issue Category
Air Resources	77
Areas of Critical Environmental Concern	95
Climate Change	6
Congressionally Designated Trails	73
Cultural Resources	30
Cumulative Impacts	16
Editorial, Readability, and Data Issues	80
Environmental Justice	1
Extension and Hard Copy Request	14
Fire and Fuels Management	8
Fish	8
Greater Sage-Grouse	105
Health and Safety	3
Invasive Species	11
Lands and Realty	18
Laws, Regulations, Guidance, Process	98
Leasable Minerals – Geothermal	4
Leasable Minerals – Oil and Gas	156
Leasable Minerals – Oil Shale	4
Leasable Minerals – Other Solid Leasable Minerals	16
Livestock Grazing Management	193
Locatable Minerals	23
Recreation	15
Renewable Energy	17
Rights-of-Way and Corridors	50
Riparian-Wetland	19
Salable Minerals	3
Socioeconomic	62

Issue Category	Number of Comments Per Issue Category
Soil	62
Special Status Species	68
Trails and Travel Management	17
Vegetation	26
Visual Resource Management	31
Water	79
Wild and Scenic Rivers	16
Wild Horses	66
Wilderness Characteristics	22
Wilderness Study Areas	12
Wildlife	81
Total	1,685
Note: Duplicative comments in form letters were only counted once.	



Note: Duplicative comments in form letters were only counted once.

Figure X.3. Number of Individual Comments by Issue Category

X.4.2. Substantive Comment Summary and Response

To provide a user-friendly method of understanding the broad themes and topics of concern expressed in the substantive comments, the BLM grouped individual comments with similar topics and concerns and developed 63 summary comments and responses. Table X.6, “Comment and Response Summaries” (p. 1841) lists the 63 summary comments and responses generally organized by BLM resource program and other appropriate issue categories (e.g., extension and hard copy requests), as described in Table X.1, “Issue Categories” (p. 1831). The summary numbers in Table X.6, “Comment and Response Summaries” (p. 1841) can be used to track the summary comment and response to the individual comments presented in Attachment B (available on the Lander RMP project website <http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html>).

Table X.6. Comment and Response Summaries

Issue	Summary Number	Summary Comment	Summary Response
Air Quality	2001-1	Commenters stated that there are various instances of inadequate, inaccurate, or insufficient information and/or data throughout the air quality impact analysis. Specifically, commenters asserted that use of data from only four air monitoring stations in the planning area and the limited amount of available air quality data from sources in and adjacent to the planning area provided inadequate data for use in completing an accurate analysis. Commenters requested the Bureau of Land Management (BLM) provide additional information, including (1) the methods and criteria used in analyzing air quality in the planning area, (2) justification of the ability of monitoring sites to adequately characterize air quality in the planning area, and (3) disclosure of the associated costs of implementing air quality mitigation. Additionally, commenters offered technical corrections to various statements made in the air quality analysis, requested inclusion of Class 1 areas in and adjacent to the planning area, requested data regarding uranium mining, and suggested addressing carbon dioxide (CO₂) sequestration.	The BLM updated the air quality sections in the Proposed RMP and Final EIS, Appendix F (p. 1491), and Appendix U (p. 1651) to respond to comments, as appropriate. Updates include, but are not limited to, the following: technical data and references were corrected associated with the most recent National Emissions Inventory, National Ambient Air Quality Standards (NAAQS), and ozone exceedances, standards, and chemistry. Appendix F (p. 1491) addresses ambient air monitoring commitments in the planning area. Project proponents are responsible for incurring the costs associated with their proposed actions. Every management action is unique, and might or might not have requirements or mitigation measures developed to protect resources. Any such measures would be within the purview of existing rules and regulations and within the BLM's authority in accordance with the Federal Land Policy and Management Act (FLPMA). Additionally, without knowing the specifics of future management actions, the BLM cannot estimate or assign a cost to such actions. The BLM incorporated Class I and II areas within 40 miles of the planning area in Appendix F (p. 1491), and updated the rights-of-way (ROW) sections to include CO₂ sequestration management. The BLM does not have accurate data for emissions associated with uranium open-pit mining.
Air Quality	2001-2	Commenters questioned the authority of the BLM to regulate air quality and require air quality mitigation measures in the region, and the State of Wyoming overall. Commenters requested additional references to applicable air quality laws and policies (specifically the 2011 Memorandum of Understanding [MOU] between the Environmental Protection Agency (EPA), the U.S. Department of the Interior, and the U.S. Department of Agriculture), and that management demonstrate compliance with Wyoming Department of Environmental Quality (DEQ) regulations and other applicable regulations. Specifically, commenters requested additional text clarifying the scope of BLM's authority in regulating air quality and that the Lander	The BLM has air resource management obligations and responsibilities under the National Environmental Policy Act (NEPA), FLPMA, and the Clean Air Act (CAA) and cannot authorize any action that would not comply with any state or federal regulation. Specifically, FLPMA requires in Section 202 [43 United States Code (U.S.C.) 1712 (c)(8)]: <i>compliance with applicable pollution control laws, including state and Federal air, water, noise, or other pollution standards or implementation plans.</i> The BLM is not attempting to regulate air quality or to supersede Wyoming DEQ's authority. The BLM goals and

Issue	Summary Number	Summary Comment	Summary Response
		RMP be consistent with conditions established in the 2011 MOU. Additionally, commenters requested the BLM include additional details outlining how stated goals and objectives for air quality management in the planning area will be accomplished, specifically regarding future oil and gas developments and associated impacts to air quality.	objectives were developed as required by the NEPA process for each resource identified in scoping, and were agreed to in a cooperating agency process that included Wyoming DEQ and EPA. The goals identified by the BLM do not interfere with Wyoming DEQ's authority and indicate that the BLM will comply with state regulations. The BLM believes the Proposed RMP and Final EIS are consistent with the 2011 MOU, and the BLM will continue to abide by the processes and recommendations outlined in the MOU. The decision to model a particular project or geographic area is made case by case and depends on availability of input data, geographic and meteorological conditions, current state of air quality, and proximity of sensitive air sheds or receptors. The BLM has authority to require Best Management Practices (BMPs), Conditions of Approval (COAs), or other measures determined in cooperation with other federal land management and regulatory agencies (including EPA and Wyoming DEQ), if management actions have the potential to adversely or substantially impact any resource area, including air resources. BMPs, mitigation measures, and COAs are project-specific and will be identified in subsequent NEPA documents addressing such projects. The Lander Air Management Plan in Appendix F (p. 1491) includes requirements for emissions inventories, monitoring, and modeling. Project-specific requirements will be determined during the development of an EIS and subsequent Record of Decision (ROD) for major oil and gas projects.

Issue	Summary Number	Summary Comment	Summary Response
Areas of Critical Environmental Concern	2002-1	Commenters questioned if the existing and newly proposed Areas of Environmental Concern (ACECs) meet the relevance and importance criteria requirements as stated in 43 Code of Federal Regulations (CFR) 1610.7-2 and the BLM Manual 1613, and whether these areas require special management to (1) protect the area and prevent irreparable damage to resources or natural systems and (2) adequately protect these areas from energy developments through the issuance of No Surface Occupancy (NSO) stipulations. In some cases, commenters suggested improvements to ACEC designations and provided detailed reasoning to support their position for modifications. Specifically, commenters requested that the BLM provide further explanation regarding designation of the Twin Creek ACEC and the Government Draw/Upper Sweetwater Sage-Grouse Reference and Education Area. Other commenters stated the BLM did not provide enough detail in the ACEC analysis to support designation, and made several specific requests that the BLM improve and/or disclose ACEC data and improve the analysis for ACECs, including (1) disclosure of completed ACEC evaluation forms, (2) an opportunity to cooperate and/or coordinate with the BLM in completing the ACEC evaluations, (3) detailed descriptions of allowable activities in ACECs, (4) correction of discrepancies in ACEC acreage, and (5) improved ACEC maps, including displaying National Historic Trail (NHT) features on ACEC maps.	The BLM analyzed a range of prescriptions for ACEC management, including allowable uses and activities in each ACEC as described in Chapters 2 and 4. The ACEC Report documents the evaluation process for existing and newly proposed ACECs. The report outlines how each proposed ACEC meets or does not meet the relevance and importance criteria. The report is available on the BLM website at: http://www.blm.gov/pgdata/etc/medialib/blm/wy/programs/planning/rmps/lander.Par.74315.File.dat/ACEC.pdf. While the overall ACEC designations in the Proposed Resource Management Plan (RMP) and Final EIS are the same as in the Draft RMP and EIS, management of some of the ACECs has been altered to address comments. In order to better protect resource values, including greater sage-grouse, the BLM is recommending withdrawal of 306,360 acres of land in the Hudson to Atlantic City, including the Twin Creek ACEC. The BLM is no longer designating the Government Draw/Upper Sweetwater Sage-Grouse Reference and Education Area which had previously encompassed the Twin Creek ACEC because the revised management approach provides adequate protection for resources. In the case of greater sage-grouse, the area will support ongoing and future research that will benefit greater sage-grouse and industry statewide. The BLM updated the Proposed RMP and Final EIS to include additional citations to the ACEC report and other sources as appropriate to support the determinations, and made various editorial changes and provided clarifying text as needed. The BLM also reviewed existing Geographic Information System (GIS) data and mapping products for ACEC locations, and made changes where appropriate based on comments received.

Issue	Summary Number	Summary Comment	Summary Response
Climate Change	2003-1	Commenters expressed concern that although impacts from climate change are described in the document, the BLM does not provide management actions to address those impacts. Some commenters insisted the BLM incorporate more climate change planning in the RMP and EIS. Other commenters recommended addressing additional resources affected by or that could affect climate change, such as the role of BLM-authorized activities in climate change and specifically the use of uranium to generate electricity.	The BLM's primary approach to address impacts from climate change is to improve range conditions in accordance with the Wyoming Standards for Healthy Rangelands by managing livestock grazing and vegetation treatments. The BLM believes the Proposed RMP is proactive in conserving wildlife habitat so that wildlife populations can survive in a changing climate. The authorized activities that could contribute to climate change are identified and addressed in the Proposed RMP and Final EIS. However, addressing the use of uranium to generate electricity is beyond the scope of the RMP.
Congressionally Designated Trails	2004-1	Commenters indicated general concern regarding the proposed uses and protection of Congressionally Designated Trails in the planning area. In addition, commenters stated impacts from trail management and other development, such as uranium development, were not fully assessed. Specific concerns included the limitations of surface-disturbing activities within 5 miles of a Congressionally Designated Trail, a lack of adequate justification for Congressionally Designated Trails protection, and a need for the BLM to incorporate direction contained in the 2009 Continental Divide National Scenic Trail Comprehensive Plan. Commenters provided suggested language and actions for the BLM to incorporate in its management of the Congressionally Designated Trails. Commenters also identified a number of technical edits related to the Congressionally Designated Trails analysis, including requests to use alternative language, corrections to technical statements and/or terms, requests to define terms, clarification of language, and corrections to GIS maps depicting the Congressionally Designated Trails.	The BLM has updated the Proposed RMP and Final EIS to reflect commenter recommendations regarding uses of and protections offered to Congressionally Designated Trails, including limitations on surface-disturbing activities within 5 miles of Congressionally Designated Trails, use of alternative language, corrections to technical statements and/or terms, requests to define terms, clarification of language, and corrections to GIS maps depicting the Congressionally Designated Trails. The BLM has reviewed and incorporated the tenets of the 2009 Continental Divide National Scenic Trail Comprehensive Plan into the Proposed RMP and Final EIS.

Issue	Summary Number	Summary Comment	Summary Response
Cultural Resources	2005-1	Commenters requested the BLM include additional analysis and data regarding impacts to cultural resources. Specifically, commenters indicated the BLM should disclose general information regarding the location of cultural sites, so livestock grazing permittees and oil and gas operations would know the locations where the described restrictions will be enforced. Commenters requested that the BLM acknowledge that oil and gas development has led to beneficial impacts on cultural resources through site-specific assessments required by the BLM. Commenters suggested other topics that the BLM should consider addressing in the Proposed RMP and Final EIS, such as protecting and managing livestock grazing as a traditional use eligible for listing on the <i>National Register of Historic Places</i>, and documenting the importance of using the historic trails for historic reenactments to The Church of Jesus Christ of Latter-day Saints. Commenters also requested clarification on the use of terms, the correction of citations, and the location of the discussions of cultural and historic properties.	The BLM will work with oil and gas companies to accommodate development plans in Designated Development Areas (DDAs) where cultural sites are present, and work with grazing permittees regarding proposed range infrastructure projects to avoid adversely impacting cultural sites. Livestock grazing as a use is not covered under the National Historic Preservation Act, which directs federal agencies to identify, evaluate, and assess effects to historic properties that are eligible for listing on the <i>National Register of Historic Places</i>. Properties associated with livestock grazing can be found eligible for National Register listing, but livestock grazing as a use cannot be considered as a historic property. The BLM added text to Chapter 4 recognizing knowledge can be gained from recordation and data recovery related to oil and gas development. However, this information is gathered to reduce adverse effects to cultural resources, and the overall effect from disturbance of cultural resources is still adverse rather than beneficial. The BLM also added text to Chapter 3 acknowledging the importance of the NHTs to The Church of Jesus Christ of Latter-day Saints. The BLM reviewed the document and made edits as necessary to clarify language and correct citations.
Cultural Resources	2005-2	Commenters requested that the BLM add more information regarding oil and gas operator cooperation with the BLM and other stakeholders to reduce potential visual impacts to cultural resources. Multiple commenters indicated that the BLM has not provided justification for requiring special management or protection for regionally significant historic trails and early highways, and justification for buffer distances for cultural sites and historic trails. A commenter recommended that several management actions under Alternative B that increase protections for cultural resources be added to Alternative D. In addition, a commenter questioned how the BLM would manage the proposed Heritage Tourism and Recreation Management Corridor, and another commenter expressed concern about the extent of BLM involvement in identifying sites for consideration for National Register listing that occur on state or private land.	The BLM added text to Chapter 4 to reflect agreements where special guidelines to reduce visual impacts on cultural resources have been incorporated into field-wide operations. Section 106 of the National Historic Preservation Act directs federal agencies to identify, evaluate, and assess effects of its undertakings on historic properties that are eligible for listing on the <i>National Register of Historic Places</i>. The BLM and State Historic Preservation Office (SHPO) have found all cultural sites, NHTs, and Regionally Significant Historic Trails and Early Highways identified in the Draft RMP and EIS eligible for nomination to the National Register. All of the NHTs and early highways have segments that are considered “contributing” to their National Register qualities and portions that are considered “non-contributing.” The BLM is required to protect the eligibility of the cultural sites, NHTs, and

Issue	Summary Number	Summary Comment	Summary Response
			Regionally Significant Historic Trails and Early Highways, and has prescribed buffers to protect the important values of these resources. The BLM determined the protections prescribed under the Proposed RMP (Alternative D) were adequate to protect cultural sites in the planning area. Many of the protections under Alternative B are provided in other management actions (e.g., Special Designations) under the Proposed RMP. Chapter 2 describes the management prescriptions in detail. The BLM's Cultural Resources 8100 Manual provides guidance for the BLM's responsibilities for cultural resources on non-federal lands. The extent of the BLM's responsibility for identifying and protecting non-federal cultural resources is limited by the degree to which BLM decisions determine or control the location of activities on non-federal lands that could affect cultural resources (see BLM Manual Section 8140.O6D). Identification and/or mitigation of adverse effects may be required as a condition of a lease, permit, or license issued by the BLM, whether federal or non-federal lands are involved.
Cumulative Impacts	2006-1	Commenters recommended that the BLM further analyze cumulative impacts regarding multiple resources, resource uses, special designations, and socioeconomic conditions. Specifically, commenters requested a higher degree of analysis of cumulative impacts to NHTs, greater sage-grouse, vegetation communities, agriculture, and oil, gas, minerals, and timber industries. Commenters also indicated a need for different models to assess cumulative socioeconomic impacts on the public in the planning area and offered technical corrections for information included in the analysis.	Overall, the BLM determined the current cumulative impacts analysis is appropriate and adequately informs the decision-making process. The BLM revised the cumulative impacts section to update citations related to statewide air emission inventory and the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5, and update information and/or provide clarifications, as appropriate. Regarding the need to address socioeconomic impacts, the BLM has adopted the Impact Analysis for Planning Model (IMPLAN) analysis for use in its planning activities; while other models are available, IMPLAN provides an appropriate tool for comparing alternatives.

Issue	Summary Number	Summary Comment	Summary Response
Editorial, Readability, and Data Issues	2007-1	Commenters recommended a number of editorial revisions in the Draft RMP and EIS including spelling and grammar corrections. Commenters also recommended additions and revisions to the glossary, incorporating updated guidance, adding specific terminology or clarifying language, and improving readability. Commenters pointed to several inaccuracies and inconsistencies in numbers and data as presented in the Draft RMP and EIS and requested that the BLM ensure that tables and figures are verified by GIS datasets; develop a detailed reference list that includes all GIS layers used; correct discrepancies in acreage; and incorporate pertinent spatial datasets. In addition, a commenter requested that the BLM provide a detailed list of sources for all GIS data layers referenced in the text.	The BLM evaluated all requests regarding readability, editorial suggestions, reference citations, and suggested additions and corrections, and revised the document, as appropriate. In addition, the BLM reviewed GIS data, methods, and mapping products and revised and updated shapefiles, tables, acreage, and maps, as appropriate. GIS data cited in the RMP includes hundreds of GIS files (e.g., shapefiles, raster datasets, and geodatabase feature classes), which provide all data and map sources referenced in the EIS. Additional information about GIS calculations presented in the EIS is provided in the Administrative Record. Revisions made in the Proposed RMP and Final EIS are identified by shaded text.
Environmental Justice	2008-1	The commenter asserted that the RMP does not adequately analyze environmental justice because it fails to measure impacts to individual communities.	The BLM believes the analysis in the RMP and EIS adequately addresses environmental justice issues, including minority or low-income communities or populations as defined in Executive Order 12898, <i>Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations</i> (February 11, 1994), and guidance provided by BLM Instructional Memorandum (IM) 2002-164 (Guidance on Environmental Justice in Planning).
Extension and Hard Copy Request	2009-1	Commenters requested that the BLM extend the comment period 45 to 90 days, to allow more time to review the Draft RMP and EIS and formulate comments. Several commenters also requested hard-copy versions of the Draft RMP and EIS.	The BLM extended the public comment period for 45 days. The BLM printed a limited number of hard-copy documents. Hard copy versions were available at public libraries throughout the planning area.
Fire and Fuels Management	2010-1	Commenters identified a number of technical edits related to fire and fuels. These edits included requests to use alternative language, corrections to technical statements and/or terms, definitions of terms, and clarification of language. In addition, commenters provided suggested changes to Management Actions Common to All Alternatives.	The BLM has updated the text of the Proposed RMP and Final EIS to reflect commenter recommendations regarding clarifying language and guidance, and to reflect commenter recommendations regarding the proposed addition to Management Actions Common to All Alternatives.

Issue	Summary Number	Summary Comment	Summary Response
Fish	2011-1	Commenters asserted that the RMP and EIS does not adequately analyze certain impacts to fish and fish habitat, including (1) impacts from oil and gas development to sensitive coldwater fish species, (2) buffers for intermittent and ephemeral streams, and (3) long-term and short-term impacts to fish longevity. Commenters recommended increasing protections for fish by designating streams as unique fisheries and increasing stream buffer protections for perennial streams. Commenters also made various data requests related to fish management, including adding a map and correcting errors in a map.	The BLM revised the Fish sections of the Proposed RMP and Final EIS based on commenter input where appropriate. Details pertaining to sensitive coldwater fish are presented in the Special Status Species section, and are not discussed in the Fish section. Discussions regarding buffers for fish-bearing streams are provided in the document where appropriate and in compliance with the BLM Wyoming policy. Chapter 4 discusses type and duration of impacts on fish longevity; however, these timeframes are used primarily as reference periods in which to conduct the analysis and do not necessarily apply to analysis of individual species. The BLM reviewed GIS data and mapping products, and revised and/or updated GIS shapefiles, text, acreage, and maps, as appropriate, in the Proposed RMP and Final EIS.
Greater Sage-Grouse	2012-1	Commenters expressed a varying range of opinions over whether greater sage-grouse protections are insufficient, overly restrictive, or are otherwise inconsistent with various regulations and guidance documents for greater sage-grouse, including the BLM State Director's IM No. WY-2010-012, the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5, and/or the 2011 National Technical Team (NTT) Report on National Greater Sage-Grouse Conservation Measures. Commenters requested additional scientific reasoning for instances in which the BLM decisions were regarded as inconsistent with existing regulations and guidance. Specific issues of concern included (1) the expansion of timing limitations and night-time stipulations on surface-disturbing activities, (2) the authorization of new transmission lines, (3) the inclusion of leks with undetermined occupancy in the BLM analyses, and (4) appropriate criteria and methodologies for determining habitat, Core Area, buffer distances, and disturbance caps. Several commenters noted oil and gas development on private lands are subject to restrictions in the Core Area strategy. Commenters also noted that the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Orders 2008-4 and 2010-4 have been replaced by Executive Order 2011-5, and	The BLM updated the alternatives, analyses, and other applicable sections related to greater sage-grouse to reflect changes in management to be consistent with National and Wyoming policies and guidance on the management of greater sage-grouse and their habitat. The Proposed RMP and Final EIS maintains overall consistency with the Core Area strategy, outlined in the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5, and includes additional conservation measures recommended in the NTT Report. The BLM supplemented Appendix H (p. 1521) with additional BMPs and Required Design Features for greater sage-grouse protection that were identified in the NTT Report. While the BLM did not incorporate all conservation measures recommended in the NTT Report into the Proposed RMP, the BLM believes all applicable conservation measures were considered in one or more of the alternatives analyzed. The NTT Conformance Table, available on the Lander RMP website (http://www.blm.gov/wy/st/en/programs/Planning/rmps/lander.html), provides additional information about how the BLM incorporated conservation measures into the Proposed RMP and Final EIS. The Proposed RMP and Final EIS includes a range of reasonable alternatives for greater sage-grouse management

Issue	Summary Number	Summary Comment	Summary Response
		that any references or associated language should be updated to reflect the most recent Executive Order. Commenters requested that Alternative D avoidance and exclusion maps based on greater sage-grouse habitat types be updated to remain consistent with the provisions in the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5.	and the BLM revised the document to include additional and updated information on greater sage-grouse Core Area management, including changes to management actions and an updated definition of Core Area in the Glossary. Additionally, the BLM verified the analysis and incorporated the latest greater sage-grouse Core Area data from the Wyoming Game and Fish Department (WGFD) as of the end of the public comment period. The BLM added language in Chapter 4 to clarify that private lands are not subject to BLM Core Area or non-Core Area stipulations; however, oil and gas activities on private land would be subject to Core Area stipulations promulgated by the Wyoming Oil and Gas Conservation Commission and the Wyoming DEQ. In addition, the BLM reviewed the Alternative D corridor maps in relation to the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5 and identified several appropriate changes, although the BLM did not make all the changes commenters suggested.
Greater Sage-Grouse	2012-2	Commenters indicated that the analysis of greater sage-grouse could be improved by including more descriptive explanations, additional rationale and analysis criteria, clarification of terminology, and scientific references. Specifically, commenters questioned or raised concerns pertaining to (1) greater sage-grouse impacts on and from livestock grazing management, particularly regarding the impacts of water development and fencing on nesting cover, (2) impacts to greater sage-grouse from oil and gas development, (3) spatial inconsistencies between Core Area depicted in the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5 and those delineated by the BLM, (4) inadequate historical context and data on greater sage-grouse populations in the region, (5) use of the Density Disturbance Calculation Tool, and (6) in some cases, commenters cited specific research the BLM could reference to inform agency decisions regarding greater sage-grouse impacts on and from other resources.	The BLM revised the analyses in applicable sections on greater sage-grouse in the Proposed RMP and Final EIS, including clarification of impacts associated with or from livestock grazing and oil and gas development, consistency with the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5, and supplemental text and supporting scientific references, as appropriate.

Issue	Summary Number	Summary Comment	Summary Response
Greater Sage-Grouse	2012-3	Commenters offered specific recommendations and critiques, and requested additional clarification for a variety of greater sage-grouse management provisions in the RMP and EIS, including prescriptions related to buffer size, habitat connectivity, disturbance caps, fencing, water development, seasonal timing limitations, noise, noxious weeds, and ravens. Commenters also suggested revising the biological resource goals to clarify the BLM's intent to maintain and preserve connections between greater sage-grouse habitat while providing for multiple-use management. A number of commenters requested that the BLM clarify restrictions on wind-energy development, particularly in Core Area.	The BLM revised management actions and applicable sections on greater sage-grouse in the Proposed RMP and Final EIS. Specifically, the BLM updated text to ensure consistency with the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5, include additional scientific citations, clarify restrictions associated with wind-energy development in Core Area, and require anti-perching and predation deterrents, and made other revisions, as appropriate.
Health and Safety	2013-1	Commenters questioned the bonding provision for surface-disturbing activity in the RMP and EIS, with some commenters suggesting expanding the requirements to better protect public health and safety and making the bonding provision cover ecological function. Other commenters opposed the bonding provision, suggesting it was adequately covered in the BLM policy and federal regulations and therefore not necessary to address in the RMP and EIS.	The Lander Field Office does not have the authority to determine how operators are bonded. BLM policy is to bond as accurately as possible to ensure full reclamation from mining activities to the desired future condition. The BLM guidance supports addressing bond requirements in a planning document.
Invasive Species	2014-1	Commenters expressed concerns that the overall approach to invasive species management is insufficient to prevent the spread of invasive species, and is onerous to operators who must comply with measures to prevent invasive species spread. Commenters proposed changes to reclamation requirements regarding invasive species including (1) reconsidering the timeframe required to successfully establish shrubs and forbs after reclamation, (2) reducing the standard for percent allowable invasive nonnative species in non-DDAs, and (3) reconsidering the objectives for final reclamation in non-DDAs. Commenters also suggested additional actions to reduce invasive species spread, such as implementing a plan to reduce cheatgrass invasion. Commenters also suggested revisions to clarify and correct inconsistencies and purported inaccuracies in the text related to livestock grazing and spread of invasive species, lists of noxious weeds, weed transmittal, and interim reclamation standards.	After further review, the BLM believes the overall approach to invasive species management in the Proposed RMP and Final EIS is adequate. Reclamation standards are designed to prevent the spread of invasive species and vary between DDAs and non-DDAs. Reclamation objectives in non-DDAs must meet a higher standard than in DDAs because non-DDAs include identified resources such as greater sage-grouse Core Area or other important wildlife and plant species. The basis for reclamation standards in non-DDA areas is restoration of habitat similar to that prior to disturbance. Reclamation standards do not establish timelines for considering when reclamation is successful. The BLM has updated the Proposed RMP and Final EIS to address inconsistencies and provide additional clarity as needed. Specifically, the BLM revised text to correct an inconsistency related to interim reclamation standards in Chapter 4.

Issue	Summary Number	Summary Comment	Summary Response
Lands and Realty	2015-1	Commenters requested land tenure adjustments for multiple reasons, including public shooting ranges, recreation opportunities, wildlife protection, and livestock grazing.	The BLM revised Appendix R (p. 1623) to include new parcels identified for land tenure adjustment, correct errors in legal descriptions, and add parcels that were inadvertently omitted in the Draft RMP and EIS. Parcels added would provide for a public shooting range, and consolidate isolated parcels used for livestock grazing. The BLM is currently working with the State of Wyoming on an agreement to exchange lands for recreation and wildlife values.
Laws, Regulations, Guidance, Process	2016-1	Commenters stated the Draft RMP and EIS did not contain sufficient historical or baseline data for assessing impacts, provided an inadequate analysis of impacts, and that the BLM did not follow relevant FLMPA and NEPA processes or comply with BLM policy and Council on Environmental Quality guidance and other relevant laws and land use plans. Commenters asserted the BLM did not fully involve interested parties, stakeholders, and/or cooperators during development of the RMP and EIS or its alternatives, or share data with interested parties.	The BLM has reviewed and ensured compliance with FLPMA, NEPA, and other relevant laws, policy, and land use plans. As revised, the BLM believes the Proposed RMP and Final EIS adequately analyzes impacts from proposed management and includes sufficient historical or baseline data for assessing impacts. The BLM has met its collaboration/cooperating agency requirements in accordance with FLPMA and public involvement requirements under NEPA. The BLM has provided non-confidential data to entities that have made such requests.
Leasable Minerals – Geothermal	2017-1	Commenters expressed general concerns regarding potential impacts from geothermal development on sensitive resources. Specifically, commenters stated that the buffer restricting geothermal development near the National Landscape Conservation System trail corridor is not large enough to protect the values of the corridor and is not consistent with management of the proposed special recreation areas, ACECs, and trail management areas that would be established along the National Landscape Conservation System corridor. Several commenters referenced new data showing geothermal energy potential in the Dubois area, and requested the BLM review and incorporate this new data into the Proposed RMP and Final EIS. In addition, commenters requested that the BLM more accurately describe the history of geothermal leasing in the planning area, including the fact that the BLM did not analyze geothermal leasing in the 1987 RMP.	The National Landscape Conservation System trail corridor is managed with an NSO stipulation and beyond that is subject to Visual Resource Management (VRM) limitations. The BLM believes this management provides sufficient protection of values in the corridor. The BLM has considered the new data regarding geothermal energy potential in the Dubois area. However, given the important wildlife values that are incompatible with geothermal development, the Dubois area is closed to geothermal leasing. Alternative A recognizes that the 1987 RMP did not analyze geothermal resources.

Issue	Summary Number	Summary Comment	Summary Response
Leasable Minerals – Oil and Gas	2018-1	Commenters expressed a number of concerns related to DDA establishment, expansion, and development constraints. In this regard, commenters requested detailed information explaining how DDA boundaries are determined, and clarification on the applicability of various development stipulations occurring therein. Commenters specifically recommended that the BLM (1) provide a mechanism that would allow the future expansion of DDAs without requiring an RMP amendment, (2) limit the application of standard stipulations and/or COAs for operations in DDAs, particularly if they would compromise valid existing lease rights or curtail mineral production, (3) remove seasonal protections in DDAs, and (4) reconfigure DDA boundaries to avoid overlap with the Ninemile Draw Important Bird Area.	The BLM has updated the Proposed RMP and Final EIS to reflect changes, including application of DDA stipulations, conducting year-round operations in DDAs, and waiver procedures for seasonal protections for operations in DDAs. The BLM has determined that an expansion of the DDAs would require an RMP amendment.
Leasable Minerals – Oil and Gas	2018-2	Given the minimal, short-term surface disturbances caused by geophysical exploration, commenters asserted that these activities should not be limited to the same extent and in the same areas where oil and gas development is prohibited. Furthermore, commenters argued that removing limitations on the collection of geophysical data would reduce future disturbances by reducing the number of wells required to locate and produce the targeted resource. Commenters also questioned if the BLM has legal authority to encourage the sharing of seismic data between operators.	The BLM has determined that, at a minimum, geophysical exploration is a disruptive activity. The BLM does not agree that a blanket closure is inappropriate since an exception may be obtained. The BLM can encourage the sharing of data that would reduce the demand for additional surveys and associated impacts to other resources.
Leasable Minerals – Oil and Gas	2018-3	Commenters expressed general concern that lease stipulations and mitigation measures for mineral development in the RMP and EIS are more restrictive than necessary based on FLPMA and Energy Policy Act of 2005 mandates. Specifically, commenters requested more detailed descriptions and reasoning regarding (1) the amount of acres closed to mineral development and subject to NSO and other stipulations, (2) how oil and gas development in the planning area will be managed for and affected by wildlife stipulations proposed in the alternatives, (3) economic impacts associated with closures, major constraints, and seasonal prohibitions placed on mineral leasing in the planning area, and (4) assurances that proposed stipulations will not interfere with valid existing lease rights. Commenters made specific requests for the BLM to revise management of oil and gas, such as allowing basic maintenance and emergency actions for oil and gas operations year-round despite proposed seasonal closures and timing limitations. Other commenters	The BLM has reviewed and updated the Proposed RMP and Final EIS to ensure consistency with applicable state and federal laws and policy. Specifically, the BLM revised text regarding the validity of existing lease rights, included the most current BMPs, used the Density Disturbance Calculation Tool for surface-disturbance evaluations in greater sage-grouse Core Area, more clearly described where NSO stipulations apply, and modified designated corridors for pipeline routes. The Proposed RMP and Final EIS incorporates the Core Area strategy, which includes surface-disturbance caps and limits on the number of energy developments. A substantial amount of Core Area is NSO for the protection of a variety of resources, including other wildlife and trails. The BLM reviewed the economic analysis, and believes the Proposed RMP and Final EIS adequately analyzes the impacts to the local and regional economy from oil and gas management.

Issue	Summary Number	Summary Comment	Summary Response
		avored the implementation of additional closures, and/or recommended additional BMPs and mitigation measures for oil and gas development. Commenters also requested the BLM give further consideration and incorporate additional analysis associated with emergent technologies including Enhanced Oil Recovery (EOR), horizontal well drilling, and CO₂ sequestration.	The BLM has considered emergent technologies in the Proposed RMP and Final EIS and made appropriate revisions, including modifying designated corridors to provide more pipeline routes.
Leasable Minerals – Oil and Gas	2018-4	Commenters expressed opposition to the Beaver Rim Master Leasing Plan (MLP) because it would be redundant in light of the existing alternative analysis and associated resource protections presented in the RMP and EIS. Therefore, commenters requested that more detailed reasoning and decision criteria be provided to determine whether the application of an MLP is warranted. One commenter in favor of the Beaver Rim MLP suggested that additional restrictions be placed on development near known occurrences of desert yellowhead.	IM 2010-117 authorized the BLM to consider proposals for and identify areas suitable for management as an MLP. The BLM received five nominations for MLPs, although only the Beaver Rim area was carried forward for detailed analysis. Chapter 2 includes the identification and consideration of all five proposed MLP areas, and Chapter 3 provides additional details regarding the Beaver Rim MLP. No additional analysis on MLPs is anticipated until a new MLP area is proposed. The BLM already has management in place that addresses the protection of desert yellowhead.
Leasable Minerals – Oil and Gas	2018-5	A commenter requested that the BLM require the disclosure of compounds in produced water and their concentrations to better assess potential impacts to nearby water resources. The commenter requested that the BLM establish additional provisions regulating the disposal of produced water.	The BLM does not have authority to establish provisions that regulate the disposal of produced water because the State of Wyoming regulates these actions. The BLM analyzed and included text in the Proposed RMP and Final EIS regarding potential for impacts to BLM-administered lands associated with produced water, with reference to State of Wyoming pollutant levels.
Leasable Minerals – Oil and Gas	2018-6	Commenters stated that the analysis of the Reasonable Foreseeable Development (RFD) underestimates the potential for the discovery of minerals and oil and gas reserves, noting the large number of potential well sites identified in recent development proposals. Furthermore, commenters stated that the RMP and EIS does not adequately analyze development potential associated with horizontal drilling and the associated surface disturbance impacts of fewer numbers of larger well pads. Many commenters requested that the BLM include additional clarification that the RFD does not represent a planning decision or development “cap”.	The BLM believes the RFD provides an appropriate estimate of future development for purposes of comparing alternatives, given the data available and the uncertainty in future oil and gas development. The BLM revised the Proposed RMP and Final EIS to further clarify that the RFD is an estimate of mineral development potential and is in no way a limitation on future oil and gas development in the planning area. The BLM uses the RFD as a tool to compare impacts across the alternatives. Site-specific impacts, including surface disturbance from horizontal drilling, or impacts on air resources are best analyzed project by project.

Issue	Summary Number	Summary Comment	Summary Response
Leasable Minerals – Oil Shale	2019-1	Commenters stated that the RMP and EIS failed to accurately account for the potential for development of oil shale formations in the planning area. Commenters argued that the BLM’s decision to restrict future oil shale development to currently producing areas contradicts the agency’s multiple-use and sustained yield mandates. One commenter suggested that alternative language be used to explain the BLM standard for processing oil shale applications.	The BLM modified text in the Proposed RMP and Final EIS to clarify that “oil shale” development in the context of the RMP refers to unconventional oil shale-tar sand development, and not to conventional oil and gas operations in shale formations. The BLM believes the overall approach to oil shale-tar sands in the RMP and EIS is adequate and is consistent with the BLM’s multiple-use mission. The BLM revised the text related to processing applications. The statement was meant to indicate that the lease could not be approved without a land use amendment. An application could be denied as inconsistent with the Proposed RMP and Final EIS, because oil shale-tar sands were not analyzed and leases were not authorized.
Leasable Minerals – Other Solid Leasable Minerals	2020-1	Commenters asserted that the BLM failed to accurately depict phosphate development potential in the planning area, and that management was too restrictive in areas with high phosphate development potential. Specifically, commenters expressed concern that (1) discussion of phosphate potential based on current market conditions is not accurate, (2) phosphate resources in the planning area have not been fully identified, (3) the BLM has not acknowledged that technology has improved, providing access to phosphate resources that were previously considered inaccessible, including underground mining methods, and (4) the discussion of adverse impacts to phosphate development are not accurate. Commenters also noted various inconsistencies in the RMP and EIS, including surface disturbance stipulations in greater sage-grouse Core Area.	The discussion of phosphate potential and market conditions in the RMP and EIS relies on the Final Mineral Occurrence and Development Potential Report for the Lander Field Office, which used the most current information at the time it was written. Commodity prices for all minerals, including phosphate, are in constant flux; therefore, the discussion of prices and market conditions provides a snapshot of the time this section was written. However, in considering phosphate and other mineral development, the BLM takes a long-term view using the most current data available. The BLM modified the phosphate sections of the Proposed RMP and Final EIS to indicate that both underground and surface mining have been evaluated. The BLM reviewed the phosphate section, including the analysis, and revised it for inaccuracies or inconsistencies.

Issue	Summary Number	Summary Comment	Summary Response
Livestock Grazing Management	2021-1	Commenters expressed concern about the Animal Unit Month (AUM) reductions proposed in the RMP and EIS, and questioned the scientific methods the BLM used to determine the location and amount of AUM reductions to minimize conflicts with other resources. Commenters requested additional information on current livestock grazing AUMs by allotment and preference and suspended AUMs.	The proposed RMP does not reduce or increase AUMs, but identifies the potential based on current rangeland health and the proposed alternative. The BLM discloses projected AUMs for each alternative in Chapter 2 and provides allotment categorization in Appendix K (p. 1547). In general, AUM adjustments are made through subsequent implementation-level analyses and decisions based on monitoring data and on-the-ground conditions. The BLM revised the AUM numbers/acreage where appropriate based on comments received. Additionally, the BLM added details that clarify AUMs by allotment and livestock type (i.e., cattle or sheep), provided additional references where appropriate, and inserted text that details why areas have not historically been available to grazing. The RMP only applies to federal lands in the Lander Field Office planning area. Private and state land AUMs and suspended AUMs are not part of the affected environment; therefore, it is inappropriate to include this information in the document.
Livestock Grazing Management	2021-2	Commenters sought clarification on the use of Comprehensive Grazing Strategies, including their definition, purpose, and requirements. Additionally, commenters requested clarification on the Comprehensive Grazing Strategy process, scale, criteria for development, and if a Comprehensive Grazing Strategy would replace the need for an Allotment Management Plan.	First, and foremost, Comprehensive Grazing Strategies are intended to maintain, and/or make substantial progress toward, fulfillment of the Wyoming Standards for Healthy Rangelands. The BLM has modified the discussion regarding Comprehensive Grazing Strategies in Appendix K (p. 1547) to clarify its definition and use. The revised discussion addresses the concerns regarding grazing intensity and season of use. The BLM revised the document to clarify that Comprehensive Grazing Strategies do not need to be a formalized management plan and do not replace the need for an Allotment Management Plan.

Issue	Summary Number	Summary Comment	Summary Response
Livestock Grazing Management	2021-3	Commenters stated there was a lack of adequate disclosure of impacts and/or consequences associated with livestock grazing in the planning area and suggested revisions to the BLM's approach to livestock grazing management. Specifically, commenters requested more discussion on the economic impacts as a result of proposed livestock grazing management changes, impacts of livestock grazing to/from wildlife species (including special status species), and policies and specific management actions or changes in current management. Commenters also requested additional details pertinent to the livestock grazing management analysis, including (1) clarification of terminology, (2) supporting scientific citations for technical statements, (3) details on determination of utilization levels for allotments, (4) specific requirements and limitations placed on livestock grazing practices for the protection of other resources, and (5) clarification indicating if livestock management activities are or are not considered surface-disturbing activities.	The BLM developed and analyzed alternatives in the Proposed RMP and Final EIS using the best available information in compliance with federal laws, guidelines, and policies. The BLM used GIS data that analyzed fence placement, distance from water, precipitation, vegetation, and production, as well as competing resources, such as wild horses and wildlife, to estimate likely future impacts. This approach allowed the BLM to calculate input to the IMPLAN model so that the economic consequences of the alternatives could be compared. The BLM has revised Appendix K (p. 1547) to address how the agency addresses livestock grazing management and conflicts with other resources. In addition, the BLM reviewed and revised the Proposed RMP and Final EIS as necessary to include clarifying text/terminology, supporting scientific citations, and correct acreage and AUM figures, and to reflect the fact that the BLM does not consider livestock grazing or other herbivory to be a surface-disturbing activity. The Proposed RMP and Final EIS does not set utilization levels for livestock grazing, because those levels are established in site-specific allotment management plans.
Livestock Grazing Management	2021-4	Commenters requested additional information in the RMP regarding how the BLM considers range improvements, specifically regarding placement, implementation, and type of water sources; fence lines; and gate operations.	The BLM considers range improvements as needed to implement a Comprehensive Grazing Management Strategy. The agency will evaluate impacts resulting from any proposed range improvement in site-specific NEPA documents.
Livestock Grazing Management	2021-5	Commenters expressed concern about how the BLM is considering rangeland health, including the process for conducting and considering rangeland health assessments, and addressing allotments that failed to meet the Standards for Healthy Rangelands. Specifically, commenters requested additional details about the methods and procedures the BLM used to complete rangeland and livestock grazing allotment assessments, and how impacts of livestock grazing on other resources were included in the assessments.	The BLM is required to meet the Standards for Healthy Rangelands and conform to the Guidelines for Livestock Grazing Management in accordance with 43 CFR 4180.2. In areas that fail to meet Standards for Healthy Rangelands, the BLM will use the Guidelines to establish appropriate actions. The BLM will work with the permittees, state and local governments, and the interested public to address those standards on a site-specific basis analyzed under NEPA. The BLM has provided clarification in the Proposed RMP and Final EIS that changes to grazing management are implemented when rangelands are not meeting standards due to current livestock grazing, and provided details on the process for completing standards assessments.

Issue	Summary Number	Summary Comment	Summary Response
Locatable Minerals	2022-1	Commenters requested the BLM provide greater protections to resource values, such as greater sage-grouse habitat and ACECs, from locatable mineral activity, including increasing the acreage of withdrawals from mineral entry in an effort to further protect environmental, scenic, and cultural values in these areas. Other commenters asserted the BLM did not recognize the value or volume of uranium resources in the planning area, and requested the BLM include additional information on the mineral's importance to the region and nation in providing clean and abundant energy and high-paying jobs. Commenters pointed out factual inaccuracies in the RMP and EIS about certain aspects of uranium operations in the planning area, such as the potential for surface and underground mining of uranium, in addition to in situ recovery. Commenters also requested updated and additional data and information in the RMP and EIS related to research on mineral potential and the location and impacts to individual mining claims.	The BLM updated management in the Minerals sections in the Proposed RMP and Final EIS identifying additional areas to pursue for mineral withdrawal, including along the Lander Front. In other areas, the Core Area strategy provides protection for greater sage-grouse and other resource values from locatable mineral activity. In addition, FLPMA Section 302(b) requires the BLM to prevent unnecessary or undue degradation of public lands. The BLM revised the Proposed RMP and Final EIS to clarify the process by which ACECs may be withdrawn on a case-by-case basis and provide the rational for lands considered for withdrawal in greater sage-grouse Core Area, and made other revisions, as appropriate. The BLM believes the discussion of uranium in the RMP and EIS accurately depicts uranium's importance and benefits in the planning area, and the magnitude of deposits. The BLM updated the Minerals sections in the Proposed RMP and Final EIS to reflect that, in addition to in situ recovery, open-pit and underground mining could be used to extract uranium in the planning area. The operational status of the Big Eagle Mine was updated as open. Regarding updating and using additional data, the BLM uses and incorporates the most current data available on mineral potential.
Recreation	2023-1	Commenters generally requested the BLM provide more opportunities for recreation activities and protect popular recreation areas from incompatible uses. Commenters suggested withdrawing certain recreation areas from mineral entry to preserve recreation opportunities, and designating other areas as Special Recreation Management Areas (SRMAs) or Extensive Recreation Management Areas (ERMAs) to manage for specific recreation opportunities. Commenters suggested other revisions and considerations to clarify the analysis of impacts and justify management prescriptions that would limit incompatible resource uses. For example, a commenter requested the BLM address how reduction in AUMS for some ranches could result in the loss of hunting and fishing opportunities on private property.	The BLM has identified areas in the Proposed RMP and Final EIS that will be withdrawn from mineral entry or designated as SRMAs or ERMAs. Where appropriate, the BLM revised the text in the Proposed RMP and Final EIS to clarify impacts and incorporate additional analysis. The BLM has revised the document to include analysis of loss of hunting and fishing on private properties, and updated the Proposed RMP and Final EIS to reflect potential impacts of the loss of AUMs to fishing and hunting on private ranches.

Issue	Summary Number	Summary Comment	Summary Response
Renewable Energy	2024-1	Commenters indicated that certain areas should be designated as exclusion and avoidance areas for wind-energy development to protect wildlife and maintain management consistency with other designated areas; other commenters requested that additional areas be opened to wind-energy development. Commenters requested a more defined management approach (as opposed to case-by-case management) and suggested larger buffers and BMPs to protect visual, wildlife, and other values. Multiple commenters requested that the BLM remove language regarding surface-disturbing caps on renewable and conventional energy development or add clarifying language that explains where and how surface-disturbing caps are applied.	The BLM has updated the Proposed RMP and Final EIS to reflect changes in areas that are designated as wind-energy development exclusion and avoidance areas, and limitations on wind-energy development in greater sage-grouse Core Area. The surface-disturbance caps referenced in Chapter 2 are for greater sage-grouse Core Area protection. The disturbance cap applies to all surface-disturbing activities in Core Area, including conventional energy development, and is consistent with the Governor's Executive Order for Core Area Protection.
Rights-of-Way and Corridors	2025-1	Several commenters expressed concern about management of communication sites, including expiration of leases (specifically communications facilities on Whiskey Mountain) and restrictions on placement of new communication sites.	The BLM is encouraging investments in modern communications infrastructure (e.g., such as fiber optics) while discouraging unplanned scattering of older technology (e.g., transmission towers) in locations that could result in adverse impacts. Applications for future sites in existing communication sites will have facilitated review, while applications for communication sites outside of approved or existing sites will require standard review under NEPA. The BLM updated Chapter 3 to incorporate additional information provided by commenters related to existing communication sites on Whiskey Peak, specifically identifying the various services provided by the sites.
Rights-of-Way and Corridors	2025-2	Commenters suggested revising the length and width of ROW corridors, consolidating corridors, and creating new corridors to accommodate additional or fewer pipelines, transmission lines, and other linear features. Connectivity between corridors already designated in other field office planning areas and corridors proposed in the planning area was a concern to commenters. Commenters also recommended map and data revisions to correct inaccuracies or inconsistencies, including where exclusion and avoidance areas overlap ROW corridors.	The BLM revised the ROW management and designated corridors in the Proposed RMP and Final EIS in applicable sections, including increasing capacity and connecting corridors where applicable. Some of the corridors identified by other field offices do not consider resource conflicts in the Lander Field Office planning area, such as the limited capacity of the Beef Gap area or the mining and U.S. Department of Energy activities in the Gas Hills. Coordination between field offices cannot always resolve complicated conflicts that might not be apparent at the time of the initial field office planning efforts. The BLM has incorporated changes in the Proposed RMP and Final EIS to adopt designated corridors from other field offices where possible. In addition, the BLM updated the maps to address commenters' concerns as appropriate. including revising ROW exclusion

Issue	Summary Number	Summary Comment	Summary Response
			and avoidance areas and designated corridors. The maps are for illustration purposes only – the management actions in the RMP are the decision.
Rights-of-Way and Corridors	2025-3	Commenters questioned the overall adequacy of the analysis in the ROW and Corridors section and requested additional rationale to support the proposed exclusion and avoidance areas under the Preferred Alternative. Some questioned if the ROWs and corridors were consistent with the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5. Commenters also suggested clarifying language and ways to improve the analysis, such as more discussion of management prescriptions for overhead transmission facilities, a more detailed discussion of reclamation of public land disturbance from an ROW permit, and adding definitions for "major" and "minor" ROW actions.	The BLM modified exclusion areas and avoidance areas and reviewed the RMP to ensure the document provided adequate analysis and justification for the areas. ROWs and corridors designated in the Proposed RMP and Final EIS are consistent with the Wyoming Governor's Greater Sage-Grouse Core Area Protection Executive Order 2011-5. The BLM identifies corridors in the Proposed RMP and Final EIS, while specific management prescriptions related to transmission lines, such as continued access to the lines and emergency maintenance activities, are part of the implementation process. Reclamation of all BLM-approved disturbances is addressed in the Soil sections, Appendix D (p. 1477), and Appendix H (p. 1521); definitions of major and minor ROWs are provided in the Glossary; and current BLM policy will be incorporated in the permit during the application process for renewable energy projects.
Riparian-Wetland	2026-1	Commenters stated that the analysis did not fully describe or consider the importance and existing conditions of riparian-wetlands in the planning area. Specifically commenters asserted the BLM did not propose limitations or requirements, or provide clear objectives for management of these resources beyond the proper functioning condition. Commenters requested additional discussion on the impacts to riparian-wetlands resulting from livestock grazing activities, range improvements, and infrastructure developments. Commenters also questioned aspects of the BLM's approach to riparian-wetland protection, including setbacks, mitigation, and monitoring, and whether they were in compliance with Executive Order 11990. Commenters suggested applying NSO stipulations around high-value riparian-wetlands as another method for protecting these highly productive areas.	The BLM reviewed all sections pertinent to riparian-wetlands management and determined that the stated goals and management in the Proposed RMP and Final EIS are appropriate. The BLM revised the text in the Proposed RMP and Final EIS, as appropriate, to provide technical corrections, additional text, and clarifications as needed. Specifically, the BLM added language pertaining to management of the proper functioning condition and evaluation of season-long grazing practices on riparian-wetlands. While the BLM agrees that additional stipulations, such as NSO, would provide a higher level of protection for riparian-wetland areas, the agency believes it more appropriate to consider such stipulations on a site-specific basis.

Issue	Summary Number	Summary Comment	Summary Response
Salable Minerals	2027-1	Commenters questioned the BLM's closure of areas to mineral material disposal and the analysis that supported the closures. Commenters were particularly concerned about access to mineral material sites in the western portion of the planning area to maintain local roads. Commenters requested that the BLM reevaluate potential resource conflicts and acknowledge that environmental impacts associated with materials disposal sites can be successfully mitigated.	The BLM has determined that the Proposed RMP and Final EIS adequately addresses the commenters' concerns regarding potential resource conflicts and materials disposal site mitigation, as currently written. Regarding closing portions of the western part of the planning area to mineral material disposal, the BLM does not believe this would adversely impact local road maintenance, because private sources appear able to meet the demand. However, closure of the South Pass area would not apply to the free use of mineral materials for the purposes of constructing and maintaining federally funded highways, as described in the BLM and Federal Highway Administration interagency agreement. In addition, the BLM has revised the discussion of management of the Dubois area to reflect that existing mineral material areas can continue to be used.
Socioeconomic	2028-1	Commenters questioned the adequacy of the analysis of social and economic impacts, and expressed concern about the impact of BLM management on local and regional economies. Commenters asserted the BLM did not adequately consider sources of revenue based on visitation, impacts to the local economy from withdrawing lands from mineral entry, impacts to the local economy from restrictions on oil and gas development, economic impacts from trends in the livestock industry, and economic impacts of new VRM I and II classifications. Other commenters suggested more discussion on topics such as the value of recreation to the Lander area economy, impacts of heritage tourism on the economy, and economic impacts of greater sage-grouse restrictions on oil and gas development. Other commenters addressed how pacing development was not the responsibility of the BLM, while others thought the provision should be expanded to include impacts on natural resources. Commenters expressed concern that an Economic Strategies Workshop was never conducted as required in the BLM's Land Use Planning Handbook (H-1601-1) Commenters recommended including the Social and Economic Monitoring Plan developed by Dr. Robert Winthrop in the RMP and EIS. Commenters recommended that the BLM	The BLM has determined that the economic analysis adequately addresses commenters' requests regarding further analysis of sources of revenue based on visitation, impacts to the local economy from withdrawing lands from mineral entry, impacts to the local economy from restrictions on oil and gas development, economic impacts from trends in the livestock industry, economic impacts of new VRM I and II classifications, and economic contribution of ranching, as currently written. It is entirely within the BLM's area of responsibility to ensure that authorized activities consider socioeconomic impacts, and the management would not limit operators' ability to ensure maximum ultimate recovery, nor would it inhibit their ability to respond to market conditions. Impacts on natural resources will be addressed on a site-specific basis as individual projects are developed. The BLM held an Economic Strategies Workshop in 2007 and has solicited input from Cooperating Agencies and members of the public through various forums throughout the revision process, thereby meeting the objectives in H-1601-1. The BLM will consider using the plan developed by Dr. Robert Winthrop in developing the indicators during implementation.

Issue	Summary Number	Summary Comment	Summary Response
		identify specific user groups (e.g., mineral extraction industries, renewable energy users, recreation users, including locals and visitors, environmental education organizations, and grazing users) and address conflicts that occur between groups.	The BLM has determined that the Proposed RMP and Final EIS as written adequately addresses the comments. Specific user groups and conflicts among users are fully described in the applicable sections of the RMP and EIS.
Socioeconomic	2028-2	Commenters stated that the socioeconomic analysis, and the IMPLAN model in particular, fail to provide an adequate picture of the local economy. Specifically, commenters stated the IMPLAN model did not adequately address the value to the local economy of ranching, recreation, local businesses such as National Outdoor Leadership School, and activities on public lands. Commenters suggested the Regional Economics Model, Inc., as an alternative to IMPLAN, and suggested additional data and analysis topics for the BLM to consider, including local recreation, statistics for surrounding communities, tax revenues at the state level, and economic impacts of air quality restrictions.	The BLM updated Chapter 3 to include additional information about the value to the local economy of local industry and businesses such as National Outdoor Leadership School. The BLM believes that the IMPLAN analysis is more suitable for the purposes of the RMP revision than the Regional Economics Model, Inc., and that it adequately analyzes local recreation, statistics for surrounding communities, tax revenues at the state level, and economic impacts of air quality restrictions.
Soil	2029-1	Commenters expressed a variety of opinions about whether management of soils in the RMP and EIS provided adequate protection or was overly restrictive, to the detriment of other resource uses. Commenters suggested ways the BLM could improve soil management by clarifying certain management actions (e.g., management of Limited Reclamation Potential [LRP] soils) and incorporating new scientific data and literature. Some commenters recommended the BLM place additional conditions on surface-disturbing activities, such as requiring the completion of a watershed protection plan and requiring further study and mitigation measures prior to allowing surface disturbances. Other commenters requested the BLM reduce the conditions on surface-disturbing activities. Commenters suggested that the analysis of soils in the RMP and EIS could be improved by including additional rationale and analysis criteria and a more quantitative analysis of soil erosion in the planning area, including a comparison of sediment contributions from natural and human sources. Commenters recommended that impacts to soils in the planning area from certain resources and activities be reassessed using these and other suggested methods.	The BLM has updated the Proposed RMP and Final EIS to clarify the agency's approach to soil management regarding analysis of LRP soils, surface discharge of produced water, natural causes of soil and water quality degradation, and impacts of fire. The BLM believes that limitations on surface-disturbing activities to protect soil resources are adequate. While applying further study or mitigation measures prior to allowing surface disturbance might provide beneficial protection to soil resources, this determination is more appropriately made on a site-specific basis. Similarly, soil erosion modeling is better performed on a project-specific basis when more detailed site and project data are available.

Issue	Summary Number	Summary Comment	Summary Response
Soil	2029-2	Numerous commenters suggested that the BLM more completely define, provide justification for, or otherwise revise its objectives and standards for reclamation and monitoring. Commenters requested that the BLM (1) clarify that reclamation plans would be required for oil and gas drilling operations under all alternatives and (2) provide additional information regarding reclamation plan requirements in LRP areas. Commenters offered many suggestions regarding the optimal balance between specific site-level prescriptions and more general comprehensive reclamation plans. Some commenters expressed their convictions that the proposed accountability mechanisms were insufficient for ensuring successful reclamation, as evidenced by poor revegetation success in existing reclamation areas.	The BLM has updated applicable sections of the Proposed RMP and Final EIS in response to comments, including adding additional information on Natural Resources Conservation Service (NRCS) Ecological Site Descriptions and LRP soils. Soil management requires a site-specific application and cannot be defined; neither can reclamation measures be identified at the RMP level. Specific reclamation objections are based on site-specific analysis.
Special Status Species	2030-1	Commenters stated that adverse impacts to certain special status species analyzed in the RMP and EIS were in some cases unsupported, exaggerated, and/or inconsistent with existing scientific literature and management directives. Commenters recommended the inclusion of additional scientific data, U.S. Forest Service (USFS) and U.S. Fish and Wildlife Service (USFWS) monitoring and management directives in the RMP and EIS, and the 2005 statewide Canada lynx Biological Assessment (BA). Specifically, commenters stated there were deficiencies or errors in the BLM's analysis of the historic range, occupancy, habitat, and adverse impacts resulting from timber management and grazing on Canada lynx, and the impacts of road density, timber management, and buffer size on northern goshawk. Commenters also requested additional evidence to substantiate stated adverse impacts from wild horses and fence construction on desert yellowhead and sensitive bird species, respectively. Commenters suggested that the BLM identify potentially occupied pygmy rabbit habitat in the planning area to substantiate the limitations placed on surface-disturbing activities.	The BLM developed and analyzed impacts to special status species in the Proposed RMP and Final EIS using the best available information in compliance with federal laws, guidelines, and policies. As appropriate, the BLM updated the analysis in applicable sections and added references that support decisions regarding special status species. Specifically, the BLM revised the Proposed RMP and Final EIS to include text to clarify the impacts of timber management, road density, and livestock grazing activities on special status species in the planning area. Pygmy rabbit habitat has not been identified for the entire planning area, and the BLM believes that including a map would be misinterpreted as being a complete depiction of habitat. Chapter 3 identifies what constitutes suitable habitat for pygmy rabbit, and the BLM has added text to expand the description of where occupied habitat has been identified.

Issue	Summary Number	Summary Comment	Summary Response
Special Status Species	2030-2	The BLM also received comments on the Draft BA that was released about the same time as the Draft RMP and EIS. One commenter noted that the section on the BA incorrectly reported (1) that no Canada lynx tracks were observed during surveys in the Dubois area and (2) omitted a subsequent Canada lynx detection in Long Creek. Other commenters questioned why the BLM would release the BA prior to selection of the Proposed RMP and recommended the BLM reduce the complexity of the BA.	The BLM has revised the BA and Chapters 3 and 4 of the Proposed RMP and EIS to reflect that Canada lynx have been found in the planning area, but have not been documented on BLM-administered lands. The BLM will announce its final decision on the Proposed RMP in the ROD; the decision is not governed by timing associated with the BA. The BLM believes the BA is appropriately written and not overly complex.
Special Status Species	2030-3	Commenters raised both specific and general concerns regarding the suitability of management determinations for special status species, and suggested that the BLM provide additional support and clarification for its management direction. Specifically, commenters requested (1) detailed information on BLM management direction and monitoring actions pertaining to special status species protection and habitat, (2) more consistency with USFS and USFWS management directives and determinations, (3) the removal of restrictions for special status species that the USFWS has withdrawn from consideration as threatened or endangered, and (4) greater protections and safety measures for listed species.	The BLM revised the Proposed RMP and Final EIS to reflect recent USFWS decisions, and incorporated, in coordination with the USFWS, USFS, and WGFD, commenter requests for specific revisions and clarifications, technical edits, changes to management actions, and updates to data and mapping, as appropriate. The USFWS and WGFD are the lead authorities responsible for the protection, management, and monitoring of all flora and fauna species in the planning area. Both the USFWS and WGFD provided guidance to the BLM, which is reflected in the special status species sections and management actions in the Proposed RMP and Final EIS.
Trails and Travel Management	2031-1	Commenters requested that the BLM change route designations to increase restrictions on travel, close areas to motorized and mechanized travel, and enact seasonal road closures to protect wildlife, water quality, wilderness values, and back country recreational experiences. One commenter expressed concern that changes in route designations would have adverse impacts to livestock grazing that are not disclosed in the document. Commenters recommended the BLM complete a comprehensive monitoring program and coordinate with stakeholders before changing route designations to protect wildlife values. Commenters also requested the BLM allow for the swift installation of snow fences, address all the road and recreation needs covered in the Fremont County Land Use Plan in coordination with the Fremont County Commission, and allow access to seasonally closed areas and alternative routes if route designations change to limited or closed. A commenter also suggested travel restrictions not apply to geophysical operators to preserve BLM administrative flexibility.	Several commenter requests do not require an RMP decision, are part of a separate process (e.g., Revised Statute 2477 rights or review of Plan of Operations), or will be addressed in the implementation phase in accordance with BLM guidance. Suggestions about specific route management can be made at implementation meetings where there will be opportunities for public input. Authorizations or permits that include motorized vehicle activities will address the use of motorized vehicles as part of the authorization or permit. The BLM added language to the tables of management actions in Chapter 2 to clarify the route designation process in an RMP. In addition, the BLM added Appendix W (p. 1813) to the Proposed RMP and Final EIS that provides additional information on travel management planning and decisions.

Issue	Summary Number	Summary Comment	Summary Response
Vegetation	2032-1	Commenters recommended multiple revisions to the Vegetation sections based on current knowledge of forest management, such as addressing discrepancies in buffer distances, replacing certain vocabulary, and incorporating BMPs. For example, commenters requested replacing the term “clear-cuts” because it has a negative connotation, and incorporating the Wyoming State Forestry Division’s Silvicultural BMPs guide.	The BLM updated management and applicable sections of the Proposed RMP and Final EIS, as appropriate. The BLM agrees with the characterization of clear-cut as a negative term; however, scoping clearly identified that clear-cutting needs to be addressed separately from other silviculture techniques. The BLM incorporated the Wyoming State Forestry Division’s Silvicultural BMPs in Appendix H (p. 1521).
Vegetation	2032-2	Commenters stated that the Draft RMP and EIS fails to implement management requirements or limitations to address the needs of vegetation communities when their health is threatened by other resource uses. Commenters suggested clarifying proposed vegetation treatments by adding a timeframe for recovery, and suggested revising a management action to include wildlife habitat objectives. Other commenters suggested management strategies to increase available forage for livestock, such as adding a management action that would allow for the BLM to apportion additional forage for livestock grazing when monitoring has shown that additional forage is available. Commenters also requested clarification on management terms, including “desirable vegetation communities.”	Management of all vegetation communities will be based on meeting Wyoming Standards for Healthy Rangelands and the NRCS Ecological Site Descriptions, which provide the reference state from which the standards are measured. The BLM will work with permittees/lessees, cooperators, and the interested public to meet Wyoming Standards for Healthy Rangelands. If standards in these communities fail due to livestock grazing, appropriate actions will be taken and incorporated into the comprehensive grazing strategies defined in Appendix K (p. 1547). Apportioning additional forage for livestock grazing use is already provided for by regulation and does not require changing management in the Proposed RMP and Final EIS. The BLM updated vegetation management in Chapter 2 to incorporate wildlife objectives. Proposed vegetation treatments will be identified in cooperation with the WGFD, and together the agencies will identify the specific objectives, including recovery timeframes, for the project. All potential projects will be subject to NEPA analysis and WGFD review related to the Density Disturbance Calculation Tool protocol. Desired plant communities will be based on the NRCS Ecological Site Descriptions and managed in a way designed to meet the Wyoming Standards for Healthy Rangelands. Desired plant communities allow for flexibility in management for specific wildlife habitats rather than historic climax plant communities.

Issue	Summary Number	Summary Comment	Summary Response
Vegetation	2032-3	Comments regarding vegetation species composition in reclamation standards for DDAs and non-DDAs include revising text with clarifying language. For example, commenters requested clarification regarding seed mixes, determining species composition, fulfilling species composition percentage requirements, and seeding times and methods.	The BLM revised Appendix D (p. 1477) and applicable sections to address these comments. The standards the BLM uses for reclamation are based on the NRCS Ecological Site Descriptions, including seed mixtures and determining species composition by weight. Site-specific conditions or issues will be addressed in the individual project reclamation plan.
Visual Resource Management	2033-1	Commenters expressed concern that designating areas with more stringent VRM classifications would adversely impact development operations, including oil and gas development on existing leases. One commenter questioned the need for a large area designated as VRM Class III across the Sweetwater watershed, noting that development in this area was not expected to necessitate a corridor of this size. Another commenter requested that the BLM consider designating the Beaver Rim MLP as VRM Class II in an effort to stay consistent with the surrounding area's VRM. Commenters also requested clarification on VRM, including providing a clear explanation of how VRM Classes were determined. Commenters requested that the BLM revise VRM maps to more accurately portray the level of development constraints and to show that the BLM VRM restrictions do not apply to privately owned or state-managed lands.	The BLM will not impose new VRM restrictions on existing oil and gas leases. Therefore, the BLM will work with operators to mitigate impacts to the best extent practical (see Washington Office IM No. 98-164). Regarding VRM Class III designation in the Sweetwater watershed, while the VRM Class III designation applies to a larger area, the ROW corridor is much narrower. In the Beaver Rim MLP, the VRM Class III designation reflects other uses in the area, and the BLM did not identify resources that require VRM Class II management. The visual resource inventory process is described in Chapter 3 and VRM Classes were developed in collaboration with the cooperating agencies. VRM Classes are not based just on inventory, but also desired management for the area. The BLM believes the identified maps accurately portray development constraints in VRM Class II areas. The BLM does not assert the right to apply VRM restrictions to state and private lands; the maps are illustrative of management, not management itself.
Water	2034-1	Commenters stated that the water resource analysis did not include recent data or current scientific reports pertaining to the characterization and classification of specific water resources and their uses in the planning area. Commenters stated that the analysis did not provide accurate data or baseline conditions for water resources indicators that would allow for an evaluation of potential impacts, including chemical, physical, and biological characteristics. Commenters also questioned the validity of statements and language used to support BLM management decisions pertaining to water quality standards and water levels in the planning area, and requested clarification on implementation of proposed BLM water monitoring actions. Finally, commenters stated that the analysis did not consider the beneficial uses of water produced by development activities,	The BLM has updated the Proposed RMP and Final EIS to address comments as appropriate. The agency updated applicable sections to include a discussion of impacts from nonpoint source pollution, clarify inventory and monitoring requirements, clarify impacts on groundwater, include analysis of sensitive drinking water resources, and included scientific references to support the analysis. The BLM determined that impacts of produced water are better analyzed on a site-specific basis, where actual water quality and stream conditions are known.

Issue	Summary Number	Summary Comment	Summary Response
		including, but not limited to, improvements in natural water quality in planning area waterways, livestock/wildlife resources, and the creation of riparian zones and wetlands. Commenters also requested the BLM remove a statement asserting oil and gas techniques impact groundwater.	
Water	2034-2	Commenters asserted that the BLM stated goals and objectives do not reflect those provided by the state, and requested justification or clarification concerning several management actions. Commenters also questioned the BLM's authority to regulate surface water quality, which they noted was under the jurisdiction of Wyoming DEQ, and requested the BLM clearly state the Wyoming DEQ has primacy regarding water issues. Commenters noted several technical corrections and inaccurate statements pertaining to management of produced water and water quality standards, and suggested edits and/or items for inclusion. Commenters also requested that the BLM include additional protective management for water resources. Specifically commenters requested NSO restrictions in areas near drinking water resources and clarification on how water management actions and BMPs will be implemented and monitored.	The BLM has updated the Proposed RMP and Final EIS in response to the comments. Changes were made to applicable sections regarding the use of pesticides and herbicides in water source areas, clarify that Wyoming DEQ regulates water quality, and update monitoring for groundwater. The BLM has determined that the RMP and EIS adequately addressed protection for water resources, including limitations on surface-disturbing activities near drinking water resources and implementation of BMPs.
Wild and Scenic Rivers	2035-1	Commenters requested that the BLM reconsider the eligibility/suitability of several waterways for inclusion in the National Wild and Scenic River System. Specifically, commenters recommended including a specific segment of Warm Springs Creek due to its Wild and Scenic River (WSR) status for the portion on adjacent USFS land, and segments of the Little Popo Agie and Sweetwater rivers due to their outstanding remarkable values. A commenter also stated that the RMP does not adequately describe other mechanisms in place to protect certain qualities of WSR-eligible segments.	After additional review, the BLM determined Segment 1 of Warm Springs Creek was suitable for inclusion in the National Wild and Scenic River System and revised the Proposed RMP and Final EIS to reflect this change. Extensive mechanisms are in place to protect qualities of WSR-eligible segments, including cultural resource management, and management associated with Congressionally Designated Trails.

Issue	Summary Number	Summary Comment	Summary Response
Wild and Scenic Rivers	2035-2	Commenters requested that the BLM incorporate management prescriptions into the RMP and EIS that would limit adverse impacts to Outstandingly Remarkable Values for all eligible and suitable river segments, including, but not limited to, the following: manage certain segments as VRM Class I and II; manage mineral and realty actions within ¼ mile of a segment with category 6 restrictions; let mineral leases within ¼ mile of segments expire; prohibit or mitigate water impoundments, diversions, or hydroelectric power facilities in river segments; close segments to motorized and mechanized vehicles; close timber harvest within river corridors; and intensive management of livestock grazing within river corridors. Commenters also requested that the BLM clarify if the nine segments will be managed to protect their Outstandingly Remarkable Values (as under Alternative A) under Alternative D, independent of recommendations to Congress.	The BLM updated the Proposed RMP and Final EIS to incorporate some of the recommended prescriptions. Other management prescriptions are effectively covered under the Proposed RMP or will be addressed during implementation. During the RMP process, the BLM decides if Outstandingly Remarkable Values meet eligibility and suitability criteria for potential congressional WSR designations. Waterways found to meet the suitability criteria receive protective management until such time Congress decides whether to designate the waterway. Waterways deemed eligible but not suitable are removed from further consideration for protection under the WSR program. This does not preclude these waterways from protections to support other programs, such as recreation, cultural and visual resources, and wildlife. The difference between the alternatives in relation to eligible waterways not deemed suitable is included in the WSR section in Chapter 4.
Wild Horses	2036-1	Commenters stated that the Draft RMP and EIS does not adequately assess the impacts of proposed management on wild horses in the planning area, that the existing conditions of Herd Areas (HAs) and Herd Management Areas (HMAs) are not adequately described, and that the BLM did not complete their analysis with current monitoring data or supporting scientific research.	The BLM reviewed all parts of the document associated with the wild horses analysis and determined the information, as stated, is valid. Management associated with wild horses is based on BLM Manual 4700, and the Proposed RMP and Final EIS complies with measures described in the manual. The BLM collects monitoring information in the planning area HAs and HMAs, including horse herd inventory, observations, use of riparian-wetland areas, livestock use, and precipitation, and the BLM used the information in the analysis.
Wild Horses	2036-2	Commenters expressed concern about the adequacy of proposed management practices for wild horses in the planning area. Specifically, commenters questioned the effectiveness of proposed management methods for addressing genetic viability and health, gather activities, and actions for meeting established population numbers. Commenters requested revisions and additional details on how the BLM will implement BMPs for the maintenance, monitoring, and management of extant wild horse populations, offered suggestions for improved wild horse viewing opportunities and reduced viewing opportunities, and requested the option for converting portions of AUMs allotted for livestock use to wild horses/herds. Commenters provided recommendations on management of wild horses that would both expand and alter management for	Management associated with wild horses is based on BLM Manual 4700. The BLM made technical edits and revised management actions in Chapter 2 for clarity, and added Appendix V (p. 1805), which includes detailed information on wild horse management practices, implementation of BMPs, and recreation opportunities associated with wild horses. The appropriate management levels in the planning area were established in 1993 and 1994. The BLM believes that the appropriate management levels are satisfactory for the current HMAs within its jurisdiction; moreover, the appropriate management levels were established in the Consent Decree, which is still in effect and has been made available on the project website.

Issue	Summary Number	Summary Comment	Summary Response
		wild horse herds and ranges, including increasing appropriate management levels.	
Wilderness Characteristics	2037-1	Commenters expressed confusion regarding guidance on lands with wilderness characteristics and stated the BLM did not provide justification for managing areas as non-Wilderness Study Area (WSA) lands with wilderness characteristics. Regarding management of these areas, multiple commenters recommended prohibiting or limiting motorized travel in lands with wilderness characteristics, while other commenters recommended managing them as ROW exclusion areas in an effort to protect primitive values. Commenters also suggested increasing the size of areas or removing areas with wilderness characteristics under Alternative D. In addition, commenters expressed a need for further inventories of resources in lands with wilderness characteristics to determine how impacts should be managed, with inventories completed using guidance found in IM 2011-154.	The BLM will manage non-WSA lands with wilderness characteristics as authorized by IM 2011-154. The BLM's inventory of lands with wilderness characteristics fully complies with this IM, and provides adequate rationale for the BLM's proposed management of non-WSA lands with wilderness characteristics. The BLM will evaluate closing or limiting motorized travel in specific areas during travel management implementation planning. However, the BLM updated the Travel Management section to include additional protections for the Greer Peak and Lysite mountain regions.
Wilderness Study Areas	2038-1	Commenters questioned if WSAs near populated areas or containing roads should remain designated as WSAs, while other commenters indicated WSAs should be expanded as recommended in the 1994 citizens' recommended wilderness report. One commenter noted the BLM did not identify or recommend any new areas for wilderness protection in Wyoming. Multiple commenters recommended closing or limiting motorized and mechanized travel in WSAs. In addition, commenters indicated a need for further inventories of resources in WSAs to determine how impacts should be managed, specifically in riparian zones. Other comments included requests to withdraw WSAs from mineral entry and imposing Category 5 restrictions in WSAs to protect wildlife. One commenter recommended the BLM not manage WSAs according to WSA management policy, in the event Congress releases those lands for multiple use management.	The BLM does not have the authority to adjust or make changes to existing WSAs. The BLM manages WSAs under BLM Manual 6330, <i>Management of Wilderness Study Areas</i>. The BLM concluded that if motorized use is found to conflict with wilderness values, that route will be closed or the impacts mitigated. Therefore, no route will be found to be non-conforming to the wilderness values. In addition, mechanized use is not prohibited by BLM Manual 6330, and there have been no documented cases where mechanized use is conflicting with wilderness values. If this does occur, the BLM will use implementation planning to address these conflicting uses.
Wildlife	2039-1	Commenters raised several concerns about the BLM's management of wildlife resources and identified information gaps in the wildlife analysis. Specifically commenters raised concerns regarding (1) the impacts of wildlife protections and seasonal restrictions on other resources and energy	The BLM updated wildlife management in the alternatives and other wildlife-related text in the Proposed RMP and Final EIS in response to the comments. Specifically, the BLM updated management actions in Chapter 2, clarified terminology, clearly identified areas open and closed to leasing under each

Issue	Summary Number	Summary Comment	Summary Response
		developments, (2) clarification on protective stipulations and annual timing of stipulations, and (3) whether BLM management actions are supported by field verified and/or cited scientific reference documents. In addition, commenters requested additional detailed information regarding management in special habitat designations, protection of big game species and crucial winter ranges, grazing restrictions in wildlife areas, and impacts on amphibian and raptor species. Commenters also identified outdated data presented on wildlife maps.	alternative, added scientific references and citations to support the analysis, and made other revisions, as appropriate. The agency revised Chapters 3 and 4 to clarify wildlife habitat ranges and designations, impacts, and protections. The maps presented in the Draft RMP and EIS are representative of data available at the time they were prepared. The BLM will obtain updated survey information for raptor nests once a federal action is authorized. The agency has updated the maps in the Proposed RMP and Final EIS to reflect recently updated data for big game winter range and greater sage-grouse leks.

X.4.3. Non-Substantive Comments

In addition to the substantive comments summarized and responded to above, the BLM received numerous non-substantive comments during the public comment period. In accordance with BLM NEPA Handbook (H-1790-1), a formal response to non-substantive comments is not required; however, the BLM has reviewed and acknowledges all comments it received. Non-substantive comments generally included:

- Comments in favor of or against management alternatives and allocations without reasoning that meet the criteria for substantive comments (e.g., we disagree with the Preferred Alternative and believe the BLM should select Alternative C)
- Comments that only agreed or disagreed with BLM policy or resource decisions without justification or supporting data that meet the criteria for substantive comments (e.g., the BLM needs to better manage oil and gas development in the planning area)
- Comments that did not pertain to the Lander Field Office planning area
- Comments that were outside the scope of analysis for the RMP and EIS (such as comments related to revision and update of laws, policies, and regulations)
- Comments that took the form of vague, open-ended questions or statements that did not meet the criteria for substantive comments

X.5. Conclusion

The BLM revised the Draft RMP and EIS and prepared the Proposed RMP and Final EIS in response to substantive public comments received during the public comment period. The BLM will continue to consider public, agency, and other stakeholder comments through completion of the Lander RMP revision, as appropriate.