CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

Roadmap to Chapter 4

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter describes environmental consequences that may result from implementing the five alternatives described in Chapter 2. The purpose of this chapter is to analyze and disclose potential impacts of the federal action on the human environment. The federal action for this Environmental Impact Statement (EIS) is the Bureau of Land Management's (BLM's) selection of an alternative on which future land use actions would be based.

The potential consequences of each alternative are described in this chapter as impacts using the same order of eight resource topics (e.g., Physical Resources, Mineral Resources, etc.) presented in Chapter 3. Identical organization for chapters 3 and 4 allows the reader to compare existing resource conditions (Chapter 3) to potential impacts (Chapter 4) for the same resources. The analysis of environmental consequences focuses on key planning issues (see Chapter 1) raised during the scoping process rather than providing an encyclopedic discussion of all possible consequences. Each resource or resource use in this Chapter is organized as described below.

Introduction

The discussion of environmental consequences for each resource program begins with a brief definition of what is considered an impact for the resource. When applicable, definitions of the following types of impacts also are included.

Beneficial/Adverse Impacts. When applicable, beneficial and adverse impacts are differentiated in this chapter. For example, an alternative that increases the number of surface water reservoirs constructed within the North Platte watershed is expected to have a beneficial impact on select local fish and recreation; however, if this alternative also increases water depletion (via evaporation) in the Platte River watershed, it may adversely impact downstream special status species, such as the pallid sturgeon. The presentation of both beneficial and adverse impacts for key planning issues is intended to provide the BLM decisionmaker and reader with an understanding of the multiple use tradeoffs associated with each alternative. However, all possible impacts are not described and, unless otherwise stated, impacts described in this chapter are assumed to be adverse.

Direct/Indirect Impacts. In general, direct impacts result from activities authorized by the BLM and generally occur at the same time and place as the management activity or action causing the impact. For example, for the action of building a road, a direct adverse impact is surface disturbance. Surface disturbance is the impact (the effect) of heavy equipment (the cause) removing existing vegetation as it grades the proposed road location. Indirect impacts often occur at some distance or time from the action. In the above example, an indirect impact could occur days after the surface is disturbed and some distance from the disturbance. Heavy precipitation following the removal of vegetation and disturbance of the ground surface could erode soil and transport sediment into streams. The impact on stream-water quality is considered an indirect adverse impact.

Short- or Long-Term Impacts. Where applicable, the short-term or long-term aspects of impacts are described in this chapter. For purposes of this EIS, short-term impacts occur during or after the activity or action and may continue for up to 5 years. Long-term impacts occur beyond the first 5 years. Five years is an approximation of the time required to restore or reclaim an area following surface disturbance.

Methods and Assumptions

Due to the programmatic and strategic nature of the Resource Management Plan (RMP) alternatives, the timing and specific location of project-specific actions that could impact resource values are not defined. Moreover, the relationship between cause (future actions) and effect (impact on resources) is not always known or quantifiable. For these reasons, the analysis of alternatives is both qualitative and quantitative and based on a series of assumptions. The methods and assumptions listed below, and for each resource in the following sections, are disclosed to provide a basis for the conclusions reached in this chapter. 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), guidelines for surface-disturbing activities, and Mitigation Guidelines (appendices I, K and N). In other words, the practices and guidelines included in appendices K and N are considered a component of each alternative. Appendix N lists standard practices used in the planning area to mitigate adverse impacts caused by surface-disturbing activities. Appendix K is a reference to BMPs.
- 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" in 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 Tenth Circuit Court of Appeals in Sierra Club vs. Peterson (717 F.2d 1409, 1983) found that "on land leased without an NSO [no surface occupancy] stipulation, the U.S. Department of the Interior (USDI) cannot deny the permit to drill…once the land is leased the DOI [Department of the Interior] no longer has the authority to preclude surface-disturbing activities even if the environmental impact of such activity is significant. The Department can only impose mitigation upon a lessee who pursues surface-disturbing exploration and/or drilling activities." The court goes on to say "notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the DOI has made an irrevocable commitment to allow some surface-disturbing activities, including drilling and road building."
- Provisions in leases that expressly provide Secretarial authority to deny or restrict development in whole or in part depend on an opinion provided by the U.S. Fish and Wildlife Service (USFWS) regarding impacts to endangered or threatened species or habitats of plants and animals that are 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 may be denied in whole or in part.
- Although not defined as a surface-disturbing activity, concentrated livestock and native ungulate grazing, off-highway vehicle (OHV) use, and fire may remove vegetation and expose the soil surface leading to increased erosion.
- Comparison of impacts among resources is intended to provide an impartial assessment to inform the decisionmaker 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.
- Key planning issues identified in Chapter 1 provide the focus for the scope of impact analyses in this chapter.

- 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 considered the extent of projected surface disturbance and associated development from BLM actions.
- BLM policy in Wyoming does not allow disposal of oil-and-gas produced water on BLM-administered surface lands using surface application methods, such as irrigation (BLM 2005f). Analysis assumes that this policy, the limited anticipated quantity of produced water in the planning area, and water-quality regulation by the Wyoming Department of Environmental Quality (DEQ) will avoid significant adverse impacts to water quality in the planning area from well-produced water under any alternative.
- The analysis of impacts reflects the anticipated consequences of alternatives on individual resources; for example, the impact of alternatives on invasive, nonnative plant species (INPS). The anticipated impacts of individual resources on other resources are discussed in the appropriate sections. For example, the impact of INPS on wildlife is described in the wildlife section—not in the INPS section.
- The analysis of impacts focuses on the anticipated 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 (Volume 2). Surface disturbance typically is described in terms of the total short- or long-term disturbances of BLM actions, as shown in Table 4-1. Refer to Appendix M for projected surface disturbance associated within individual reasonable foreseeable actions (RFAs). Surface disturbance for new wells that are later abandoned is reclaimed and accounted for in surface-disturbance acreage in Appendix M.
- Under all alternatives, appropriate threatened and endangered species surveys will be conducted, where applicable, during the appropriate season.

Table 4-1. Total Projected Surface Disturbance from BLM Reasonable Foreseeable Actions in the Casper Planning Area

Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E *(Proposed RMP)*
Total Acres Short-Term Disturbance from BLM Actions	59,990	36,650	58,689	63,649	61,274
Total Acres Reclaimed from BLM Actions	38,903	25,085	38,331	41,569	39,602
Total Acres Long-Term Disturbance from BLM Actions	21,087	11,565	20,358	22,080	21,672

Source: Appendix M, Table M-1
BLM Bureau of Land Management

Analysis of Alternatives

The analysis of alternatives describes how each alternative could affect baseline conditions of individual resources in the planning area. Impacts typically are described by topic, such as surface disturbance, other resources or resource uses, and proactive management actions. Proactive management actions generally include management actions anticipated to protect or enhance the resource of interest. For example, proactive management actions for soils include prohibiting or restricting surface-disturbing activities on steep slopes or highly erosive soils. If a particular allowable use or management action is not discussed for a resource, it is because no impacts are expected or the anticipated impact is not considered significant.

Conclusion

The conclusion section for each resource and resource use briefly highlights the overall impacts of alternatives relative to which alternatives are projected to have the most and least impacts. Action Alternatives are compared to the No Action Alternative (Alternative A). In some cases, there are no discernable differences in impacts from alternatives.

Cumulative Impacts

Cumulative impacts are described in the Cumulative Impacts section of this chapter. Cumulative impacts combine the past and present impacts encompassed in existing conditions described in Chapter 3 with the anticipated incremental impacts of alternatives described in the sections of this chapter and the impacts of RFAs. The Cumulative Impacts section also includes anticipated incremental impacts of non-BLM RFAs.

4.1 Physical Resources

The Physical Resources section describes the potential impacts to air quality, geologic resources, soil, and water resources with respect to each alternative. Within each resource, impacts common to all alternatives and the methods and assumptions used for the analysis are described.

4.1.1 Air Quality

Actions that could occur through implementing each alternative could affect future air quality within the region ("region" includes the planning area and Class I areas within 100 miles). This section describes the impacts of each alternative on air quality in terms of short-term and long-term impacts.

4.1.1.1 Methods and Assumptions

The air quality analysis estimated emissions associated with proposed management actions for each project alternative. The analysis focused on emissions associated with a year of peak construction activity (year 2006) and operational emissions approximately 10 and 20 years in the future (years 2011 and 2020). As a reasonably conservative approach, the analysis included the peak annual construction emissions to years 2011 and 2020 operational emissions to estimate total annual emissions for these years. Years 2011 and 2020 emissions were compared to year 2001 existing emissions to determine the future change in emission levels for each project alternative. The analysis then presents qualitative descriptions of potential air quality impacts within the region for air quality. This qualitative analysis, rather than a quantitative analysis approach, was used because sufficient site-specific data were not available regarding future proposed activities and because the Wyoming DEQ would require demonstration of compliance with federal and state air quality regulations and standards for any substantial future development action under their jurisdiction. Given the uncertainties concerning the number, nature, and specific location of future emission sources and activities, the emission comparison approach provides an appropriate basis for comparing the potential impacts under the various alternatives. Refer to Appendix J for the Air Quality Impact Technical Support Document.

Activity data used to estimate emissions for proposed emission sources were obtained from Casper Field Office staff and National Environmental Policy Act (NEPA) analyses performed for BLM actions within Wyoming that are similar to those associated with the actions proposed in this EIS (BLM 2002f; BLM 2005g). Emission factors used to estimate proposed emissions were obtained from (1) the U.S. Environmental Protection Agency (EPA) NONROAD Emissions Model (EPA 2004); (2) Wyoming DEQ best available control technology (BACT) levels for natural gas-fired internal combustion engines (Hanify 2006, Wyoming DEQ 2000); (3) MOBILE6 emissions models for on-road vehicles (EPA 2003); and (4) special studies on fugitive dust emissions. The Air Quality Impact Technical Support Document (Appendix J) includes data and assumptions used to estimate emissions for each project alternative.

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

- Stationary sources associated with oil and gas development would operate at emission levels based on currently observed BACT levels.
- Activity data associated with management actions other than those related to conventional and coalbed natural gas (CBNG) wells were averaged over the entire analysis period to produce annual average emissions.
- Assuming the current rate of mining in the planning area continues, existing coal leases provide sufficient reserves through 2030.

- EPA off-road emission standards were used to estimate emissions for nonroad sources in project years 2006/2011/2020. This approach simulates the replacement of existing sources by new lower-emitting equipment with future EPA off-road emission standards.
- The analysis in this section estimated only emissions from permitted activities that would occur on federal lands within the planning area.
- Use of water application as a BMP would reduce fugitive dust emissions from ground-disturbing activities during construction/reclamation and maintenance of roads by 50 percent from uncontrolled levels.

The analysis calculated emissions for the following types of development and use activities: (1) CBNG, (2) conventional oil and natural gas, (3) coal mine, (4) rights-of-ways (ROW), (5) livestock management, (6) OHV, (7) resource roads, (8) salable and locatable minerals, (9) fire management (including prescribed fire), (10) forest and woodlands, (11) renewable energy development, and (12) vegetation management. The project planning area for air quality includes the planning area and federal Class I areas within 100 miles. The nearest federal Class I areas to the planning area are the Bridger National Wilderness Area (NWA) in Sublette County (approximately 90 miles to the west), Fitzpatrick NWA in Fremont County (approximately 100 miles to the west), and Wind Cave National Park in South Dakota (approximately 75 miles to the east). Table 4-2 summarizes the annual emissions anticipated under each alternative.

Table 4-2. Total Annual Emissions Summary for BLM Activities Within the Casper Planning Area

Summary Year	Emissions (tons per year)						
	PM_{10}	$PM_{2.5}$	NO_x	SO_x	CO	VOC	HAP
Base Year (2001) Totals	1,116	241	1,311	84	1,016	2,898	308
Alternative A							
2011 Total	1,361	290	1,367	80	1,947	4,248	454
2020 Total	1,381	306	1,498	83	2,354	4,915	526
Alternative B							
2011 Total	1,115	226	715	25	1,597	1,058	115
2020 Total	1,197	248	773	27	1,886	1,108	120
Alternative C							
2011 Total	1,457	300	1,307	75	1,924	3,971	424
2020 Total	1,475	315	1,429	78	2,320	4,558	488
Alternative D							
2011 Total	1,697	334	1,376	81	1,981	4,199	448
2020 Total	1,718	350	1,500	83	2,385	4,867	520
Alternative E (Proposed RMP)							
2011 Total	1,486	306	1,369	80	1,958	4,249	454
2020 Total	1,506	323	1,497	83	2,364	4,882	522

Source: Appendix J
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
SO_x sulfur oxides
VOC volatile organic compound

4.1.1.2 Analysis of Alternatives

Impacts Common to All Alternatives

Air quality impacts from these actions primarily would result from minerals development and production and oil and gas production, as potential emissions associated with these actions would substantially outweigh those produced from any other proposed activity.

Short-term air quality impacts from minerals development and production would occur from six sources: (1) combustive emissions (vehicle tailpipe and exhaust stack emissions) due to the operation of mobile and stationary source construction equipment, (2) fugitive dust emissions (particulate matter less than 10 microns in diameter [PM_{10}]) due to earthmoving activities and the operation of vehicles on unpaved surfaces, (3) nitrogen oxides (NO_X) emissions from blasting, (4) particulate matter emissions from blasting, (5) coal fines blowing off trains hauling coal out of the basin, and (6) diesel emissions from those same trains. Minerals production would generate long-term combustive and fugitive dust emissions from two sources: (1) stationary sources, such as natural gas flaring, natural gas-fired compressors, and minerals storage and handling equipment; and (2) mobile sources that access and service oil and gas facilities and extract and handle subsurface minerals, such as coal and hard minerals. Minerals reclamation activities also would produce combustive and fugitive dust.

The project alternatives could impact air quality related values (AQRVs) within the Bridger and Fitzpatrick NWAs and the Wind Cave National Park (federal Class I areas). Previous quantitative air quality analyses have shown that emission sources potentially can impact Class I areas up to 200 miles away (i.e., Powder River Basin EIS). Although minerals development and production and oil and gas production would be the primary sources of emissions, other resource management actions that could produce combustive and (or) fugitive dust emissions include the following:

1. Forestry production due to road construction, logging equipment usage, slash burning, and prescribed burns.
2. Fire management due to the combustion of vegetation from prescribed burns and wildland fire, combustive emissions from the use of fire suppression equipment, and fugitive dust from the use of fire suppression equipment on unpaved roads; emissions from prescribed burns and wildland fire would depend on fuel and meteorological conditions.
3. Road maintenance due to the use of grading equipment on unpaved roads.
4. ROW due to combustive and fugitive dust emissions from equipment used to construct proposed infrastructure.
5. OHV use due to vehicle usage on unpaved surfaces.

The Wyoming DEQ has the authority to implement emission controls for sources requiring air permits under the Wyoming Air Quality Standards and Regulations and to ensure that these sources would not contribute to an exceedance of an ambient air quality standard. To facilitate this process, the BLM currently implements a program to share emission source information with the Wyoming DEQ and other government agencies. This program would continue under all alternatives. In addition, the BLM will require implementation of BMPs within its authority to minimize impacts, such as fugitive dust emissions in proximity to high use roadways, populated areas, and resource-sensitive areas. Prior to project approval, the BLM will conduct environmental analyses in compliance with NEPA.

Alternative A

Figure 4-1 presents a summary of annual emissions for the base year (2001) and for 2011 for each alternative. Figure 4-2 presents a summary of annual emissions for the base year and for 2020 for each alternative. Appendix J provides the detailed spreadsheets that serve as the basis of these charts, along with the emission calculations and emission summary tables.

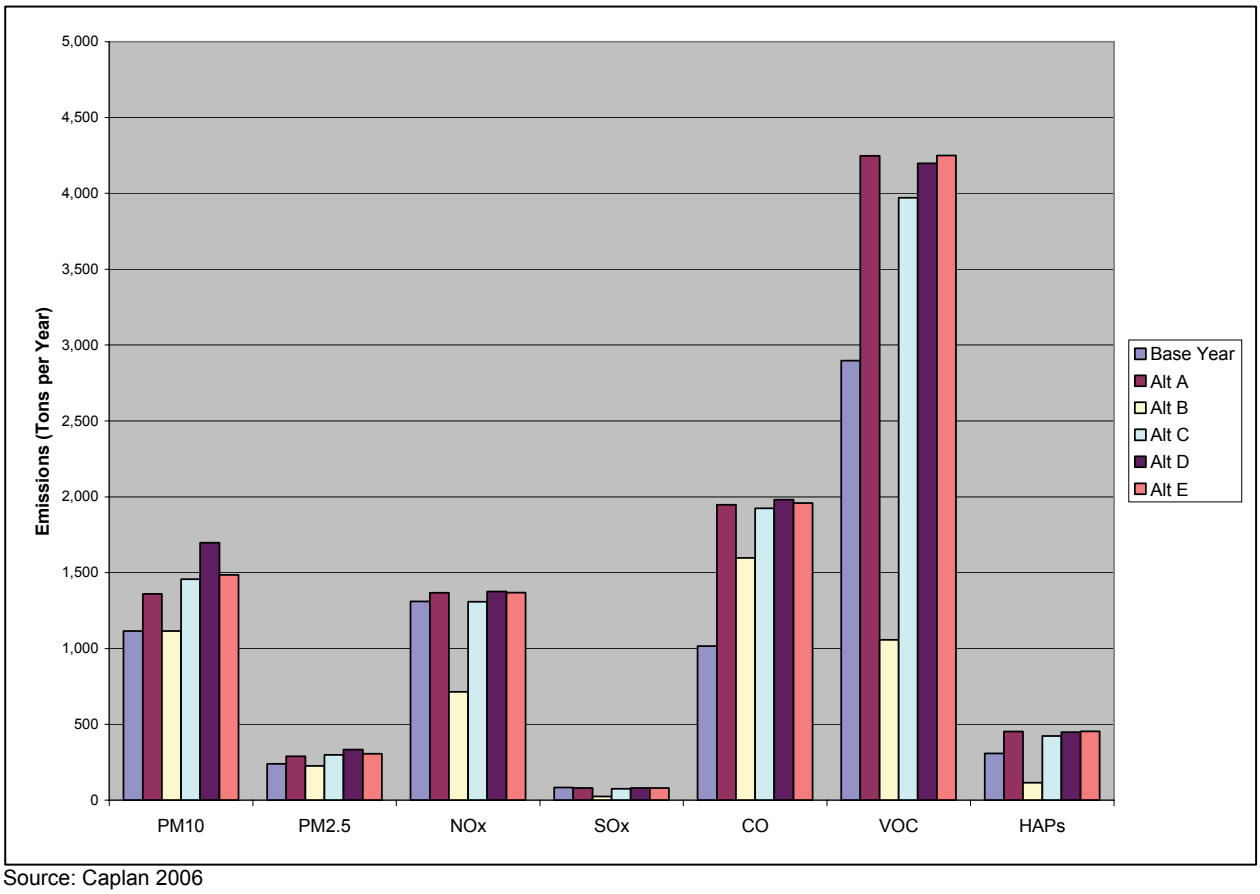
Figure 4-2 also shows that Alternative A would result in increased emission levels for all pollutants except sulfur oxides (SO_x) by 2020, compared to existing conditions in year 2001. The most substantial increases are projected to be carbon monoxide (CO), volatile organic compounds (VOC), and hazardous air pollutants (HAPs) emissions, increasing by 1,338 tons (132%), 2,017 tons (70%), and 217 tons (71%),

respectively, from 2001 levels. The largest source of these increased emissions is the new development of oil and natural gas production in the planning area.

The planning area is a large irregularly shaped region with a maximum east-west extent of 175 miles and a north-south extent of 125 miles. Given the generally good air quality currently existing in the region and the expected separation of sources within the planning area, it is unlikely emissions from Alternative A would contribute to an exceedance of a national or state ambient air quality standard. There could be localized air quality impacts depending on the locations and emission levels of proposed sources in the area, the surrounding topographical characteristics, and the site-specific meteorology.

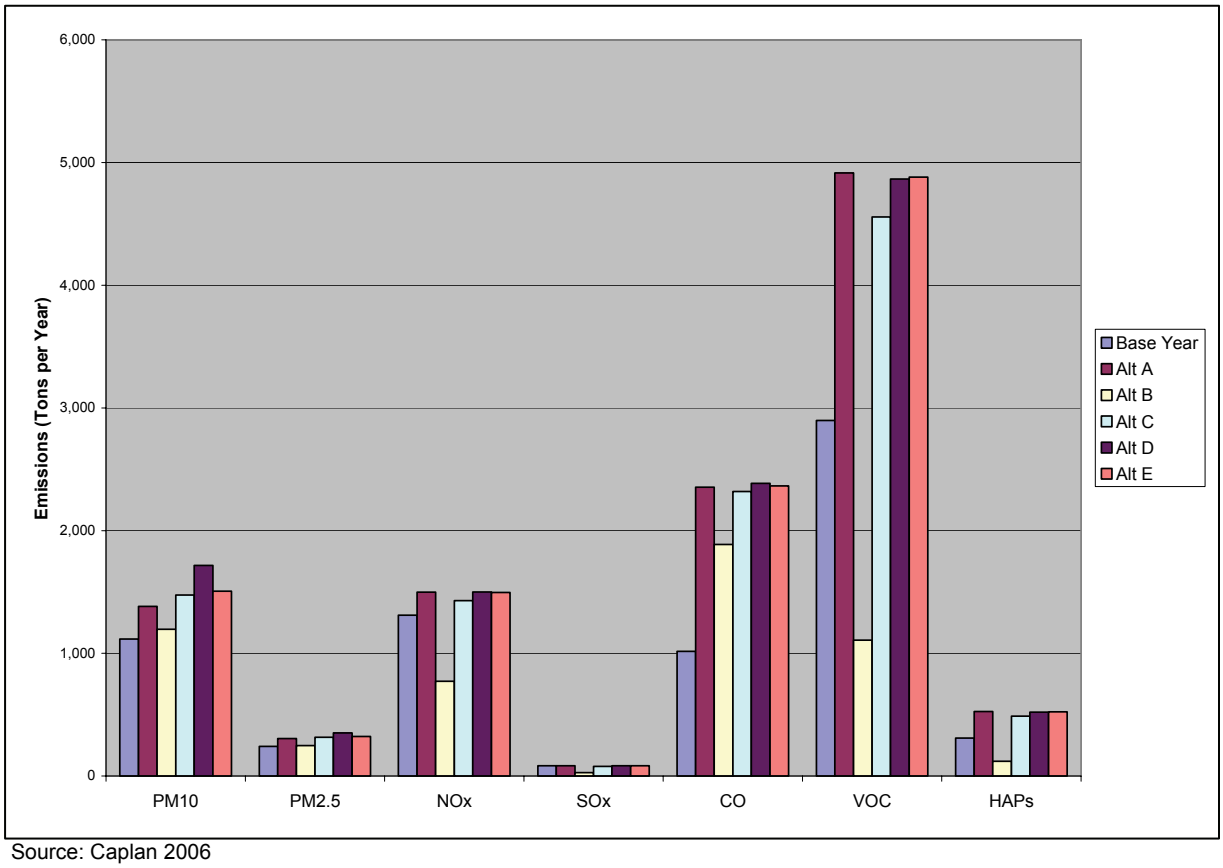
The impacts of these future air emissions at pristine Class I areas under Alternative A are difficult to estimate with any level of confidence without information on the specific locations and characteristics of projected sources in the planning area. Detailed air dispersion modeling can be used to estimate these impacts, but the modeling is very sensitive to atmospheric conditions and to the exact locations and emission levels of the proposed sources in the planning area. In addition, the Wyoming DEQ air-permitting processes will require larger development projects to identify the locations for specific emission sources to demonstrate with dispersion modeling analyses that proposed emissions would not adversely impact AQRVs in Class I areas.

Figure 4-1. Project Emissions from BLM Activities Within the Casper Planning Area: Year 2011



Source: Caplan 2006

Figure 4-2. Project Emissions from BLM Activities Within the Casper Planning Area: Year 2020



Source: Caplan 2006

In addition to the proposed sources of HAPs within the planning area, there also may be emissions of hydrogen sulfide (H_2S). These sources would include fossil fuel combustion, fugitive VOCs, and emissions due to oil and gas production. The accidental release of sour natural gas (rich in H_2S) poses the main risk under Alternative A. Another source of release of H_2S is at oil and gas fields where secondary recovery operations are occurring. To mitigate H_2S impacts, applications for permit to drill in sour gas areas would include a contingency plan that may include requirements to monitor wind speed, wind direction, and atmospheric stability, and to conduct dispersion modeling analyses. These requirements would apply to areas where public health and safety or important resource values are a concern, such as proposed well sites in proximity to residences. If the BLM determines after review of a contingency plan that additional data or safety precautions are needed, the BLM would require these items as conditions of approval (COAs). The potential release of H_2S during production operations in sour gas areas may be mitigated by health and safety plans.

The BLM would consider implementing mitigation actions within its authority to reduce emissions under Alternative A, such as selecting projects with smaller area coverage, fewer units, or less ground disturbance, or choosing projects with improved designs that minimize air emissions. The BLM intends to use dispersion modeling to estimate the impacts of projects whose emissions have not been analyzed before, but might be significant. If an analysis shows that significant impacts are possible, mitigation measures similar to those presented in Appendix L may be recommended. The BLM also would facilitate discussions with stakeholders to implement mitigation beyond the BLM's authority to reduce proposed emissions, including considering a program to offset emissions from proposed projects and reducing emissions from existing sources by techniques such as retrofits with more stringent BACT.

Alternative B

Figure 4-1 and Figure 4-2 present estimates of base year and future annual emissions for each alternative in years 2011 and 2020, respectively. Figure 4-2 shows that compared to the 2001 base year emissions, in 2020, Alternative B would result in the lowest increase in emissions of any of the alternatives, with modest increases in PM_{10} emissions (81 tons or 7%), $PM_{2.5}$ (7 tons or 3%), and CO emissions (870 tons or 86%). VOC emissions would drop by 1,791 tons or 62 percent due to the conservation measures incorporated into Alternative B, resulting in the lowest natural gas production of all alternatives, the primary source of VOC emissions.

As a result, this alternative would result in impacts to Air Quality Related Value's (AQRV's) at the nearest Class I areas similar to base year conditions. In addition, given the generally good air quality currently existing in the region, emissions from Alternative B would not be expected to contribute to an exceedance of National Ambient Air Quality Standards (NAAQS) or Wyoming Ambient Air Quality Standards (WAAQS). Implementing the mitigation identified for Alternative A also would reduce emissions and air quality impacts associated with Alternative B.

Alternative C

Figure 4-2 shows that Alternative C would result in moderately increased emission levels for all pollutants by 2020 compared to existing conditions in year 2001. The most significant increases are projected to be CO, VOC, and HAPs emissions, with an increase of 1,303 tons (128%), 1,659 tons (57%), and 179 tons (58%), respectively, from 2001 levels. As shown in Figure 4-2, the emission increases under Alternative C over base year conditions are similar, but somewhat lower, for several pollutants than for Alternative A, but substantially higher than for Alternative B. The primary source of these increased emissions from base year conditions is the new development of oil and natural gas production in the planning area.

The air quality impacts under Alternative C should be very similar to the impacts under Alternative A. It is likely that emissions under Alternative C would not contribute to an exceedance of NAAQS or WAAQS due to the generally good air quality currently existing in the region. In addition, given the moderate level of emission increases that will be spread over relatively large distances under Alternative C, this alternative is not expected to cause adverse impacts to AQRVs in the nearby NWAs. Implementing the mitigation identified for Alternative A also would reduce emissions and air quality impacts associated with Alternative C.

Alternative D

Figure 4-2 shows that Alternative D would result in moderately increased emission levels for all pollutants by 2020 compared to existing conditions in year 2001. The most substantial increases are projected to be CO, VOC, and HAP emissions, with an increase of 1,369 tons (135%), 1,968 tons (68%), and 212 tons (69%), respectively, from 2001 levels.

Alternative D results in the highest emission increases over base year conditions of any of the alternatives, although the increases for most of the pollutants are only slightly higher than alternatives A, C, and E. For example, compared to Alternative A, emissions of most pollutants under Alternative D are projected to increase by relatively small amounts: 2 tons of NO_x and 31 tons of CO. The biggest difference in 2020 emissions under Alternative D compared to Alternative A is PM_{10} emissions, which are projected to increase by 336 tons (44%) primarily because of additional salable and locatable minerals development.

The air quality impacts resulting from emissions under Alternative D should, therefore, be very similar to the impacts from emissions under Alternative A. It is likely that emissions from Alternative D would not contribute to an exceedance of NAAQS or WAAQS due to the generally good air quality currently existing in the region. In addition, given the moderate level of emission increases that will be spread over relatively large distances under Alternative D, this alternative is not expected to cause adverse impacts to AQRVs in nearby NWAs. Implementing the mitigation identified for Alternative A also would reduce emissions and air quality impacts associated with Alternative D.

Alternative E (Proposed Casper RMP)

Figure 4-2 shows that Alternative E would result in moderately increased emission levels for all pollutants by 2020, compared to existing conditions in year 2001. The most substantial increases are projected to be CO, VOC, and HAP emissions, with an increase of 1,348 tons (133%), 1,984 tons (68%), and 214 tons (69%), respectively, from 2001 levels.

Alternative E results in emission increases in 2020 over base year conditions that are comparable to Alternative A. For example, compared to Alternative A, annual emissions of most pollutants under Alternative E are projected to decrease by relatively small amounts: 1 ton of NO_x and 23 tons of VOCs. The biggest difference in 2020 emissions under Alternative E compared to Alternative A is PM_{10} emissions, which increase by 124 tons (68%) because of additional salable and locatable minerals development.

The air quality impacts under Alternative E would, therefore, be very similar to the impacts under Alternative A. It is likely that emissions from Alternative E could not contribute to an exceedance of NAAQS or WAAQS due to the generally good air quality currently existing in the region. In addition, given the moderate level of emission increases that will be spread over relatively large distances under Alternative E, this alternative is not expected to result in adverse impacts to AQRVs in the nearby NWAs. Implementing the mitigation identified for Alternative A also would reduce emissions and air quality impacts associated with Alternative E.

4.1.1.3 Conclusion

Alternative B results in the least amount of development and the most land use restrictions; therefore, it is the alternative with the lowest levels of air emissions in 2011 and 2020. Compared to base year emissions, Alternative B results in relatively small increases in some of the pollutants, such as PM_{10} and NO_x, and a substantial decrease in VOC emissions. Therefore, Alternative B is expected to produce no exceedances of ambient air quality standards or adverse impacts on AQRVs in Class I areas.

Alternatives A, C, D, and E result in increases of all pollutants. The emission levels among these alternatives are very similar, except for PM_{10}, which is somewhat higher for Alternative D due to increased development of salable and locatable minerals. Because new or expanded individual development projects are likely to be widely separated throughout the planning area and current measured air quality concentrations are well below federal and Wyoming standards, it is unlikely projected increased emissions will contribute to an exceedance of a national or state ambient air quality standards.

4.1.2 Geologic Resources

Management actions for geologic resources address preserving unique geologic features within the planning area and reducing potential risks from known geologic hazards. The Alcova Fossil Area and the Pterodactyl Tracks Area are unique geologic features proposed for protection under certain alternatives. A discussion of associated impacts is found in the Heritage and Visual Resources section of this chapter.

Activities in known geologic hazard areas are restricted on the public surface or federal mineral estate. The BLM addresses the management challenges associated with geologic hazards via the environmental analysis process for individual project proposals. When appropriate, the Casper Field Office develops mitigation measures to avoid and minimize impacts associated with geologic hazards. Although abandoned mines are classified as a geologic hazard, they are discussed in the Health and Safety section later on in this chapter.

4.1.3 Soil

Stable and productive soil in the planning area provides the foundation for other resources (e.g., biological resources) and for resource uses (e.g., livestock grazing). Actions that disturb or compact soil, disrupt soil stability, or reduce soil productivity are considered adverse impacts. Conversely, beneficial impacts to soil include actions that stabilize soil or increase soil productivity. In addition, those actions that avoid or minimize soil compaction or erosion are beneficial.

Most allowable uses have the potential to affect soil resources to some degree. Appendix M provides projected surface disturbance resulting from all RFAs. The BLM action likely to cause the greatest amount of short-term disturbance would be ignited prescribed fire. Developing coal resources would produce the greatest amount of long-term disturbance resulting from a BLM action. Surface-disturbing actions would result in removal of vegetative cover, soil compaction, reduced infiltration, changes in physical and biological properties, and reduction in organic matter content. These direct impacts to soils tend to result primarily from removing the vegetative cover, loosening the surface soil, formation of compacted layers, and increasing the potential for accelerated erosion by exposing soil particles to wind and water. There also would be a loss of soil productivity through disruption of natural soil horizons and removal of vegetated acreage for use by roads, well pads, and other facilities.

Indirect impacts caused by disrupting soil stability, increased compaction, and reduced productivity include (1) sedimentation of drainages and perennial water bodies primarily by wind or water erosion, (2) particulate matter affecting air quality through wind erosion, (3) reduced infiltration, (4) an increase in surface water runoff that could cause higher peak streamflows and possibly downstream flooding, and (5) changes in surface water quality caused by exposing soils or bedrock with undesirable chemical characteristics. These indirect impacts would be minimized through implementing BMPs and developing and implementing a Stormwater Pollution Prevention Plan (SWPPP) and erosion and sediment control plans, as required under the Wyoming Pollutant Discharge Elimination System (WYPDES) Construction General Permit for any surface disturbance of more than 1 acre.

Surface uses that may not result in direct surface disturbance, but may affect soil stability through changes in vegetative cover or soil infiltration rates, include grazing by livestock and wildlife (if improper grazing damages vegetative cover), vegetative treatments, OHV use (especially cross-country travel), and fire and fuels management. Operating motorized vehicles on moist soils, especially heavy equipment, is likely to cause compaction of the surface layer, which may decrease infiltration and aeration and, in turn, potentially reduce soil productivity by making it more difficult for plant roots to grow and obtain soil moisture and nutrients.

Short-term impacts to soils are those that result during initial surface disturbance prior to completion of revegetation or installing other practices that minimize wind and water erosion. The amount of bare ground predicted under each alternative after successful reclamation of disturbed areas is important to consider when evaluating long-term impacts to soils. Areas not reclaimed leaving bare soil include roads and areas around facilities that sustain concentrated surface uses by equipment or animals, which preclude the reestablishment of vegetation. Long-term impacts due to accelerated erosion would occur in locations where bare soils are allowed to remain exposed to wind and water for more than 5 years. Other long-term

impacts to soils include the loss of productivity in areas where facilities and structures are built by removing or greatly altering the soil profile. Refer to Map 4 for soil resources.

4.1.3.1 Methods and Assumptions

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

- Approximately 45,156 acres of federal surface have no detailed soils data and have been excluded from the analysis. No determination on erodibility in these areas could be made.
- No soil erosion modeling has been conducted.
- 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 wind and water erosion than undisturbed soil.
- Implementing standards for healthy rangelands (BLM 1998b) improves vegetation health, vigor, cover, and litter, as well as minimizes erosion rates in most areas.
- Proposed surface disturbance under each alternative potentially 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 is approximately 40-percent greater (USFS 2004) than predicted for less erodible soils.
- Most soils with a high water-erosion potential within the planning area correlate with steep slopes (greater than 15%).
- Installing and maintaining erosion controls and other mitigation measures, such as BMPs, results in a substantial reduction in soil erosion, ranging between 40 and 97 percent depending on site conditions (USFS 2003b). However, these measures may not reduce adverse impacts on soil compaction and productivity.
- To be effective on highly erodible soils, more extensive BMPs than those in common use are required to be installed and aggressively maintained. The risk of BMP failure is greater on highly erodible soils.
- Disturbance on highly erosive soils is distributed across the landscape in the same proportion these soils occur on the land, unless a proposed management action specifies additional protective measures. In other words, if 5 percent of the soils in the planning area are highly erosive, then it is assumed that 5 percent of the projected total disturbance would occur on highly erosive soils. In general for the planning area, 5 percent of the soils have high water-erosion potential and 4 percent of the soils have high wind-erosion potential.
- Disposal of produced waters by land application, such as irrigation, is not permitted on BLM surface (BLM 2005f).

4.1.3.2 Analysis of Alternatives

The types of impacts that are projected to occur to soils as a result of the various alternatives are similar; however, the intensity of the impacts is anticipated to vary by specific allowable uses and management actions associated with individual alternatives, as described below. The following sections describe the anticipated impacts to soils from individual alternatives by categories anticipated to have a measurable difference among alternatives: surface-disturbing activities, OHV use, fire management and ecology, and proactive management actions.

Impacts Common to All Alternatives

Soils on BLM-administered surface lands and federal mineral estate could potentially be disturbed under each alternative by activities proposed across a variety of resource programs. Appendix M lists projected surface disturbance by alternative over the life of this plan. Table 4-3 contains the estimated acreage of highly erosive soils that may be impacted by each alternative.

Table 4-3. Estimated Acreage of Highly Erosive Soils That Maybe Impacted by Each Alternative

	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E (Proposed RMP)	
	Water	Wind	Water	Wind	Water	Wind	Water	Wind	Water	Wind
Potential impact to highly erosive soils (acres) from BLM Actions	1,054	843	0	0	1,018	814	1,104	883	1,084	867
Potential impact to highly erosive soils (acres) from Non-BLM Actions	2,021	1,617	2,021	1,617	2,021	1,617	2,021	1,617	2,021	1,617
Potential impact to highly erosive soils (acres) from All Actions	3,075	2,460	2,021	1,617	3,039	2,431	3,125	2,500	3,105	2,484

Assumptions for Non-BLM Actions:

BLM Surface = 16% (1,361,577); Non-BLM = 84% (7,159,770)

BLM Minerals = 55% (4,657,172; Non-BLM = 45% (3,864,175), except coal was developed from actual non-BLM mineral ownership.

It is assumed that the same amount of development would occur on Non-BLM surface and Non-BLM minerals.

BLM Bureau of Land Management

Alternative A

Surface-disturbing Activities. Surface-disturbing activities on public land under Alternative A are evaluated on a case-by-case basis. Authorizations prescribe mitigation that reduces impacts to soils from the Proposed RMP. Standard BMPs and mitigation guidelines combined with the restriction on development on slopes greater than 25 percent generally are effective in mitigating impacts to soil and water resources under normal conditions.

Under Alternative A, the projected short-term disturbance from BLM actions would impact 59,990 acres. Following reclamation of disturbed sites, approximately 21,087 acres are anticipated to be impacted in the long term from BLM actions under Alternative A (see Appendix M). Under Alternative A, it is estimated that approximately 1,054 acres of soils with high water-erosion potential and 843 acres of soils with high wind-erosion potential may be impacted by BLM actions (see Table 4-3). The lack of special management actions relating to highly erodible soils under this alternative may result in accelerated erosion in some areas.

Surface Use Activities. Most of the planning area is open to livestock grazing. Application of the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming* (BLM 1998b) generally are effective in managing the impacts to soils from domestic livestock grazing. Adjustments to grazing authorizations are made on a case-by-case basis when site-specific studies indicate changes in management are required.

The majority of the planning area is designated as being limited to existing roads and trails for OHV use; however, off-road or other inappropriate use of these vehicles can cause undue environmental degradation and accelerated soil erosion. Accelerated erosion resulting from OHV use has not been quantified, but generally is constrained to isolated incidences throughout the planning area.

Prescribed fire is used in accordance with treatments identified by the range, wildlife, and forestry program. Mitigation measures incorporated into the fire prescription generally are effective at controlling

accelerated soil erosion. Rehabilitation of wildland fire is conducted on a case-by-case basis. The rate of revegetation on burned areas can vary significantly as a result of environmental and site conditions, but, in general, most burned areas have successfully revegetated and are not contributing to accelerated soil erosion.

Proactive Management Actions. Existing management actions intended to protect soils include modifying surface-disturbing activities, implementing timing restrictions, and prohibiting surface disturbance in selected areas to reduce erosion based on site-specific evaluations. Surface-disturbing activities on highly erosive soils would be evaluated on a case-by-case basis, as would the requirement for implementing BMPs, establishing temporary surface treatments and monitoring reclamation success.

Alternative B

Surface-disturbing Activities. Under this alternative, projected short-term disturbance from BLM actions would impact 36,650 acres, the least of any alternative. Following reclamation of disturbed sites, the projected long-term disturbance acreage would be 11,565 acres (see Appendix M). The projected long-term disturbance acreage for Alternative B is approximately 45-percent less when compared to Alternative A. Reducing total surface disturbance by as much as 45 percent will have a beneficial impact on soil erosion and long-term soil productivity.

Alternative B stipulates NSO on identified highly erosive soils. This management action will protect approximately 1,800 more acres of the most erosive and difficult soils to reclaim than any other alternative.

Surface Use Activities. Most of the planning area would remain open to livestock grazing under this alternative. In addition to the application of *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming*, forage utilization will be limited to 40 percent of the current year's production (BLM 1998b). Management actions limiting forage utilization by livestock generally should result in more surface cover and reduce erosion. However, utilization of forage by wildlife is not controlled by the BLM and will continue even after livestock is removed, so the actual increase in surface cover is uncertain for any given area.

Alternative B proposes the largest area closed to OHV use (26,027 acres) and the smallest area limited to existing roads and trails for OHV use (909,651 acres). Alternative B also designates the largest area (425,657 acres) limited to designated roads and trails for OHV use. Additional restrictions on OHV use would help limit the impacts to soils.

Alternative B would limit use of heavy equipment for fire suppression to existing roads and trails or immediately adjacent to them, as well as prohibit the use of prescribed fire on highly erosive soils. Prescribed fire is projected to cause the greatest amount of short-term disturbance of all BLM actions (see Appendix M), so additional restrictions on fire operations could provide long-term beneficial impacts to soil resources.

Proactive Management Actions. Of all the alternatives, the management prescriptions on public lands under Alternative B are the most protective of soil resources. Proactive management actions under this alternative include long-term surface disturbance limited to 80 acres per square mile, a requirement for temporary protective surface treatments on all disturbed areas within 30 days, completion of all reclamation activities within one growing season, closure and reclamation of unused and unnecessary roads and trails, reseeding if less than 50 percent of the predisturbance vegetative cover has been established after 3 years and reseeding if less than 80 percent of the predisturbance vegetative cover has been established after 5 years, use of certified weed-free seed, and full topsoil salvage and segregation.

Applying proactive management actions under this alternative will provide the most beneficial impacts to soils of any alternative.

Alternative C

Surface-disturbing Activities. Under Alternative C, the potential for adverse impacts to soils through reduced stability and productivity and increased compaction would be slightly greater than, but similar to, that described for Alternative A. The projected long-term disturbance acreage (20,358 acres) from BLM actions under Alternative C would be within approximately 3 percent of disturbance acreage predicted for Alternative A (see Appendix M).

The NSO on highly erosive soils is not applied under this alternative. Approximately 1,018 acres of erodible soils highly susceptible to water erosion and 814 acres highly susceptible to wind erosion (refer back to Table 4-3) on public lands within the planning area could be disturbed under Alternative C.

Surface Use Activities. In addition to the application of *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming*, forage utilization will be set for allotments with a high percentage of highly erosive soils, providing beneficial impacts to soil resources (BLM 1998b). Impacts to soils from OHV use and fire will be similar to those described under Alternative B.

Proactive Management Actions. Under Alternative C, proactive management actions anticipated to avoid, reduce, or minimize adverse impacts to the soils resource would be similar to Alternative B and more beneficial to soils relative to Alternative A. In general, the same types of proactive management actions would be employed, but longer amounts of time would be allowed to reach objectives.

Alternative D

Surface-disturbing Activities. Under Alternative D, the projected long-term disturbance of acreage (22,080) from BLM actions following reclamation is the most of any alternative (see Appendix M). The projected long-term disturbance acreage for Alternative D is approximately 5-percent higher compared to Alternative A and 91-percent higher than Alternative B (Appendix M).

Approximately 1,104 acres of erodible soils highly susceptible to water erosion and 883 acres highly susceptible to wind erosion (refer back to Table 4-3) on public lands within the planning area could be disturbed under Alternative D.

Surface Use Activities. Impacts to soils from livestock grazing under this alternative would be similar to those described under Alternative A. The *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming* (BLM 1998b) would be utilized to protect and improve rangeland health, which would produce beneficial impacts to soil resources.

Alternative D predicts approximately 2,661 acres would be closed to OHV use, 1,292,630 acres limited to existing roads and trails for OHV use, and 66,001 acres (the second lowest of all alternatives) limited to designated roads and trails for OHV use.

Alternative D would use full protection strategies and tactics across the entire planning area. Alternative D would employ similar fire management as described for current management (Alternative A), except grading of roads would not be allowed. Without special management actions for highly erosive soils or interim reclamation, adverse impacts to soils would be anticipated.

Proactive Management Actions. Proactive management actions to conserve soil under Alternative D would be limited to standard mitigation measures and similar to current management. The lack of proactive mitigation for highly erosive soils and quantitative reclamation standards would likely result in adverse impacts to soil resources.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. The projected long-term disturbance acreage (21,672 acres) from BLM actions under Alternative E is within approximately 3 percent of disturbance acreage predicted for Alternative A (see Appendix M). Approximately 1,084 acres of erodible soils highly susceptible to water erosion and 867 acres highly susceptible to wind erosion on public lands within the planning area could be disturbed (refer back to Table 4-3).

Surface Use Activities. The *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming* (BLM 1998b) would be utilized to protect and improve rangeland health, which will produce beneficial impacts to soil resources. All livestock grazing allotments will be managed to prevent downward a trend in rangeland health, and increases or decreases in forage allocations will be based on monitoring data. Beneficial impacts to soil resources would result from the proposed management actions under this alternative.

Alternative E designates approximately 2,224 acres closed to OHV use, 1,162,244 acres limited to existing roads and trails for OHV use, and 196,824 acres limited to designated roads and trails for OHV use. These designations will control the growth of new trails and minimize adverse soil impacts.

Alternative E restricts fire suppression tactics similar to Alternative B. Prescribed fire will be limited on highly erosive soils, and all fires will be evaluated for rehabilitation. Management actions under this alternative will minimize adverse affects to soil resources from the use of prescribed fire.

Proactive Management Actions. Under Alternative E, proactive management actions anticipated to avoid, reduce, or minimize adverse impacts to soils would be similar to alternatives B and C. An effort would be made under Alternative E to minimize the disturbance to all highly erosive soils by relocating proposed surface-disturbing activities and restricting the use of prescribed fire in areas of highly erodible soils, when practicable. Limitations on total long-term surface disturbance and strict requirements for reclamation of disturbed soils would minimize erosion on all soils, not just the highly erodible soils.

4.1.3.3 Conclusion

Allowable uses and management actions described in this section for the various alternatives were used to determine the potential impacts to soil resources. Meaningful differences in long-term disturbance acreage; livestock management actions; areas open, closed, and limited to OHV use; fire suppression tactics; NSO on steep slopes and highly erosive soils; and reclamation requirements form the basis for the following conclusion. Alternative B is anticipated to produce the least potential adverse impact to soil resources because management actions are anticipated to result in less soil disturbance and potential soil compaction. Therefore, Alternative B is anticipated to conserve more soil resources. Alternatives A, C, and E are similar and are anticipated to produce more soil compaction and erosion relative to Alternative B, but result in somewhat less adverse impacts to soil resources than Alternative D. The alternatives listed in ascending order from the least potential adverse to the most potential adverse impact on soil resources are Alternative B, alternatives A, C, and E, followed by Alternative D. Alternative D includes the least restrictive and protective measures for soils of all alternatives.

4.1.4 Water

This section describes impacts to surface water quality, surface water quantity, and groundwater quality and quantity. For this analysis, short-term impacts include those actions that degrade surface water quality, change surface water flows, or change groundwater quality and quantity as a result of unstable soils or poor watershed condition until revegetation or other reclamation can be established (up to 5 years).

Surface Water Quality

Direct impacts to surface water quality result from activities that degrade the ambient water quality of surface waters in the planning area. Indirect impacts include actions that disturb soil, especially highly erodible soil. Indirect impacts to surface water quality also may result from activities that modify drainages in the planning area. For example, actions that change the number of road-stream crossings or the distribution and condition of wetlands and riparian areas, would indirectly result in changes to surface water quality. Wetlands and riparian areas filter pollutants contained in runoff before they enter the stream system.

Beneficial impacts to surface water quality include those actions that minimize, reduce, or prevent offsite erosion or the discharge of supplemental water that is of lower quality than the ambient water quality of the receiving water. An adverse impact to water quality is any action resulting in a violation of state water quality standards or negatively impacts a designated beneficial use. Surface-disturbing activities (Appendix M) that contribute to offsite erosion and sediment delivery also are considered direct adverse impacts.

Long-term impacts to surface water quality are those that result from long-term (more than 5 years) bare soil or established point discharges that increase sediment loads or degrade water quality.

Surface Water Quantity

Impacts to surface water quantity include those that reduce or supplement streamflows and may either be beneficial or adverse, depending on the quantity and the location of the withdrawal(s) and (or) discharge(s).

Direct impacts to surface water quantity result from activities, watershed conditions, or treatments (including vegetative and physical treatments, impoundments, retention and detention structures, etc.) that increase or decrease runoff, as well as from changes in the quantity of produced water discharged into the system. Direct impacts also can be the result of adding or modifying withdrawals from the drainage system. Indirect impacts to surface water quantity result from activities that modify the capacity of stream channels or result in changes to the amount of water reaching the stream system. For example, changes in the locations of roads that direct surface water runoff into drainages may increase or decrease the timing and amount of surface water flowing in the stream system. The distribution and condition of wetlands and riparian areas would indirectly result in changes to surface water quantity because they increase infiltration and delay peak flows.

Long-term impacts to surface water quantity are those resulting from long-term facilities that increase impervious surface or changes to established discharges that alter supplemental streamflows (more than 5 years).

Groundwater Quality and Quantity

Direct impacts to groundwater quality and quantity could result from changes in the number of wells—including water supply, water disposal, oil and gas wells, and in-situ uranium mining wells—drilled, the

number of springs developed, water conservation efforts, and the amount of surface water that infiltrates the ground before flowing to the surface water system. Indirect impacts to groundwater quality and quantity result from activities that modify the areas or sources that recharge the groundwater system. For example, activities that decrease vegetative cover or increase runoff would reduce the infiltration of precipitation and reduce groundwater recharge.

Long-term impacts to groundwater quality and quantity are those that result from permanent facilities or landscape alterations that modify groundwater recharge, including wells that deplete the aquifer through extraction, facilities that are paved to eliminate surface water infiltration, or wells that are used to inject water (disposal wells) into the groundwater system.

4.1.4.1 Methods and Assumptions

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

- Surface disturbance (Appendix M) can affect surface water quality mainly by increasing sediment delivery to drainages, which is ultimately transported to streams during runoff events. Surface disturbance of highly erosive soils is the most likely disturbance to increase sedimentation in streams.
- The major watersheds (2nd-level, 4-digit hydrologic units) projected to contain the greatest acreage of moderate-to-high densities of oil and gas wells listed in decreasing order of projected well density are Big Horn River (24% of the watershed within the planning area, or approximately 81,000 acres), Powder River (6% or approximately 70,000 acres), Cheyenne River (less than 2% or less than 19,000 acres), and North Platte River (less than 2% or less than 93,000 acres). The total acreage for all four watersheds is approximately 263,000 acres, or less than 6 percent of the 4.6-million acres of federal mineral estate in the planning area.
- Soils that are the most susceptible to erosion are the most likely to adversely impact surface water quality if disturbed, primarily because these soils are difficult to protect through the implementation of standard BMPs. For this analysis, the acres of highly erodible soils in each 2nd-level hydrologic unit protected by major constraints (NSO or no surface disturbance) and those administratively unavailable for the life of the plan to oil and gas development are used as an indicator of the relative amount of impact on surface water quality. These constraints were applied in a Geographic Information System (GIS) using areas designated for major constraints and apply to all surface-disturbing activities under consideration.
- The impacts of Special Designations and Other Management Areas (MAs) on water quality and quantity are considered through application of constraints within these areas.
- Erosion contributes to sedimentation if it results in sediment delivery to the surface water drainage system. The amount of sedimentation is determined by the amount of erosion and effectiveness of BMPs applied to minimize erosion caused by surface-disturbing activities, as well as by 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) is an indicator of the quantity of sediment delivery that may impact surface water quality within each watershed (Furniss et al. 2000).
- Produced water generated from oil and gas development adds to surface water flows and can supplement streamflows. It is assumed legal water rights are established according to the requirements of the state engineer if livestock producers or other land users choose to utilize this water. On BLM-administered surface lands, produced water is not discharged by land application disposal methods, such as irrigation (BLM 2005f).

- Mineral development is the primary activity with a potential to impact shallow groundwater quality and quantity. Locations in the planning area with depths to groundwater of less than 100 feet are considered the most likely to be impacted by mineral development. The shallower the depth to water, the more sensitive an aquifer is to contamination (Wyoming Geographic Information Science Center 1998).

4.1.4.2 Analysis of Alternatives

The following analysis focuses on potential short-term and long-term impacts to surface water and groundwater quality and quantity projected as a result of allowable uses and management actions proposed under each alternative. The proposed management of the following resource programs have the potential to affect (beneficially or adversely) water resources: cultural resources, fire management, fish and wildlife, special status species, forestry, INPS, minerals (including oil and gas), National Historic Trails (NHTs) and Other Historic Trails, OHV use, paleontology, rangeland and livestock grazing, recreation, soils, other MAs, transportation, and vegetation. Refer to Map 5 for Water resources.

Impacts Common to All Alternatives

Based on the definitions, methods, and assumptions described above, the potential impacts of each alternative are described below. The following analysis of alternatives is organized according to the impacts of activities associated with each alternative. Impacts common to all alternatives are not repeated in the analysis of individual alternatives.

Surface Water Quality

Actions that remove vegetation and loosen surface soil could cause soil erosion and sedimentation in the surface water system. Eroded soil that reaches surface water channels is a primary source of impaired surface water quality. The amount of sediment delivered to a stream depends on many factors (e.g., slope length and gradient, vegetative cover and type, and density of the drainage network), all of which can result in deposition of the sediment before it reaches a drainage (also called buffering).

Roads intercept surface water runoff on the landscape and often direct flows to drainages through ditches and culverts. If roads are unsurfaced, runoff flowing down a road often picks up sediment that is then deposited in the surface water system at stream crossings or at culverts and water bars. Alternatives that increase the density of roads in a watershed, especially unsurfaced roads, would likely increase sedimentation. Roads also may act as conduits for directing contaminants from vehicles and resource management activities (e.g., pesticide applications) into the surface water system (Furniss et al. 2000).

Surface disturbance from alternatives described in Chapter 2 is most likely a result of mineral development, vegetation treatments, pit and reservoir construction, concentrated OHV use, road construction, and pipeline and powerline corridor construction. Other activities that could remove vegetation and loosen soil, increasing the potential for offsite erosion and sediment delivery into the stream system, include trail construction and maintenance, road maintenance, concentrated livestock and native ungulate grazing, fire management, and the reclamation of disturbed areas. Those watersheds with the greatest proportion of highly erodible soils have the most potential for contributing sediment to the surface water system with the presence of surface-disturbing activities. These watersheds include the main stems and tributaries of the South Fork of the Powder River, the Cheyenne River, Salt Creek, and the North Platte River. Under all alternatives, sedimentation within watersheds would be minimized through the implementation, inspection, and maintenance of BMPs and the development and implementation of SWPPPs and erosion and sediment control plans, as required under the WYPDES Stormwater Program. Water management plans for surface discharges of produced water would include reclamation strategies and mitigation, monitoring to track changes in receiving channels, and minimizing

adverse impacts to watershed health. Monitoring rangeland condition is used to determine which grazing management actions are needed to minimize the amount of erosion that could affect surface water quality. WYPDES permits required by the State of Wyoming would regulate water quality changes (Wyoming DEQ 2004b).

BLM water monitoring activities are carried out primarily in support of specific management activities. This monitoring is used to measure the presence and magnitude of impacts (both positive and negative), the effectiveness of mitigation measures, and as a mechanism to drive adaptive management. The Wyoming DEQ has an ongoing monitoring program (Wyoming DEQ 2004) designed to (1) determine the overall quality of the waters of the state, (2) determine the extent of water quality changes over time, (3) identify problem areas and areas in need of protection, and (4) determine the effectiveness of existing clean water programs. The monitoring done by the BLM generally is more intensive and site-specific (tied to specific actions) than that which is carried out by the Wyoming DEQ; however, the two programs can be, and are, complementary.

Surface discharges of produced water from oil and gas wells (including CBNG wells) are permitted by Wyoming DEQ through a WYPDES permit that requires compliance with specific water quality standards. These surface discharges have been authorized in the North Platte River, Cheyenne River, and Powder River watersheds. The produced water quality discharged on the surface must be suitable for beneficial uses, such as agricultural and livestock, and cannot result in a violation of water quality standards in the receiving stream. In general within the planning area, the volume of produced water from CBNG wells is greater than with conventional natural gas development (however, not greater than that associated with the production of oil). The coalbed zones currently being developed in the planning area contain water of relatively high quality. Produced water from oil and gas wells in the vicinity of Midwest, Wyoming, has much higher salinity than that from CBNG wells in the planning area because it is derived from aquifers that are typically more saline than the Wasatch/Fort Union formations associated with CBNG. Adverse impacts on surface water quality from oil and gas (including CBNG) development will be minimized under all alternatives by following standard practices, BMPs, and guidelines for Surface-disturbing activities (Appendix K).

Surface Water Quantity

When watersheds lack vegetation (especially grasses, forbs, and residual litter), surface infiltration into the soil decreases, causing more runoff to reach the stream system. Conversely, activities such as reclamation can improve vegetative cover and would have a beneficial impact. As surface disturbance increases, so does the amount of bare soil, compacted soils, and possibly less-pervious areas in a watershed. As a result, more surface water runoff reaches streams in a shorter period of time, which increases the potential for sedimentation and the frequency of flooding or erosive velocities from high flows in channels. 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. Concentrated grazing by livestock and wildlife may contribute to soil compaction and damage to the vegetative cover and soil crust, thus increasing surface water runoff, erosion, and sedimentation.

Produced water from oil and gas wells (including CBNG wells) is sometimes discharged to surface waters, thereby contributing to surface water flows. In general, most (approximately 80%) of the surface discharge supplements local surface water flows when present, with the balance lost to infiltration or evapotranspiration (BLM 2003g). The percentage would change if other disposal methods were utilized (e.g., containment, enhanced infiltration, re-injection). Surface water modeling conducted for the *Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003g) calculated discharge increases from produced water in major tributaries in CBNG development areas ranging between 7 and 15 cubic feet per second (cfs). Average annual streamflows in the Powder River range from 15 to 270 cfs, while average annual streamflows in major tributaries range

from 1 to 44 cfs (USGS 2005b). The area modeled included that portion of the Powder River Basin within the planning area. The number and density of wells modeled for the *Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project* (BLM 2003g) is much greater (two orders of magnitude or more) than that projected within the planning area. In addition, the Powder River Basin modeling effort included surface application through irrigation, which would not occur on BLM-administered land in the planning area. The volume of surface water discharge and the channel capacity of the receiving stream would determine the change, if any, to stream characteristics.

Groundwater Quality and Quantity

Potential sources of groundwater contamination may come from point sources, such as chemical spills, chemical storage tanks (above ground and underground), industrial sites, landfills, oil and gas well sites (including reserve pits), oil and gas (including CBNG) detention and retention ponds, and mining activities (e.g., in-situ uranium development). Other possible sources of groundwater contamination may come from nonpoint sources, such as household septic tanks, roadways, and agricultural activities. Groundwater quality is most susceptible to pollution where the aquifer is shallow because there is less opportunity for filtering by the soil and bedrock. Produced water with high salinity levels would not be considered for surface discharge (unless treated first) and most likely would be re-injected.

A portion of the water in aquifers associated with coal seams would be extracted as produced water during development of CBNG wells and a portion of the aquifers associated with the coal seams would be extracted by coal mining. Most of the produced water would likely be returned to shallow aquifers from the surface water drainage system through infiltration or groundwater injection. Produced water would have the greatest potential to affect groundwater quality and quantity where the oil and gas (including CBNG) wells are in areas with shallow depth to groundwater. These areas include the western part of the planning area in Natrona County south of U.S. Highway 20-26 and north of Douglas in Converse County within the Powder River Basin (Wyoming Geographic Information Science Center 1998).

Alternative A

Surface Water Quality

Over the long term, it is projected that BLM actions under Alternative A would disturb 21,087 acres. Under Alternative A, more than 4.6-million acres would be open to mineral leasing and development; however, most development is projected for the Wind River Basin, which contains few Class 2 (and no Class 1) streams. Approximately 575,778 acres of highly erodible soils could be disturbed due to oil and gas development.

Other proposed activities that would result in surface disturbance and could, therefore, contribute sedimentation include the mining of coal, salable, and locatable minerals; the development of wind-energy sites; construction of reservoirs, pits, or wells for wildlife and livestock use; and vegetation treatments. In addition, Alternative A has the largest area (1,311,715 acres) designated as limited to existing roads and trails for OHV use; this area includes highly erodible soils. Without limits on the disturbance of these soils, OHV use could contribute sedimentation to surface water bodies. Structures related to road and trail construction could intercept surface water runoff and divert sediment to the stream systems. Approximately 10 percent of the grazing allotments would be evaluated each year to determine whether they meet the standards for healthy rangelands. Those allotments that meet the standards for healthy rangelands do not adversely impact water quality. Those allotments that do not meet the standards would be identified through monitoring and guidelines would be implemented to bring the allotment into conformance. Table 4-4 compares the acreage of highly erodible soils susceptible to water erosion that could be impacted and likely to adversely impact surface water quality.

Table 4-4. Estimated Acres of Soils with a High Potential for Water Erosion by Alternative

Actions	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
BLM Actions	1,054	0	1,018	1,104	1,084
Non-BLM Actions	2,021	2,021	2,021	2,021	2,021
All Actions	3,075	2,021	3,039	3,125	3,105

Source: Meyer 2005
BLM Bureau of Land Management

Surface Water Quantity

Because Alternative A would contain fewer limits on activities that could result in soil compaction and vegetation removal, surface water flows are anticipated to increase throughout the planning area. Alternative A is projected to have the highest number of oil and gas (including CBNG) wells drilled relative to other alternatives; however, impacts associated with produced water from these wells is expected to be relatively minor and localized. For comparison purposes, the amount of water projected and the number of CBNG wells drilled under Alternative A are both expected to be substantially less (more than two orders of magnitude) than corresponding numbers projected in the *Powder River Basin Oil and Gas EIS Surface Water Modeling Technical Report* (BLM 2002c).

Groundwater Quality and Quantity

Alternative A would have the greatest potential for soil compaction, vegetation disruption, and road construction, all of which would reduce the amount of precipitation that infiltrates the ground to recharge shallow and deep aquifers. Pitless technology for drilling operations most likely would not be prevalent, so the opportunity for contaminants to enter the groundwater would be the highest under this alternative. However, the potential for contaminants to enter the groundwater is quite low due to the regulation by the Wyoming Oil and Gas Conservation Commission (WOGCC) and site-specific analyses done at the time of permitting. Alternative A would have the highest number of oil and gas (including CBNG) wells drilled, so the potential for adverse impacts on groundwater quality within the areas with shallow depth to groundwater is also the highest. However, the relatively low density of CBNG wells combined with the fairly high quality of produced water in the planning area is not expected to result in adverse impacts to groundwater quality. In addition, with the highest number of wells being drilled under this alternative, the potential of impacts to groundwater quantity (associated with CBNG extraction) also would be the highest.

Alternative B

Surface Water Quality

Alternative B projects the least long-term surface disturbance (11,565 acres) over the long term relative to other alternatives. Alternative B initially would involve surface disturbance to reclaim unnecessary roads, but this would improve long-term watershed health and eventually reduce sedimentation from roads. Compared to Alternative A, there would be fewer opportunities for surface-disturbing actions, including oil and gas development, vegetation treatment, and more areas designated as NSO and controlled surface use (CSU) along perennial streams, riparian areas, and water bodies. Under Alternative B, no highly erodible soils could be disturbed (NSO) on BLM-administered land.

The use of prescribed fire on highly erosive soils would be prohibited under Alternative B, which would provide limitations on damage to vegetative cover, thus minimizing erosion and reducing sedimentation in surface water bodies. The stringent requirements to revegetate all disturbed areas within one growing

season would re-establish soil cover more quickly than under Alternative A and result in fewer opportunities for soil erosion and sedimentation. Other restrictions on surface disturbance proposed under Alternative B include establishing larger areas that limit the extraction of minerals around bald eagle roost sites, limiting OHV access to designated roads and trails, and minimizing stream crossings.

As shown in Table 4-3, Alternative B would provide the greatest protection of highly erodible soils of all alternatives. This protection would result in the fewest adverse impacts to water quality, especially in the high-quality streams.

Surface Water Quantity

With the fewest projected number of oil and gas (including CBNG) wells, Alternative B is projected to result in the least amount of change to surface water quantity. Quantities of produced water from CBNG wells are anticipated to be negligible in the planning area.

Groundwater Quality and Quantity

Alternative B would have the least potential for oil and gas development, soil compaction, and vegetation disturbance of any alternative. Rehabilitation of well and spring developments would result in the extraction of additional groundwater not previously available, but the potential impacts to groundwater quantity would be minimized through the use of flow-control devices.

Alternative C

Surface Water Quality

Alternative C, as shown in Table 4-3, would provide greater protection of highly erodible soils than under Alternative A, and less than under Alternative B. This protection would result in fewer adverse impacts to water quality than under the No Action Alternative (Alternative A), including in the high-quality streams.

Surface Water Quantity

Alternative C would have similar, but slightly greater impacts to surface water quantity compared to Alternative B, but less than Alternative A. Quantities of produced water from CBNG wells are anticipated to be negligible in the planning area.

Groundwater Quality and Quantity

Alternative C would have similar, but slightly greater, impacts to groundwater quality and quantity than would Alternative B, but less than Alternative A.

Alternative D

Surface Water Quality

Relative to all other alternatives except Alternative A, surface water quality would sustain greater adverse impacts by increased sedimentation and other contaminants under Alternative D. Fewer limits on surface disturbance, more mineral development, less stringent reclamation and revegetation requirements, and no monitoring of disturbed areas to ensure stability under Alternative D would be the causes of surface water impacts. OHV restrictions would be similar to those described under Alternative A, except slightly greater within proposed MAs, so the potential for surface disturbance and sedimentation would be slightly less under Alternative D than under Alternative A. BLM Wyoming guidance limits off-road travel related to nonpermitted activities to 300 feet under all alternatives.

As shown in Table 4-3, under Alternative D, protection of highly erodible soils would result in fewer adverse impacts to water quality than under Alternative A, but more than under alternatives B, C, or E.

Surface Water Quantity

Alternative D impacts to surface water quantity would be similar to, but slightly less than, those under Alternative A. Alternative D would have the highest number of CBNG wells drilled, with the majority being within the Antelope Creek and Dry Fork of the Cheyenne River watershed. Increases in surface water discharge from produced water would be similar to those described under Alternative A, while limits on other management actions would provide for slightly improved protection that might decrease surface water runoff.

Groundwater Quality and Quantity

Overall, Alternative D impacts to groundwater quality and quantity would be similar to, but slightly less than, those under Alternative A.

Alternative E (Proposed Casper RMP)

Surface Water Quality

The potential for adverse impacts to surface water quality through reduced soil stability and increased sedimentation and other contaminants in the surface water system under Alternative E would be less than that described under alternatives A, C, or D, but greater than that for Alternative B.

Surface Water Quantity

Alternative E would have similar, but slightly fewer, adverse impacts to surface water quantity compared to Alternative A. Alternative E would contain some limits on activities that could result in soil compaction and vegetation removal. Alternative E is projected to have more CBNG wells drilled (with the majority within the Antelope Creek and Dry Fork of the Cheyenne River watershed) than under Alternative A. Supplemental flows from produced water associated with CBNG wells projected under Alternative E are expected to be negligible relative to surface water quantity in the planning area.

Groundwater Quality and Quantity

Alternative E would have some potential for soil compaction, vegetation disruption, and road construction, all of which would reduce the amount of precipitation that infiltrates the ground to recharge shallow and deep aquifers. Rehabilitation of well and spring developments would result in the extraction of additional groundwater not previously available. Potential impacts to groundwater quantity would be minimized through the use of surface protection of water sources and conservation measures.

4.1.4.3 Conclusion

Allowable uses and management actions described in this section for the various alternatives were used to determine the potential impacts to water resources. Meaningful differences in long-term disturbance acreage, including areas open, closed, and limited to OHV use; acreage of highly erosive soils; number of oil and gas (including CBNG) wells; and produced water discharge form the basis for the following conclusion. Alternative B results in the least adverse impacts to water resources because management actions under this alternative result in the least amount of change to surface water and groundwater quality and quantity. Therefore, Alternative B provides the greatest protection to surface water and groundwater resources. Alternatives A and D are similar in that they are projected to result in similar adverse impacts to surface water and groundwater quality and quantity and result in somewhat more adverse impacts to water resources than Alternative C. Alternative E results in less adverse impacts to surface water quality than Alternative A, slightly fewer adverse impacts on surface water quantity than Alternative A, and similar impacts to Alternative A relative to groundwater quality and quantity. In ascending order from the least adverse to the most adverse impacts on water resources, the alternatives rank as follows: Alternative B, Alternative E, followed by alternatives C, D, and A.

4.2 Mineral Resources

The mineral resources section describes potential impacts from the proposed alternatives to locatable, leasable, and salable minerals within the planning area. Within each resource, methods and assumptions and analysis of alternatives are included.

4.2.1 Locatable

Unlike leasable minerals (e.g., oil and gas or coal) or salable minerals (e.g., sand and gravel), where issuance of a lease or permit is at the BLM's discretion, the discovery and location of a locatable mineral claim is initiated by the mining claimant. The regulations as stated in 43 Code of Federal Regulation (CFR) 3809 manage surface-disturbing activities on mining claims. For exploration activities that will disturb 5acres or less, the claimant is required to submit a Notice of Intent (NOI) to the BLM. For exploration involving more than 5 acres, and for actual mining operations regardless of acreage, the claimant must submit a plan of operations (POO) for approval by the BLM before mining operations can begin. These regulations do not apply to lands in the National Park System, National Forest System, and the National Wildlife Refuge System; on acquired lands; or on BLM-administered lands under wilderness review. If a mining claimant's operation is located on lands patented under the Stock Raising Homestead Act and no written surface owner consent exists, then a POO must be submitted for BLM approval. When the surface owner's consent has been obtained, the claimant does not need to submit an NOI or obtain POO approval.

Actions that could occur through implementing an alternative could affect access to locatable minerals. Other types of actions may place or remove restrictions or additional requirements on exploration and development activities. An example of an additional restriction would be a viewshed restriction on development activity that, while not preventing access, requires that development activity be conducted so that it is not readily apparent.

4.2.1.1 Methods and Assumptions

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

- The potential for occurrence of locatable minerals exists across the planning area.
- About 277,861 acres of federal mineral estate has a moderate-to-high potential for the occurrence of uranium. The potential for locatable uranium development activity is high to moderate for the planning period. Most uranium development in the planning area will occur by in-situ mining.
- About 49,980 acres of federal mineral estate has a moderate-to-high potential for the occurrence of metallic minerals other than uranium. The potential development activity for these types of locatable metallic minerals is moderate to low for the planning period.
- About 197,836 acres of federal mineral estate has a moderate-to-high potential for the occurrence of bentonite. The potential for locatable bentonite development activity is high to moderate for the planning period.
- About 123,389 acres of federal mineral estate has a moderate-to-high potential for the occurrence of gypsum. The potential for locatable development activity is low for the planning period.
- About 117,680 acres of federal mineral estate has a moderate-to-high potential for the occurrence of limestone. The potential for locatable limestone development activity is moderate to low for the planning period.

- Any alternative that limits locatable mineral development (i.e., reduces the area available for development) will have some adverse impact on the minerals listed above and other potential locatable minerals.
- Restrictions on resource uses apply to the life of the RMP, but can be changed by amending the RMP.
- The 43 CFR 3809 regulations manage surface-disturbing activities on mining claims.
- Withdrawals of less than 10 percent of the high-to-moderate federal mineral estate are considered minor impacts.

4.2.1.2 Analysis of Alternatives

Allowable uses and management actions that could adversely impact locatable mineral exploration and development activities include management actions that result in areas withdrawn from locatable minerals and other resource restrictions applied to locatable minerals.

Impacts Common to All Alternatives

Restrictions on locatable mineral exploration and development activities could result in adverse impacts when areas are withdrawn, classified, or segregated from locatable mineral entry or other resource restrictions are applied. However, the intensity of impacts is anticipated to vary by alternative. The greater the acreage withdrawn, classified, or segregated, the greater the adverse impact to this resource. Therefore, adverse impacts to locatable minerals from these actions are described under the individual alternatives. NSO, timing limitation stipulation (TLS), and CSU restrictions may add additional limits (mainly by increasing costs) on the ability of claimants to develop these types of locatable minerals, but they are more minor potential adverse impacts.

Alternative A

No more than about 4 percent of the total federal mineral estate is adversely impacted by withdrawals, classifications, or other segregations for uranium, metallic minerals other than uranium, bentonite, gypsum, and limestone. Adverse impacts are considered to be minor for these mineral resources.

Approximately 488,531 acres (about 10%) of the total federal mineral estate are withdrawn from locatable mineral entry in the planning area. These management actions could result in adverse impacts to those locatable minerals not listed above by limiting where exploration and development of these minerals may occur.

Alternative B

Only the withdrawal protecting NHTs and Other Historic Trails (924,153 acres or 20%) has more than a minor adverse impact for metallic minerals other than uranium. Most withdrawals have an adverse impact of less than 10 percent to the potential uranium, bentonite, gypsum, and limestone resources and thus would be only minor in affect. Adverse impacts from withdrawals greater than 10 percent of the high-to-moderate federal mineral estate are listed below.

- Uranium
  - NHTs and Other Historic Trails (108,560 acres or 39%)
- Bentonite
  - Fragmentation blocks (507,616 acres or 37%)
  - NHTs and Other Historic Trails (27,687 acres or 14%)

  - South Bighorns/Red Wall Area of Critical Environmental Concern (ACEC) (23,332 acres or 12%)
- Gypsum
  - South Bighorns/Red Wall ACEC (67,421 acres or 55%)
  - Fragmentation blocks (55,947 acres or 45%)
- Limestone
  - NHTs and Other Historic Trails (31,319 acres or 27%)
  - South Bighorns/Red Wall ACEC (16,398 acres or 14%)

Approximately 2,253,132 acres (about 40%) of the total federal mineral estate are withdrawn from locatable mineral entry in the planning area (Map 13). These withdrawals could result in adverse impacts to those locatable minerals not listed above by limiting where exploration and development of these minerals may occur.

Alternative C

Potential adverse impacts to metallic minerals other than uranium are considered to be minor, since no more than about 1 percent of the potential resource is impacted by any withdrawal. Most withdrawals have less than an adverse impact of 10 percent to the potential uranium, bentonite, gypsum, and limestone resources and thus, would be only minor in affect. Adverse impacts from withdrawals greater than 10 percent of the high-to-moderate federal mineral estate are listed below.

- Bentonite
  - South Bighorns/Red Wall MA (80,128 acres or 41%)
  - Fragmentation blocks (30,703 acres or 16%)
- Gypsum
  - South Bighorns/Red Wall MA (78,914 acres or 64%)
  - Fragmentation blocks (48,811 acres or 40%)
- Limestone
  - South Bighorns/Red Wall MA (15,221 acres or 13%)

Approximately 1,314,556 acres (about 28%) of the total federal mineral estate are withdrawn from locatable mineral entry in the planning area (Map 14). These withdrawals could result in adverse impacts to those locatable minerals not listed above by limiting where exploration and development of these minerals may occur.

Alternative D

No more than about 4 percent of the total federal mineral estate is adversely impacted by withdrawals, classifications, or segregations for uranium, metallic minerals other than uranium, bentonite, gypsum, and limestone. Adverse impacts are considered to be minor for these mineral resources.

Approximately 52,243 acres (about 1%) of the total federal mineral estate are withdrawn from locatable mineral entry in the planning area (Map 15). These management actions have the potential to result in adverse impacts to those locatable minerals not listed above by limiting where exploration and development of these minerals may occur.

Alternative E (Proposed Casper RMP)

Potential adverse impacts to uranium, metallic minerals other than uranium, bentonite, and limestone minerals are considered to be minor, since no more than about 10 percent of the potential resource could be impacted by any withdrawal. Most withdrawals have an adverse impact of less than 10 percent to the potential gypsum resource and thus, would be only minor in affect. The withdrawal of the South Bighorns/Red Wall MA (53,624 acres or 43%) and fragmentation blocks (45,006 acres or 36%) adversely impacts the potential gypsum resource.

Approximately 578,699 acres (about 12%) of the total federal mineral estate are withdrawn from locatable mineral entry in the planning area (Map 16). These withdrawals could result in adverse impacts to those locatable minerals not listed above by limiting where exploration and development of these minerals may occur.

4.2.1.3 Conclusion

Management actions may adversely impact the acreage available for exploration and development and how these activities can be conducted. Impacts due to withdrawal from locatable mineral entry with high-to-moderate mineral development potential are a direct adverse impact. Adverse impacts from withdrawals less than 10 percent of the high-to-moderate federal mineral estate are minor and impacts greater than 10 percent are substantial.

Impacts from alternatives A and D are similar and minor for uranium, metallic minerals other than uranium, bentonite, gypsum, and limestone. Under Alternative E, only impacts to gypsum are considered minor. Under Alternative C, impacts to bentonite, gypsum, and limestone are considered substantial. Impacts from Alternative B are substantial for uranium, metallic minerals other than uranium, bentonite, gypsum, and limestone.

With respect to other potential locatable minerals not listed above, it should be noted that the location of these potential resource areas are not mapped for this analysis. Therefore, predicting potential adverse impacts due to restrictions identified under each alternative were presented only in a general way.

4.2.2 Leasable – Coal

Prior to offering federal coal reserves for lease, a screening process, as outlined in 43 CFR 3420.1-4, must be completed. The process includes four screens: coal development potential, unsuitability criteria, multiple use conflicts, and surface-owner consultation. The area may be offered for lease only after the screening process has been completed and the area has been determined to be acceptable for further consideration for coal leasing.

Once the coal reserves have been leased, oversight of mining operations passes to the Office of Surface Mining and the Wyoming DEQ, Land Quality Division. Verifying production tonnage and determining maximum economic recovery remain the responsibility of the BLM. The U.S. Forest Service (USFS) is responsible for managing federal surface lands within the coal development potential area (CDPA). Since mining is restricted to those areas that have already undergone the screening process, the impacts to and from other resources have already been or will be evaluated. No BLM surface lands are overlying current coal leases.

Actions that could occur through implementing each alternative could affect coal resources. This section describes the impacts of each alternative on coal exploration and leasing in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as beneficial or adverse. Direct impacts are the result of actions that either specifically prohibit or permit coal exploration and development. An example of a direct impact would be when an area is identified as unacceptable for

further consideration for coal leasing to protect other resources. Indirect impacts are the result of actions that may place or remove restrictions or additional requirements on mineral exploration and development. An example of an indirect impact would be a viewshed restriction on development activity that, while not preventing development, requires that development activity be conducted so that it is not readily apparent. Short-term impacts are those impacts that occur in less than 5 years. A TLS or other moderate resource restrictions result in short-term impacts. Long-term impacts occur beyond the first 5 years and perhaps for the duration of the management plan. Closures and major restrictions result in long-term impacts.

4.2.2.1 Methods and Assumptions

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

- The results of the coal screening for lands in Converse County were performed under the Buffalo RMP (BLM 2001a; USFS 2001a).
- No additional CDPAs currently are being evaluated as acceptable for further consideration for coal leasing and development.
- While all BLM-administered lands may be considered open for coal exploration, new exploration outside the current CDPA is unlikely during the planning period.
- Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Four core holes per section typically are drilled with more holes drilled where additional detail is required, such as near the edge of the deposit.
- Major restrictions on coal exploration and development include NSO or overlapping TLS restrictions that result in year-round restrictions.
- Moderate restrictions on coal exploration and development include seasonal restrictions and CSU.
- Restrictions from other resources apply to the life of the RMP, but can be changed by amending the RMP.

4.2.2.2 Analysis of Alternatives

As coal exploration and development are affected by the alternatives, coal exploration and development can, in turn, impact other resources. For example, roads built to accommodate development could contribute to habitat fragmentation. The impacts of coal development on other resource topics (e.g., physical, biological, fire management and ecology, etc.) are discussed under the appropriate impacted resource section. Refer to Map 6 for coal resources.

Impacts Common to All Alternatives

Oil and gas fields underlie the existing CDPA. The development and production of these oil and gas reserves could impact the timing of coal leasing. Washington Office Instruction Memorandum (IM) 2003-253, dated August 21, 2003, provides direction on resolving conflicts between surface coal mining and CBNG operations on federal leases. Conflict Administration Zones (CAZs) have been defined in areas where federal oil and gas leases overlie federal coal reserves in the path of projected mining. Conflict resolution is the same under all alternatives.

Under all alternatives, all BLM-administered lands within the planning area are open to coal exploration, a beneficial impact to coal exploration. Coal exploration on federal mineral estate would be subject to the requirements and conditions of the coal exploration license process, which requires project-specific stipulations and conditions designed to limit impacts from exploration on other resources. While all lands may be considered open for exploration, the assumption is that exploration activity would focus on the

current CDPA identified in northern Converse County. Therefore, the discussion of impacts from other resource restrictions will focus on northern Converse County. If coal exploration were to occur across the planning area, the moderate (CSU and TLS) and major (NSO and overlapping TLS) restrictions and restrictive impacts identified in the oil and gas discussion by alternative and shown on the Oil and Gas maps 7 through 11 would apply to coal exploration activities.

Alternative A

Coal Exploration Impacts

Other Resource Restrictions on Coal Exploration. Under Alternative A, management actions from soils, special status species – wildlife, and special designations would place restrictions on coal exploration in northern Converse County. Major restrictions would apply along the Bozeman Trail west of the Thunder Basin National Grasslands boundary. Major restrictions could result in an adverse impact to coal exploration because NSO is allowed or overlapping TLS restrictions apply. The remainder of the area would be managed with standard or moderate restrictions. Moderate restrictions may limit the time of operation or require specific mitigation, but they do not preclude coal exploration. Impacts to coal exploration from moderate restrictions are adverse, but minor in nature.

Impacts to coal exploration from other resource restrictions under Alternative A are similar to alternatives C, D, and E and less than under Alternative B. Moderate and major restrictions for Alternative A are illustrated on Map 7 for Oil and Gas.

Coal Leasing Impacts

Within the CDPA. Under Alternative A, BLM-administered lands identified in the 2001 Buffalo RMP (BLM 2001a) maintenance action are acceptable for further consideration for coal leasing. Under this alternative, restrictions from other resources could impact coal leasing during the reapplication of coal screens; however, only standard or moderate restrictions apply under Alternative A. Impacts to coal leasing from moderate restrictions are adverse, but minor in nature, and include specific mitigation.

Outside the CDPA. Under Alternative A, management actions addressing coal development outside the CDPA do not exist. Therefore, it is assumed that all BLM-administered lands outside the CDPA with coal development potential are considered acceptable for further consideration for coal leasing, resulting in a beneficial impact to coal leasing. However, under Alternative A, major and moderate restrictions from other resources could adversely impact coal development outside the CDPA by constraining development. The intensity of impacts to coal development outside the CDPA from major and moderate restrictions is the same as those identified in the oil and gas discussion under Alternative A.

Alternative B

Coal Exploration Impacts

Other Resource Restrictions on Coal Exploration. Under Alternative B, management actions from soils and special status species – wildlife would place restrictions on coal exploration in northern Converse County. Major restrictions would apply within the 4-mile protective buffer for greater sage-grouse leks (leks occur outside the CDPA, but protective buffers cross the boundary), and on soils with high wind-erosion potential within the CDPA. Major restrictions could result in adverse impacts to coal exploration because NSO is allowed or overlapping TLS restrictions apply. The remainder of the area would be managed with standard or moderate restrictions. Moderate restrictions may limit the time of operation or require specific mitigation, but they do not preclude coal exploration. Impacts to coal exploration from moderate restrictions are adverse, but minor in nature.

Adverse impacts to coal exploration from other resource restrictions are greater under Alternative B than under any other alternative. Moderate and major restrictions for Alternative B are illustrated on Map 8 for Oil and Gas. Restrictions from other resources apply to the life of the RMP, but can be changed by amending the RMP.

Coal Leasing Impacts

Under Alternative B, no coal development would be considered inside or outside the CDPA. While existing leases would be honored, the CDPA would be closed to further leasing under Alternative B. This management action results in a direct, adverse impact to coal leasing.

Alternative C

Coal Exploration Impacts

Other Resource Restrictions on Coal Exploration. Under Alternative C, major restrictions would apply within the 2-mile protective buffer for greater sage-grouse leks (leks occur outside the CDPA, but protective buffers cross the boundary) on the western boundary of the CDPA. Major restrictions could result in an adverse impact to coal exploration because surface disturbance is restricted. The remainder of the area would be managed with standard or moderate restrictions. Moderate restrictions may limit the time of operation or require specific mitigation, but they do not preclude coal exploration. Impacts to coal exploration from moderate restrictions are adverse, but minor in nature.

Impacts to coal exploration from other resource restrictions under Alternative C are greater than, but similar to, Alternative A. Moderate and major restrictions for Alternative C are illustrated on Map 9 for Oil and Gas. Restrictions from other resources apply to the life of the RMP, but can be changed by amending the RMP.

Coal Leasing Impacts

Impacts to coal leasing under Alternative C are the same as those identified under Alternative B.

Alternative D

Coal Exploration Impacts

Other Resource Restrictions on Coal Exploration. Under Alternative D, no major restrictions occur within the CDPA. Moderate restrictions exist within the CDPA and may limit the time of operation or require specific mitigation, but they do not preclude coal exploration. Impacts to coal exploration from moderate restrictions are adverse, but minor in nature.

Impacts to coal exploration from other resource restrictions under Alternative D are less than, but similar to, Alternative A. Moderate restrictions for Alternative D are illustrated on Map 10 for Oil and Gas. Restrictions from other resources apply to the life of the RMP, but can be changed by amending the RMP.

Coal Leasing Impacts

Within the CDPA. Under Alternative D, BLM-administered lands identified in the 2001 Buffalo RMP maintenance action are acceptable for further consideration for coal leasing. The only exceptions are those lands determined unacceptable within the planning area. The coal unsuitability criteria are reevaluated whenever new coal lease applications are received. Under Alternative D, restrictions from other resources could impact coal leasing during the reapplication of coal screens; however, restrictions under this alternative are moderate, and adverse impacts are anticipated to be minor in nature.

Outside the CDPA. Under Alternative D, all BLM-administered lands outside the CDPA with coal development potential will be considered for coal leasing unless specifically identified as unacceptable for consideration for further coal leasing. This proactive coal development management action results in a beneficial impact to coal development. However, under Alternative D, major and moderate restrictions from other resources could adversely impact coal development outside the CDPA by constraining development. The intensity of impacts to coal development outside the CDPA from major and moderate restrictions is the same as that identified in the oil and gas discussion under Alternative D.

Alternative E (Proposed Casper RMP)

Coal Exploration Impacts

Other Resource Restrictions on Coal Exploration. The impacts to coal exploration within the CDPA are the same as those described under Alternative D.

Coal Leasing Impacts

Impacts to coal leasing under Alternative E are the same as those identified under Alternative D, except the intensity of impacts from other resources would be the same as that identified in the oil and gas discussion under Alternative E.

4.2.2.3 Conclusion

Allowable uses and management actions described in this section for the various alternatives were used to determine the potential impacts to coal exploration and development. Meaningful differences in resource restrictions on coal form the basis for the following conclusion. Impacts to coal from the alternatives are anticipated to be similar in type, primarily adverse, but different in intensity based on the type of restriction in place (i.e., major, moderate, standard). For the purposes of this analysis, it is assumed that future exploration and development of coal reserves will occur within the CDPA. Under this assumption, alternatives D, E, and A, respectively, have the least potential adverse impact on coal exploration and development because they place the fewest restrictions on surface-disturbing activities and reclamation. Alternatives B and C close the planning area to further leasing, resulting in an adverse impact on coal leasing and development in the planning area.

4.2.3 Leasable – Geothermal

Exploration for geothermal resources on BLM-administered public surface is permitted at the BLM's discretion. Little geothermal exploration or development has occurred within the planning area. Potential exists for development as a byproduct of oil and gas operations or water resource development. The most likely use of the resource would be localized with small areas of surface disturbance (BLM 2005g). Any adverse impacts to geothermal resources are expected to be minor for all alternatives.

4.2.4 Leasable – Oil and Gas

Management actions implemented for the protection of other resources impact the oil and gas industry both directly and indirectly. A direct impact is one that either specifically prohibits or permits oil and gas exploration and development. An example of a direct impact would be the making of an area to oil and gas leasing administratively unavailable for the life of the plan to protect another resource. Indirect impacts are the result of actions that may place or remove restrictions or additional requirements on oil and gas exploration and development. These actions do not explicitly permit or prohibit oil and gas exploration and development activity, but may influence a company's decision on whether to proceed with a given project. An example of an indirect impact might be a seasonal restriction that would prevent entry into a greater sage-grouse nesting area for part of the year. Short-term impacts are those impacts that occur in less than 5 years. A TLS or other moderate resource restrictions result in short-term impacts.

Long-term impacts occur beyond the first 5 years and perhaps for the duration of the management plan. Administratively unavailable and major restrictions result in long-term impacts.

4.2.4.1 Methods and Assumptions

The impact analysis used the following methods and assumptions.

- Analysis began with the baseline total unconstrained oil and gas development potential taken from the Reasonable Foreseeable Development (RFD) scenario for oil and gas (BLM 2005c) as summarized in Chapter 3 and applied the constraints from the other resource programs in Chapter 2. Each of the alternative's constraints impacted oil and gas development.
- Most of the planning area has a high occurrence potential for oil and gas (BLM 2005c).
- The RFD scenario for oil and gas (BLM 2005c) based development potential on the anticipated drilling activity over the next 20 years, with most of the development occurring as infill wells in existing fields.
- Analysis assumed that the BLM can permit geophysical exploration activities in more restrictive visual resource management (VRM) areas because the operations are short-term activities.
- The BLM considers OHV use for geophysical operations a "necessary task" under the OHV designations for each alternative.
- Unless the BLM amends the RMP, restrictions on resource uses apply to the life of the RMP.
- The acreage numbers in Table 4-5 for moderate and major constraints to oil and gas development could increase substantially because they do not reflect the number of unknown acres associated with greater sage-grouse nesting habitats outside the buffer areas around leks that would be subject to a TLS.
- Other federal agencies have made the Naval Petroleum Reserve, (the U.S. Department of Energy [DOE]), Camp Guernsey (Military), and Fort Laramie National Historic Site, (National Park Service [NPS]) administratively unavailable for oil and gas leasing.

4.2.4.2 Analysis of Alternatives

Impacts Common to All Alternatives

Under the regulations of 43 CFR 3150, the BLM is responsible for authorizing and administering geophysical exploration operations on all public surface lands within the planning area, while the WOGCC is responsible for authorizing all operations on state and private surface. Under the 43 CFR 3160 regulations, the BLM authorizes geophysical exploration under an oil and gas lease via Sundry Notice approval. The information gained from geophysical exploration reduces the number of dry holes drilled during the field development stage, resulting in less unnecessary surface impacts and fewer impacts to other resources.

- Major restrictions, such as NSO stipulations or overlapping TLS restrictions, could result in adverse impacts to oil and gas exploration and development. Companies typically drill oil and gas wells vertically because the costs are lower and drilling problems are less likely, but they could employ directional drilling in an area with NSO to protect other resources. For example, an operator could place a drilling location, access road, or production facility in a less-sensitive area and drill the well directionally to recover reserves underlying the area with the surface-disturbance restriction. But directional drilling is 1.5 to 4 times more costly than vertical drilling, and the increased costs could make some drilling ventures uneconomical. Companies can utilize directional drilling to tap oil and gas reserves on portions or margins of oil and gas leases in large

contiguous areas subject to NSO and employ this technology to develop isolated NSO lease parcels. Since directional drilling has its horizontal limitations, operators could not develop all the oil and gas resources from all the acreage associated with large NSO areas such as those associated with 4-mile buffer zones around greater sage-grouse leks. Companies typically cannot use directional drilling to develop CBNG as the reservoirs are too shallow. In areas with overlapping TLS restrictions, companies would be limited to narrow timeframes to complete work. In some cases, an operator may have to start development, and then postpone operations during critical time periods. If the window during which work can be done is too short, a development project may have to be done in phases, requiring more time to complete, adding to the project's cost, and prolonging the time before the investment is recovered. A company may decide not to develop the reserves if it considers the project marginal without the additional requirements and added time and cost.

- Impacts from moderate restrictions, while adverse, are indirect and not as severe as those resulting from major restrictions. Moderate restrictions may limit the time of operation or require specific mitigation, but they do not necessarily remove the acreage from development or require directional drilling. Under TLS restrictions, development may become more intensive over a shorter timeframe to complete operations before timing restrictions start.
- Management directives for air quality will allow emissions from drilling and production activities up to applicable standards and guidelines, which would represent a limiting factor for oil and gas development within the planning area.
- Most of the oil and gas development will occur in Class III or Class IV VRM areas under all alternatives. To meet the visual requirements of a Class III VRM area, operators will incur additional costs to develop the oil and gas resources.
- In portions of the planning area, conflicts will occur under all alternatives between oil and gas development and other mineral development, such as coal and uranium mining. The BLM has established CAZs near the Antelope Coal Mine. A CAZ identifies an area around an active coal mine where coal mining operations will occur in the next 10 years and conflicts between coal mining and CBNG development will occur. When areas of conflict are identified, the BLM notifies the oil and gas lessees in the CAZ areas and requires the operators to develop their leases to avoid losing the CBNG resource unless the operator demonstrates that it is uneconomical to do so. Conflicts also will occur between in-situ uranium mining operations and developing CBNG from the same geologic horizon. CBNG development would not be compatible in active in-situ uranium mining areas because the de-watering process would harm in-situ operations and the associated oil and gas produced water may be radioactive.

In January 2003, BLM-administered oil and gas leases covered 1,738,185 acres in the planning area, which is about 37 percent of the federal mineral estate within the planning area. The acreage leased for oil and gas is almost entirely in Natrona and Converse counties (BLM 2005c).

Alternative A

Geophysical Exploration. Alternative A allows for operators to conduct geophysical exploration on the BLM-administered lands open to oil and gas leasing. The alternative also allows for geophysical operations on BLM-administered lands open to leasing that are subject to NSO if the activity is determined to have no substantial impact on other resources through an environmental analysis. These proactive oil and gas management actions result in a beneficial impact to oil and gas exploration.

Areas Administratively Unavailable for Oil and Gas Leasing for the Life of the Plan. Alternative A makes approximately 37,922 acres (< 1%) of BLM-administered mineral estate administratively

unavailable to oil and gas leasing (Table 4-5 and Map 7). Compared to all other alternatives, Alternative A makes the second lowest acreage of oil and gas administratively unavailable for leasing. Administratively unavailable areas for oil and gas leasing under Alternative A is the result of protective management actions listed in Table 4-6. These management actions result in direct adverse impacts to oil and gas leasing and development.

Table 4-5. Total Acres of Federal Mineral Estate Administratively Unavailable for/Open for Oil and Gas Leasing for the Life of the Plan by Alternative in the Casper Planning Area

Restriction	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Open with Standard Conditions Percent (%) of Federal Mineral Estate	1,136,855 24%	446,019 10%	1,012,656 22%	1,524,375 33%	1,080,935 23%
Open with Moderate Restrictions Percent (%) of Federal Mineral Estate	2,711,404 58%	1,196,922 26%	2,058,162 44%	2,445,107 53%	2,506,530 54%
Open with Major Restrictions Percent (%) of Federal Mineral Estate	770,991 17%	2,296,267 49%	1,113,078 24%	662,664 14%	843,139 18%
Administratively unavailable for Leasing Percent (%) of Federal Mineral Estate	37,922 <1%	717,964 15%	473,276 10%	25,026 <1%	226,568 5%

Source: BLM 2006a
< less than
BLM Bureau of Land Management

Table 4-6. Acres of Federal Mineral Estate Administratively Unavailable for Oil and Gas Leasing for the Life of the Plan by Resource in the Casper Planning Area

Restriction	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Fragmentation Alternative	0	580,007	238,724	0	168,386
Sand Hills	0	17,633	17,633	0	17,633
South Bighorns	0	216,460	309,854	0	75,913
North Platte River	0	15,286	7,840	6,054	0
Other Federal No-lease Areas	22,232	0	0	0	0
Muddy Mountain EEA		1,419	1,419	1,419	1,419
Naval Petroleum Reserve No. 3	9,324	9,324	9,324	9,324	9,324
Fort Laramie	792	940	940	940	940
Camp Guernsey	5,620	11,850	11,850	5,620	11,850
Total	37,922	852,774	597,439	23,213	285,320

Note: Due to overlaps in the Fragmentation Alternatives and the alternatives for the South Bighorns, acres in this table do not add to the total federal mineral estate administratively unavailable for oil and gas leasing in Table 4-5.
Source: BLM 2006a
EEA Environmental Education Area
No. Number

Other Resource Restrictions. Under Alternative A, management actions from other resources, including soil, water, wildlife, special status species, cultural, paleontology, recreation, and special designations, would place restrictions of varying types and intensity on oil and gas exploration and development (refer to Table 2-3, Details of Alternatives). Under Alternative A, 1,136,855 acres of BLM administered mineral estate is open to oil and gas development with standard stipulations, 2,711,404 acres are open with moderate restrictions, and 770,991 acres are open with major restrictions (refer to Table 4-5).

Compared to all other alternatives, Alternative A proposes the second lowest acreage with major restrictions on exploration and oil and gas development. Alternative A proposes the highest number of

acres with moderate restrictions. NSO associated with the Jackson Canyon ACEC, Muddy Mountain Environmental Education Area (EEA), North Platte River, Muddy Mountain elk crucial winter range area, Pterodactyl tracts, Red Wall/Gray Wall, and bald eagle roosts, nests, and feeding areas will have a minor impact on conventional oil and gas and CBNG development, as the areas have low to very low or no oil and gas development potential for both resources.

The management prescription for NSO within ¼ mile of a historic trail will have an adverse impact on conventional oil and gas and CBNG development. VRM prescriptions also will impact conventional oil and gas development. Of the 80,285 acres of BLM-administered mineral estate within the ¼ mile NSO for historic trails, 2,517 acres have a high potential for conventional oil and gas development; 4,213 acres have a moderate development potential for conventional oil and gas and 1,773 acres have a moderate development potential for CBNG; 36,265 acres have a low development potential for conventional oil and gas and 10,194 acres have a low development potential for CBNG; and the remaining acres have very low to no development potential for both resources. This alternative has 365,967 acres of BLM-administered mineral estate with a Class II VRM status, of which 8,400 acres have a moderate development potential for conventional oil and gas and the remaining acres have a low to very low to no development potential for conventional oil and gas and CBNG. While the management prescriptions for VRM and historic trails do not prohibit drilling, companies would have to drill directionally to develop the oil and gas reserves, making some of the ventures unfeasible or uneconomical. Potential adverse impacts to exploration and oil and gas development from other resource restrictions under Alternative A are less than all other alternatives, with the exception of Alternative D (see Table 4-5).

Alternative A projects that 467 federal CBNG wells and 1,356 federal conventional oil and gas wells will be drilled in the planning area between 2001 and 2020 (Table 4-7). Of these wells, the RFD estimates that there will be 458 productive CBNG wells and 1,081 productive oil and gas wells (a 6% decrease in producing CBNG wells and a 9% decrease in producing conventional wells from the unconstrained baseline projection).

Alternative B

Geophysical Exploration. Under Alternative B, companies could conduct geophysical exploration operations on BLM-administered lands open to oil and gas leasing, but not on BLM-administered surface open to leasing with an NSO stipulation. Compared to Alternative A, fewer lands would be open to geophysical operations under Alternative B, resulting in an adverse impact to oil and gas exploration activities.

Areas Administratively Unavailable for Oil and Gas Leasing for the Life of the Plan. Under Alternative B, 717,964 acres (15%) of BLM-administered mineral estate are administratively unavailable for oil and gas leasing for the life of the plan (refer to Table 4-5 and Map 8). The areas unavailable for leasing under Alternative B result from a range of resources, including vegetation (habitat fragmentation), Special Designations and Other MAs (refer to Table 4-6). These management actions result in direct adverse impacts to oil and gas development. The proposed South Bighorns/Red Wall ACEC and the habitat fragmentation blocks contain the bulk of the acreage administratively unavailable for oil and gas leasing, but the RFD (BLM 2005c) has identified most of this area as having low to very low or no development potential for conventional oil and gas and CBNG. The South Bighorns/Red Wall ACEC contains 216,460 acres of BLM-administered mineral estate, of which 7,946 acres have a moderate oil and gas development potential for conventional oil and gas. The remaining area has a low to very low to no development potential for both conventional oil and gas and CBNG. The proposed habitat fragmentation blocks contain 580,007 acres of BLM-administered mineral estate with low to very low to no development potential for both conventional oil and gas or CBNG. Consequently, these special designations would have only a minor impact on the total development projected under this alternative.

The proposed Sand Hills MA contains 17,633 acres of BLM-administered mineral estate, of which 3,172 acres are presently held by production and 10,265 acres are presently leased; as a result, this establishment would have only a minor impact on the total development projected under this alternative for conventional oil and gas and CBNG. The no-leasing area associated with the Muddy Mountain EEA containing 1,419 acres of BLM-administered mineral estate and the North Platte River containing 15,286 acres of BLM-administered mineral estate will not have a substantial impact on development, since these areas have very low to no development potential for both conventional oil and gas and CBNG. Compared to Alternative A and all other alternatives, the areas administratively unavailable for oil and gas leasing under Alternative B would have the greatest adverse impact on oil and gas exploration and development.

Table 4-7. Projected BLM Federal Wells Drilled by Alternative through 2020 in the Casper Planning Area

	Coalbed Natural Gas Wells	Oil and Gas Wells	Total Wells
Projected Wells Drilled (2001 – 2020)[1]			
Baseline – Wells Drilled (Unconstrained)	**497**	**1,491**	**1,988**
Alternative A – Wells Drilled Percent Reduction from Baseline	467 6%	1,356 9%	1,823 8%
Alternative B – Wells Drilled Percent Reduction from Baseline	65 87%	125 92%	190 90%
Alternative C – Wells Drilled Percent Reduction from Baseline	430 13%	1,234 17%	1,664 16%
Alternative D – Wells Drilled Percent Reduction from Baseline	468 6%	1,332 11%	1,800 9%
Alternative E – Wells Drilled Percent Reduction from Baseline	469 6%	1,345 10%	1,813 9%
Projected Producing Wells (2001 – 2020)[1]			
Base Line – Producing Wells (Unconstrained)	**487**	**1,189**	**1,676**
Alternative A – Producing Wells Percent Reduction from Baseline	458 6%	1,081 9%	1,539 8%
Alternative B – Producing Wells Percent Reduction from Baseline	64 87%	100 92%	164 91%
Alternative C – Producing Wells Percent Reduction from Baseline	421 14%	984 17%	1,405 16%
Alternative D – Producing Wells Percent Reduction from Baseline	459 6%	1,062 11%	1,521 9%
Alternative E – Producing Wells Percent Reduction from Baseline	460 6%	1,072 10%	1,532 9%

Source: BLM 2005c

[1]Well counts do not include existing wells.

BLM Bureau of Land Management

Other Resource Restrictions. Under Alternative B, management actions from other resources, including soil, water, vegetation, wildlife, special status species, cultural, paleontology, recreation, special designations, and other MAs would place restrictions of varying types and intensity on oil and gas exploration and development (refer to Table 2-3, Details of Alternatives). Under Alternative B, 446,019 acres of BLM-administered mineral estate are open to oil and gas development with standard stipulations, 1,196,922 acres are open with moderate restrictions, and 2,296,267 acres are open with major restrictions (refer to Table 4-5).

Compared to all other alternatives, Alternative B proposes the highest acreage with major restrictions on exploration and oil and gas development. Management prescriptions under the proposed Bates Hole MA

would have a limited impact on development, since the RFD projections in this area have very low to no development potential for both conventional oil and gas and CBNG. Prescriptions under the proposed Cedar Ridge ACEC would impact conventional oil and gas development, since the RFD projects that most of the BLM-administered mineral estate (18,591 acres) has a moderate development potential. The ACEC has a very low to no development potential for oil and gas. Although the ACEC does not prohibit drilling, prescriptions such as CSU stipulations, NSO on the Traditional Cultural Property (TCP) area, and directional drilling requirements, may make some drilling ventures unfeasible or uneconomical.

NSO stipulations under this alternative for highly erosive soils and greater sage-grouse nesting habitats will have the biggest adverse impact on oil and gas development. Of the 575,778 acres of BLM-administered mineral estate with highly erosive soils that would be subject to NSO, 6,661 acres have a high development potential for conventional oil and gas and 1,177 acres have a high development potential for CBNG; 13,222 acres have a moderate development potential for conventional oil and gas and 4,231 acres have a moderate development potential of CBNG; 180,740 acres have a low development potential for conventional oil and gas and 58,264 acres have a low development potential for CBNG; and the remaining acres have either very low or no development potential for both resources. Of the 1,782,953 acres of BLM administered mineral estate in greater sage-grouse nesting habitats within 4 miles of leks that would be subject to NSO, 12,015 acres have a high development potential for conventional oil and gas; 112,275 acres have a moderate development potential for conventional oil and gas and 16,427 acres have moderate development potential for CBNG; 877,073 acres have a low development potential for conventional oil and gas and 223,867 acres have a low development potential of CBNG; and the remaining acres have either very low to no development potential for both resources. Although these prescriptions do not prohibit drilling, companies would have to drill directionally to develop the oil and gas reserves, making some of the ventures unfeasible or uneconomical.

The NSO and CSU stipulations attributed to the historic trails and the management prescriptions for VRM also would have an adverse impact on oil and gas development. Of the 80,285 acres of BLM-administered mineral estate within the ¼-mile NSO for historic trails, 2,517 acres have a high development potential for conventional oil and gas; 4,213 acres have a moderate development potential for conventional oil and gas and 1,773 acres have a moderate development potential for CBNG; 36,265 acres have a low development potential for conventional oil and gas and 10,194 acres have a low development potential for CBNG; and the remaining acres have very low to no development potential for both resources. This alternative has 1,062,550 acres of BLM-administered mineral estate with a Class II VRM status, of which 19,687 acres have a moderate development potential for conventional oil and gas and the remaining acres have a low to very low to no development potential for conventional oil and gas and CBNG. Although these prescriptions do not prohibit drilling, companies would have to drill directionally to develop the oil and gas reserves, making some of the ventures unfeasible or uneconomical.

NSO associated with the Jackson Canyon ACEC, Muddy Mountain elk crucial winter range area, and bald eagle roosts, nests, and feeding areas will have a limited impact on conventional oil and gas and CBNG development, as the areas have low to very low or no oil and gas development potential for both resources. Adverse impacts to exploration and oil and gas development from other resource restrictions under Alternative B are greater than under all other alternatives.

Under Alternative B, it is projected that 65 federal CBNG wells and 125 federal conventional oil and gas wells would be drilled on federal mineral estate between 2001 and 2020 (refer to Table 4-7). Of these wells, the RFD estimates that there would be 64 productive CBNG wells and 100 productive oil and gas wells. Alternative B results in a 92-percent decrease in producing oil and gas wells and an 87-percent decrease in producing CBNG wells from the unconstrained baseline projection. Companies would have to drill many conventional federal wells directionally from existing well pads due to large NSO areas

associated with erosive soils and 4-mile buffer zones around greater sage-grouse leks. Companies would develop only a few CBNG reserves because these wells are too shallow to use directional drilling technology. Federal oil and gas resources would be subject to drainage from offsetting state and private wells, which are not subject to the constraints. Compared to Alternative A and all other alternatives, adverse impacts to oil and gas development are greatest under Alternative B.

Alternative C

Geophysical Exploration. Impacts under Alternative C are the same as Alternative B for geophysical exploration operations.

Areas Administratively Unavailable for Oil and Gas Leasing for the Life of the Plan. Under Alternative C, 473,276 acres (10%) of BLM-administered mineral estate are administratively unavailable for oil and gas leasing; (see Table 4-5 and Map 9). The areas unavailable under Alternative C result from a range of resources including vegetation (habitat fragmentation), Special Designations and Other MAs (refer to Table 4-6). These management actions result in direct adverse impacts to oil and gas leasing and development. The proposed South Bighorns/Red Wall MA and the habitat fragmentation blocks contain the bulk of the acreage administratively unavailable for oil and gas leasing, but the RFD (BLM 2005c) has identified most of this area as having low to very low or no oil and gas development potential for both conventional oil and gas and CGNG. The South Bighorns/Red Wall MA contains 309,854 acres of BLM-administered mineral estate, of which 39,653 acres have a low development potential for conventional oil and gas and the remaining acres have a very low to no development potential for conventional oil and gas. The entire area has no development potential for CBNG. The proposed habitat fragmentation blocks contain 238,724 acres of BLM-administered mineral estate, of which 116 acres have a low development potential for conventional oil and gas and 1,194 acres have a low development potential for CBNG. The remaining acres have a very low to no development potential for both resources. Consequently, these Special Designations and Other MAs would have only a minor impact on the total development projected under this alternative. The proposed Sand Hills MA would have the same impact on oil and gas development as Alternative B. The no-leasing areas associated with the North Platte River ACEC/Special Recreation Management Area (SRMA) and Muddy Mountain EEA will have a minor impact on oil and gas development, since most of the acreage is in low to very low to no development potential for both conventional oil and gas and CBNG.

Other Resource Restrictions. Under Alternative C, management actions from other resources, including soils, water, vegetation, wildlife, special status species, cultural, special designations, and other MAs would place restrictions of varying types and intensity on oil and gas exploration and development (refer to Table 2-3, Details of Alternatives). Under Alternative C, 1,012,656 acres of BLM-administered mineral estate are open to oil and gas development with standard stipulations, 2,058,162 acres are open with moderate restrictions, and 1,113,078 acres are open with major restrictions (refer to Table 4-5).

Compared to all other alternatives, Alternative C proposes the second highest acreage with major restrictions on exploration and oil and gas development. Under Alternative C, adverse impacts to exploration and oil and gas development from other resource restrictions are greater than under Alternative A, but less than Alternative B. The proposed Bates Hole MA would have the same impact on oil and gas development as Alternative B. Prescriptions under the proposed Cedar Ridge MA would impact conventional oil and gas development, since the RFD projects that most of the BLM-administered mineral estate (16,994 acres) has a moderate development potential. The Cedar Ridge MA has very low to no development potential for CBNG. While the ACEC does not prohibit drilling, prescriptions such as CSU stipulations, NSO on the TCP area and directional drilling requirements may make some drilling ventures unfeasible or uneconomical.

Management prescriptions for greater sage-grouse nesting and VRM also will have an adverse impact on development under this alternative. Of the 688,761 acres of BLM-administered mineral estate in greater sage-grouse nesting habitats within 2 miles of leks that would be subject to NSO, 214 acres have a high development potential for conventional oil and gas; 50,309 acres have a moderate development potential for conventional oil and gas and 2,977 acres have a moderate development potential for CBNG; 336,442 acres have a low development potential for conventional oil and gas and 92,328 acres have a low development potential for CBNG; and the remaining acres have a very low to no development potential for both resources. This alternative has 816,310 acres of BLM-administered mineral estate with a Class II VRM status, of which 10,957 acres have a moderate development potential for conventional oil and gas and the remaining acres have a low to very low to no development potential for conventional oil and gas and CBNG. While the prescriptions for greater sage-grouse nesting habitats and VRM do not prohibit drilling, operators would have to directionally drill to develop the resources, making some ventures unfeasible or uneconomical.

NSO associated with the Jackson Canyon ACEC, Muddy Mountain elk crucial winter range area, and bald eagle roosts, nests, and feeding areas will have a minor impact on conventional oil and gas and CBNG development, as these areas have low to very low or no oil and gas development potential for both resources.

Under Alternative C, it is projected that 430 federal CBNG wells and 1,234 federal conventional oil and gas wells would be drilled on federal mineral estate between 2001 and 2020 (refer to Table 4-7). Of these wells, the RFD estimates that there would be 421 productive CBNG wells and 984 productive oil and gas wells. Alternative C results in a 13-percent decrease in producing CBNG wells and a 17-percent decrease in conventional producing oil and gas wells from the unconstrained baseline projection. The number of producing wells projected under Alternative C is slightly lower than those projected under Alternative A. The reduction in wells from the unconstrained baseline projection is mainly attributable to constraints associated with measures to protect vegetation, greater sage-grouse nesting habitats, the Cedar Ridge TCP, and VRM.

Alternative D

Geophysical Exploration. Alternative D allows operators to conduct geophysical exploration on all BLM-administered surface lands. Compared to Alternative A, more lands would be open to geophysical operations under Alternative D, resulting in a beneficial impact to oil and gas exploration activities.

Areas Administratively Unavailable for Oil and Gas Leasing for the Life of the Plan. Under Alternative D, 25,026 acres (<1%) of BLM-administered mineral estate are administratively unavailable for oil and gas leasing (Table 4-5 and Map 10). The areas unavailable under Alternative D are the result of protective management actions listed in Table 4-6. Areas of mineral estate administratively unavailable for oil and gas leasing results in an adverse impact to oil and gas development; however, compared to Alternative A and all other alternatives, Alternative D has the least adverse impact on oil and gas development. Areas administratively unavailable for oil and gas leasing in the Muddy Mountain EEA and areas along the North Platte River will have a minor impact, as both areas have very low to no development potential for conventional oil and gas and CBNG.

Other Resource Restrictions. Under Alternative D, management actions from other resources, including water, wildlife, special status species, cultural, special designations, and other MAs would place restrictions of varying types and intensity on oil and gas exploration and development (refer to Table 2-3, Details of Alternatives). Under Alternative D, 1,524,375 acres of BLM-administered mineral estate is open to oil and gas development with standard stipulations, 2,445,107 acres are open with moderate restrictions, and 662,664 acres are open with major restrictions (refer to Table 4-5).

Compared to all other alternatives, Alternative D proposes the lowest acreage with major restrictions on exploration and oil and gas development. Alternative D proposes the third lowest number of acres with moderate restrictions. Adverse impacts to exploration and oil and gas development from other resource restrictions under Alternative D are less than under Alternative A. NSO associated with the Jackson Canyon ACEC, Muddy Mountain elk crucial winter range area, and bald eagle roosts, nests, and feeding areas will have a minor impact on conventional oil and gas and CBNG development, as the areas have low to very low or no oil and gas development potential for both resources. This alternative has 465,688 acres of BLM-administered mineral estate with a Class II VRM status, of which 16,331 acres have a moderate development potential for conventional oil and gas and the remaining acres have a low to very low to no development potential for conventional oil and gas and CBNG. While the management prescriptions for VRM do not prohibit drilling, operators would have to directionally drill to develop the resources, making some ventures unfeasible or uneconomical.

Under Alternative D, it is projected that 468 federal CBNG wells and 1,332 federal conventional oil and gas wells would be drilled on federal mineral estate between 2001 and 2020 (refer to Table 4-7). Of these wells, the RFD estimates that there would be 459 productive CBNG wells and 1,062 productive oil and gas wells (a 6% decrease in the number of producing CBNG wells and an 11% decrease in the number of producing conventional oil and gas wells from the unconstrained baseline projection). The number of wells projected under Alternative D is slightly lower than those projected under Alternative A.

Alternative E (Proposed Casper RMP)

Geophysical Exploration. Impacts on geophysical operations under Alternative E would be the same as those identified under Alternative A.

Areas Administratively Unavailable for Oil and Gas Leasing for the Life of the Plan. Under Alternative E, 226,568 acres (5%) of BLM-administered mineral estate are administratively unavailable for oil and gas leasing for the life of the plan (see Table 4-5 and Map 11). The areas unavailable for oil and gas leasing under Alternative E are the result of a variety of protective management actions, including vegetation (habitat fragmentation), special designations, and other MAs (refer to Table 4-6). Mineral estate administratively unavailable for oil and gas leasing would result in an adverse impact to oil and gas development. The proposed South Bighorns/Red Wall MA and the habitat fragmentation blocks contain the bulk of the acreage administratively unavailable for oil and gas leasing, but the RFD (BLM 2005c) has identified most of this area as having low to very low development potential for conventional oil and gas. The South Bighorns/Red Wall MA contains 75,913 acres of BLM administered mineral estate of which 1,535 acres have a low development potential for conventional oil and gas, and 74,378 acres of which have a very low development potential for oil and gas. The entire MA has no development potential for CBNG. The proposed habitat fragmentation blocks containing 168,386 acres of BLM-administered mineral estate have 116 acres with low development potential for conventional oil and gas, 146,554 acres with very low development potential for conventional oil and gas, and 21,716 acres with no potential. The entire area has no development potential for CBNG. Consequently, these special designations and MAs would have only a minor impact on the total development projected under this alternative. The proposed Sand Hills MA and Muddy Mountain EEA would have the same impact on oil and gas development as Alternative B.

Other Resource Restrictions. Under Alternative E, management actions from other resources, including water, wildlife, vegetation, special status species, cultural, special designations, and other MAs would place restrictions of varying types and intensity on oil and gas exploration and development (refer to Table 2-3, Details of Alternatives). Under Alternative E, 1,080,935 acres of BLM-administered mineral estate is open to oil and gas development with standard stipulations, 2,506,530 acres are open with moderate restrictions, and 843,139 acres are open with major restrictions (see Table 4-5).

Compared to all other alternatives, Alternative E proposes the third lowest acreage with major restrictions on exploration and oil and gas development. Alternative E proposes the second highest acreage with moderate restrictions. Adverse impacts to exploration and oil and gas development from other resource restrictions under Alternative E are similar to those under Alternative A. The proposed Bates Hole MA would have the same impact on oil and gas development as Alternative B. NSO on the Cedar Ridge TCP would impact conventional oil and gas development because it contains 3,501 acres of BLM administered mineral estate with moderate development potential for conventional oil and gas. NSO associated with the Jackson Canyon ACEC, North Platte River ACEC/SRMA, Muddy Mountain elk crucial winter range area, and bald eagle roosts, nests, and feeding areas will have a limited impact on conventional oil and gas and CBNG development, as the areas have low to very low or no oil and gas development potential for both resources. VRM impacts would be the same as Alternative C.

Under Alternative E, it is projected that 469 federal CBNG wells and 1,345 federal conventional oil and gas wells would be drilled on federal mineral estate between 2001 and 2020 (refer to Table 4-7). Of these wells, the RFD estimates there would be 460 productive CBNG wells and 1,072 productive oil and gas wells (a 6% decrease in producing CBNG wells and a 10% decrease in producing conventional oil and gas wells from the unconstrained baseline projection). Alternative E is similar to Alternative A with respect to the number of projected wells.

4.2.4.3 Conclusion

Differences in the size of areas administratively unavailable for oil and gas development and other resource restrictions on oil and gas drilling and development form the basis for the following conclusion. Impacts to oil and gas from the alternatives are anticipated to be similar in type, primarily adverse, but different in intensity. Alternatives B and C place greater constraints on geophysical operations compared to alternatives A, D, and E. Alternative D results in the least potential restrictive impacts to geophysical operations because it allows the most acreage available for exploration. Acreages of areas administratively unavailable for oil and gas leasing are lowest under Alternative D. Considering this unavailability, major restrictions from other resources, and the number of producing wells expected, Alternative A results in the least potential adverse impacts to oil and gas exploration and development, followed by alternatives E and D. Conversely, Alternative B results in the greatest number of areas administratively unavailable for oil and gas leasing and major restrictions from other resources, resulting in the greatest adverse impact to oil and gas development.

4.2.5 Leasable – Other Solid Leasables

Actions that could occur through implementing an alternative could affect access to other solid leasable minerals for exploration and development activities. Other types of actions may place or remove restrictions or additional requirements on exploration and development activities. An example of an additional restriction would be a viewshed restriction on development activity that, while not preventing access, requires that development activity be conducted so that it is not readily apparent.

4.2.5.1 Methods and Assumptions

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

- About 623 acres of the federal leasable mineral estate has a moderate to high potential for occurrence of sodium (trona). Potential for sodium exploration and development activity is low for the planning period.
- About 9,030 acres of the federal leasable mineral estate has a moderate to high potential for occurrence of phosphate. Potential for phosphate exploration and development activity is low for the planning period.

- Uranium, bentonite, gypsum, limestone, and other hardrock minerals may be present on small amounts of acquired land and available for lease. Potential for uranium or bentonite activity is moderate to high for the planning period, while the other mineral types have a low potential.
- Any alternative that limits other solid leasable mineral development (i.e., reduces the area available for development) will have some adverse impact.
- Exploration activities could include coring or trenching to evaluate a deposits potential.
- Restrictions on resource uses apply to the life of the RMP, but can be changed by amending the RMP.

4.2.5.2 Analysis of Alternatives

Allowable uses and management actions with the potential to adversely impact mineral development include management actions that result in areas administratively unavailable to leasing and areas of NSO, TLS, and CSU restrictions.

Impacts Common to All Alternatives

Restrictions on other solid leasables could result in adverse impacts to exploration and development activities when closures and NSO restrictions apply, since those activities require surface occupancy. The intensity of impacts is anticipated to vary by alternative. The greater the acreage administratively unavailable, or NSO, the greater the adverse impact to this resource. Therefore, impacts from closures and NSO restrictions are described under the individual alternatives. Restrictions linked to TLS restrictions and CSU restrictions may put some limits on activities associated with exploration and development, but these types of restrictions are not expected to prevent activity.

Alternative A

No closures or NSO restrictions apply to any federal mineral estate with potential sodium resources. Closures for steep slopes/erosive soils and NSO restrictions for VRM Class II and the South Bighorns/Red Wall area would adversely impact about half the federal mineral estate with potential phosphate resources. The impact of closures or NSO restrictions on those potential other solid leasable minerals on acquired lands appear to be minor.

Alternative B

NSO restrictions within 4 miles of occupied greater sage-grouse leks and for highly erosive soils areas would adversely impact about half the federal mineral estate with potential sodium resources. Closures and NSO restrictions would adversely impact the entire federal mineral estate with potential phosphate resources. VRM Class II, South Bighorns/Red Wall ACEC closure, NSO restrictions within 2 miles of greater occupied sage-grouse leks, and fragmentation block closures, respectively, would be the biggest impacts to potential phosphate resources. With the exception of bentonite and limestone, the impact of closures or NSO restrictions on those potential other solid leasable minerals on acquired lands appear to be minor. Adverse impacts of closures and NSO restrictions for bentonite and limestone could be greater, but actual comparisons of acquired lands to these restrictions have not been made.

Alternative C

Only minor NSO restrictions apply to federal mineral estate with potential sodium resources. Closures and NSO restrictions would adversely impact the entire federal mineral estate with potential phosphate resources. The South Bighorns/Red Wall MA closure, VRM Class II, fragmentation block closures, and NSO restrictions within 2 miles of occupied greater sage-grouse leks, respectively, would be the biggest impacts to potential phosphate resources. With the exception of bentonite and limestone, the impact of

closures or NSO restrictions on those potential other solid leasable minerals on acquired lands appear to be minor. Adverse impacts of closures and NSO restrictions for bentonite and limestone could be greater, but actual comparisons of acquired lands to these restrictions have not been made.

Alternative D

No closures or NSO restrictions apply to federal mineral estate with potential sodium resources. Only VRM Class II would impact the federal mineral estate with potential phosphate resources, but only in a minor way. The impact of closures or NSO restrictions on those potential other solid leasable minerals on acquired lands appear to be minor.

Alternative E (Proposed Casper RMP)

Only minor NSO restrictions apply to federal mineral estate with potential sodium resources. Closures and NSO restrictions would adversely impact the entire federal mineral estate with potential phosphate resources. VRM Class II, fragmentation block closures, and the South Bighorns/Red Wall MA closure, respectively, would be the biggest impacts to potential phosphate resources. With the exception of bentonite and limestone, the impact of closures or NSO restrictions on those potential other solid leasable minerals on acquired lands appear to be minor. Adverse impacts of closures and NSO restrictions for bentonite and limestone could be greater, but actual comparisons of acquired lands to these restrictions have not been made.

4.2.5.3 Conclusion

Impacts to other solid leasable minerals from alternatives are anticipated to be similar in type, primarily adverse, but different in intensity. Management actions may impact the acreage open to exploration and development and how these activities can be conducted. The sodium federal mineral estate is not impacted by any closures or NSO restrictions under alternatives A and D, and only in a minor way by NSO restrictions for alternatives C and E. Alternative B has the largest adverse impact on the sodium federal mineral estate, since about half is impacted by NSO restrictions for 4-mile areas occupied by greater sage-grouse leks and for highly erosive soils.

The phosphate federal mineral estate has the highest potential adverse impact of all other solid leasable minerals. Under Alternative D, potential impacts are minor. Alternative A has an adverse impact on about half the area with VRM Class II and a smaller closure for steep slopes/erosive soils. All other alternatives have large adverse impacts. VRM Class II impacts all phosphate federal mineral estate for each of these alternatives and closures impact all these lands for alternatives B and C and almost half for Alternative D. Greater sage-grouse-related NSO restrictions adversely impact more that two thirds of lands under Alternative B, less than one third under Alternative C, and none of the lands for Alternative E.

With the exception of bentonite and limestone, the impact of closures or NSO restrictions on those potential other solid leasable minerals on acquired lands appear to be minor for all alternatives. Adverse impacts of closures and NSO restrictions for bentonite and limestone could be greater under alternatives B, C, and E, but appear to be minor for alternatives A and D.

4.2.6 Salable

Actions that could occur through implementing an alternative could affect access to salable minerals. Other types of actions may place or remove restrictions or additional requirements on exploration and development activities. An example of an additional restriction would be a viewshed restriction on development activity that, while not preventing access, requires that development activity be conducted

so that it is not readily apparent. Potential impacts to the sand and gravel resource are discussed in the Special Designations and Other MAs section (North Platte River ACEC/SRMA).

4.2.6.1 Methods and Assumptions

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

- The potential for occurrence of mineral materials exists across the planning area.
- About 197,836 acres of federal mineral estate have a moderate-to-high potential for the occurrence of bentonite. Potential for salable bentonite development activity is moderate to low for the planning period.
- About 123,389 acres of federal mineral estate have a moderate-to-high potential for the occurrence of gypsum. Potential for salable gypsum development activity is low for the planning period.
- About 117,680 acres of federal mineral estate have a moderate-to-high potential for the occurrence of limestone. Potential for salable limestone development activity is moderate to low for the planning period.
- Additional common variety materials, such as decorative stone, clay (e.g., shale), borrow material, clinker (scoria), and leonardite (weathered coal), occur within the planning area, but their areal extents have not been mapped. Commercial sand and gravel deposits are not sufficiently mapped for quantitative analysis. Some varieties (e.g., sand, gravel, and borrow material) have moderate-to-high potential for development, while the rest have moderate-to-low potential.
- Any alternative that limits mineral material development (i.e., reduces the area available for development) will have some adverse impact.
- Exploration activities could include coring or trenching to evaluate a deposit.
- Restrictions on resource uses apply to the life of the RMP, but can be changed by amending the RMP.

4.2.6.2 Analysis of Alternatives

Allowable uses and management action with the potential to adversely impact salable mineral development include management actions that result in areas closed to mineral material disposal, NSO areas (effectively closes areas to mineral material disposal), TLS restrictions, and CSU restrictions.

Impacts Common to All Alternatives

Restrictions on salable mineral development could result in substantial adverse impacts to exploration and development activities when closures and NSO restrictions apply, since these activities require surface occupancy. The intensity of impacts is anticipated to vary by alternative. The greater the acreage administratively unavailable or restricted by an NSO, the greater the adverse impact to this resource. Therefore, impacts from closures and NSO restrictions are described under the individual alternatives. Restrictions linked to TLS restrictions and CSU restrictions may add additional limits (mainly by increasing costs) on the ability of industry to develop these types of high-volume, cost-sensitive types of resources.

Adverse impacts to bentonite, gypsum, and limestone remain the same across all alternatives for certain management actions. The Jackson Canyon ACEC, Muddy Mountain elk crucial winter range, bald eagle roosts, bald eagle nests, and bald eagle feeding areas each remove the same amount of salable minerals

from development for all alternatives. None of these management actions impacts more than about 3 percent of any of these mineral resource types, so associated impacts are considered to be minor.

Alternative A

Only minor amounts of closure to mineral material disposal or NSO restrictions apply to the federal mineral estate with potential salable bentonite resources. VRM Class II would adversely impact about half the potential gypsum resource, while the South Bighorns/Red Wall NSO would impact about one third and other restrictions would be minor. VRM Class II would adversely impact about 13 percent of the potential limestone resource, while other restrictions would be minor.

Approximately 51,924 acres (less than 1%) of the total federal mineral estate are closed to mineral material disposal in the planning area. These closures result from management actions for all bald eagle roosts, the Jackson Canyon ACEC, and federal mineral estate within ¼ mile of the North Platte River for its entire length in the planning area. Approximately 770,991 acres or 17% of federal mineral estate are NSO or have overlapping TLS restrictions, which have the potential to effectively close these areas to mineral material disposal. Closures, NSO restrictions, and overlapping TLS restrictions could result in adverse impacts by reducing access to the additional common variety materials listed above in the Methods and Assumptions section.

Alternative B

VRM Class II and greater sage-grouse NSO restrictions each would adversely impact 130,173 acres and 133,489 acres respectively, or more than 60 percent of the federal mineral estate for the potential bentonite resource. NSO restrictions for habitat fragmentation would adversely impact 37 percent of the federal mineral estate for the potential bentonite resource, while NSO restrictions for highly erosive soils and the South Bighorns/Red Wall ACEC would adversely impact 12 to 21 percent. Other restrictions are minor in impact. VRM Class II (105,662 acres or 86%), South Bighorns/Red Wall ACEC (67,421 acres or 55%), fragmentation blocks (55,947 acres or 45%), greater sage-grouse NSO restrictions (65,204 acres or 45%), and highly erosive soils (41,080 acres or 21%) adversely impact the potential gypsum resource, with other restrictions being only minor in affect. For the potential limestone resource, VRM Class II would adversely impact about 44,609 acres or 38 percent and other restrictions would be less than 10 percent and minor in affect.

Approximately 737,118 acres (about 16%) of the total federal mineral estate are closed to mineral material disposal in the planning area. These closures result from management actions for all bald eagle roosts, the Jackson Canyon ACEC, the South Bighorns/Red Wall ACEC, Cedar Ridge TCP ACEC, Sand Hills MA, habitat fragmentation blocks 1 through 16, and federal mineral estate within ¼ mile of the North Platte River for its entire length in the planning area. Approximately 2,296,267 acres or 49 percent of federal mineral estate are NSO or have overlapping TLS restrictions, which could effectively close these areas to mineral material disposal. Closures, NSO restrictions, and overlapping TLS restrictions could result in adverse impacts by reducing access to the additional common variety materials listed above in the Methods and Assumptions section.

Alternative C

VRM Class II adversely impacts about 106,196 acres or (54%) of the federal mineral estate for the potential bentonite resource, while greater sage-grouse NSO restrictions (46,521 acres or 24%) and fragmentation blocks (30,703 acres or 16%) have a smaller adverse impact; other restrictions are minor. VRM Class II (95,311 acres or 77%), fragmentation blocks (48,811 acres or 40%), South Bighorns/Red Wall MA (78,914 acres or 64%), and greater sage-grouse NSO restrictions (14,638 acres or 12%) adversely impact the potential gypsum resource, while other restrictions are minor in affect. For the

potential limestone resource, VRM Class II would adversely impact about 26,712 acres or 23 percent; other restrictions would be minor in affect.

Approximately 304,620 acres (about 7%) of the total federal mineral estate are closed to mineral material disposal in the planning area. These closures result from management actions for all bald eagle roosts; the Jackson Canyon ACEC; Cedar Ridge TCP MA; Sand Hills MA; habitat fragmentation blocks 3, 5, 8, 11, 13, 15, and 16; and federal mineral estate within ¼ mile of the North Platte River for its entire length in the planning area. Approximately 1,113,078 acres or 24 percent of federal mineral estate are NSO or have overlapping TLS restrictions, which could effectively close these areas to mineral material disposal. Closures, NSO restrictions, and overlapping TLS restrictions could result in adverse impacts by reducing access to the additional common variety materials listed above in the Methods and Assumptions section.

Alternative D

Only minor amounts of closure to mineral material disposal or NSO restrictions apply to the federal mineral estate with potential salable bentonite and limestone resources. VRM Class II would adversely impact about 37 percent of the potential gypsum resource, while other restrictions would be minor.

Approximately 42,786 acres (less than 1%) of the total federal mineral estate are closed to mineral material disposal in the planning area. These closures result from management actions for all bald eagle roosts, the Jackson Canyon ACEC, and federal mineral estate within ¼ mile of the North Platte River for its entire length in the planning area. Approximately 662,664 acres (about 24%) of federal mineral estate are NSO or have overlapping TLS restrictions, which have the potential to effectively close these areas to mineral material disposal. Closures, NSO restrictions, and overlapping TLS restrictions could result in adverse impacts by reducing access to the additional common variety materials listed above in the Methods and Assumptions section.

Alternative E (Proposed Casper RMP)

VRM Class II adversely impacts about 106,196 acres or 54 percent of the federal mineral estate for the potential bentonite resource, while other restrictions are minor. VRM Class II (95,311 acres or 77%), South Bighorns/Red Wall MA (53,624 acres or 43%), and fragmentation blocks (44,689 acres or 36%) adversely impact the potential gypsum resource, with other restrictions minor in affect. VRM Class II would adversely impact about 26,712 acres or 23 percent of the potential limestone resource, while other restrictions would be minor.

Approximately 257,017 acres (about 6%) of the total federal mineral estate are closed to mineral material disposal in the planning area. These closures result from management actions for all bald eagle roosts; the Jackson Canyon ACEC; Cedar Ridge TCP; Sand Hills MA; habitat fragmentation blocks 3, 5, 8, 11, 13, 15, and 16 (with boundary adjustments from Alternative C); and federal mineral estate within ¼ mile of the North Platte River for its entire length in the planning area. Approximately 843,139 acres or 18 percent of federal mineral estate are NSO or have overlapping TLS restrictions, which could effectively close these areas to mineral material disposal. Closures, NSO restrictions, and overlapping TLS restrictions could result in adverse impacts by reducing access to the additional common variety materials listed above in the Methods and Assumptions section.

4.2.6.3 Conclusion

Impacts to salable minerals from alternatives are anticipated to be similar in type, primarily adverse, but different in intensity. Management actions may adversely impact the acreage available for exploration and development and how these activities can be conducted.

The potential bentonite federal mineral estate is impacted only in a minor way by closures and NSO restrictions under alternatives A and D. Alternative E has the next largest impact to bentonite, with more than half in VRM Class II. Alternative C also has the same VRM Class II restriction, with additional restrictions tied to greater sage-grouse NSO restrictions and fragmentation blocks. Alternative B has the greatest impact to potential bentonite resources. VRM Class II and greater sage-grouse NSO restrictions exceed 60 percent; fragmentation blocks and highly erosive soils exceed more that 15 percent.

The potential gypsum federal mineral estate is adversely impacted by at least one major action for all alternatives. Alternative D has the fewest major adverse impacts (one restriction of 37% of the potential gypsum federal mineral estate). Alternative B has two major adverse impacts (49% and 32%); Alternative C has three major adverse impacts (77%, 40%, and 11%); Alternative E has four major adverse impacts (77%, 43%, 36%, and 32%); and Alternative B has five major adverse impacts (86%, 55%, 45%, 45%, and 32%).

For all alternatives, management actions applied to the potential limestone federal mineral estate have only a minor adverse impact, except for VRM Class II. VRM Class II is a minor adverse impact for Alternative D, an impact of 13 percent of the area for Alternative A, an impact of 15 percent for alternatives C and E, and an impact of 25 percent for Alternative B.

With respect to the additional common variety materials listed in the Methods and Assumptions section, it should be noted that the location of these potential areas are not mapped for this analysis. Therefore, predicting potential adverse impacts due to restrictions identified under each alternative was presented in a general way only.

4.3 Fire Management and Ecology

The impacts of alternatives on fire management and ecology are anticipated to affect the planning, management, implementation, and cost of fire management. Restrictions on fire management and ecology 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. For example, livestock grazing may be used to manage fuel loads, thereby reducing the risk or incidence of wildland fire.

Fire plays an important and natural part in ecosystem function; however, the natural fire regime largely has been suppressed in the planning area. Although the suppression 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, would be 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, provide protection to a resource against potential fire damage, a beneficial impact. Regarding planned or prescribed fire, actions restricting the acreage or effectiveness of prescribed fire would be considered adverse. For example, stipulations to protect other resources (e.g., wildlife or livestock grazing) restricting or preventing prescribed burns from being conducted in certain areas or at certain times of the year are considered direct adverse impacts to prescribed fire management. Conversely, the lack of stipulations or actions increasing the acreage or effectiveness of prescribed fire would be considered a beneficial impact.

For the purpose of this analysis, short-term impacts to fire management and ecology include impacts occurring within 5 years. Long-term impacts are those remaining or occurring after 5 years. Impacts to fire management and ecology from alternatives are anticipated to be short- and long-term.

The following description of impacts is organized into three sections: unplanned/wildland fire, planned/prescribed fire, and rehabilitation following fire. The methods and assumptions, and analysis of alternatives sections are described under the first section only, unplanned/wildland fire, but apply to all three sections.

4.3.1 Unplanned/Wildland Fire

4.3.1.1 Methods and Assumptions

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

- Alternatives were evaluated based on a regional context of high fuel loadings and current management issues for all resource programs, as described in Chapter 3.
- Wildland fire in wildland-urban interface (WUI) areas typically will be suppressed with unlimited tactics.
- Some wildland fires that do not pose a threat to human life, private properties, or important resources can be used as a tool to reduce fuel loads and improve plant communities and wildlife habitats. The application of the appropriate management response to naturally ignited wildland fires to accomplish specific resource management objectives and predefined designated areas is outlined in individual fire management plans.

- The *Eastern Wyoming Zone Fire Management Plan* (BLM 2004e) implements the fire management direction on BLM land within the planning area.
- Air quality currently is not affecting the ability to conduct prescribed burns; however, the more stringent air quality standards are, the more likely they affect the ability to perform prescribed burns.
- Where livestock grazing occurs, it is BLM policy that prescribed burn areas be deferred or rested from grazing a minimum of two growing seasons. The deferment requirement of two growing seasons may be adjusted based on environmental conditions and management objectives consistent with Wyoming's standards for healthy rangelands.
- Compared to limited tactics, unlimited tactics would reduce the amount of acres burned annually, but increase the amount of surface disturbance from suppression activities and result in the need for more rehabilitation of damage caused by suppression activities. Unlimited fire suppression tactics also alter the condition class of the vegetation by preventing wildland fire to play its appropriate role in maintaining fire-adapted ecosystems.
- Where native plants cannot be successfully reestablished, use of nonnative perennials in rehabilitation may be needed. Some nonnative grass species, such as Russian wildrye, increase the risk of wildland fire and could actually reduce it.
- Current BLM policy is to use certified weed-free native plant species seed for rehabilitation when reseeding is necessary.
- Annual bromes (e.g., cheatgrass) and INPS can elevate the risk of fire and actually alter the natural fire regime; therefore, alternatives contributing to the invasion and spread of INPS are anticipated to adversely impact wildland fire.
- In areas of cultural resource sensitivity, use of heavy equipment typically is limited to existing roads and trails, except where human safety is at risk.
- Cultural resource surveys are conducted, where applicable, for all prescribed burns, other fuel treatments, and rehabilitation.
- Current policy (BLM Manual 1745) requires use of native plant species for rehabilitation when they are available.

4.3.1.2 Analysis of Alternatives

Allowable uses and management actions with the potential to impact fire management and ecology generally can be characterized as either restrictions or proactive management actions associated with each alternative. The following analysis of alternatives describes potential impacts from alternatives in three sections: wildland fire, prescribed fire, and rehabilitation.

As fire management and ecology is affected by the alternatives, fire management and ecology can, in turn, impact other resources, including resource protection. Fires burning greater acreage for longer periods of time would emit more particulate matter into the air. In addition to affecting public health and safety, fire also can affect rangeland health, wildlife habitat quality and quantity, and plant community health (Map 18). The impacts of fire management and ecology on other resource topics (e.g., physical, biological, etc.) are discussed under the appropriate impacted resources sections.

Impacts Common to All Alternatives

The types and context of impacts anticipated for wildland fire as a result of the various alternatives are similar. Impacts to wildland fire from restrictions and proactive management actions, therefore, are described under individual alternatives.

Alternative A

Management actions regarding fire suppression are currently guided by decisions in the existing plan (BLM 1985a) and the *Eastern Wyoming Zone Fire Management* (BLM 2004e). Under Alternative A, priority is given to the use of unlimited tactics, except for a few cases. The existing plan contains a few restrictions on the use of heavy equipment and protection of bald eagle winter roosts. The other sites identified for protection are wagon ruts of the Oregon and Bozeman trails and elk crucial winter range, where there are limitations on the tactics that can be employed toward fire suppression. By default, unlimited fire management tactics can be used for all other types of areas, including WUIs, ROW, communication sites, riparian areas, and sites with highly erosive soils. No explicit fire guideline stipulating wildland fires may be allowed to burn to meet management objectives exists. Under this alternative, wildfire use is not a management option.

Restrictions. Alternatives restricting fire suppression, fuels management, or wildland fire planning are anticipated to adversely impact wildland fire management. For example, except to protect human life, Alternative A does not allow use of heavy equipment to construct fire lines in areas containing wagon ruts of the Oregon and Bozeman trails or in elk critical winter range. Moreover, to the extent possible, Alternative A also does not allow trees to be cut during fire suppression in bald eagle roost areas, unless a fire threatens human life or private property. These restrictions limit fire suppression and fire management.

Proactive Management Actions. For the Jackson Canyon ACEC, Alternative A designates all adjacent public lands as unlimited tactics and does not restrict road construction or grading. For the entire planning area, Alternative A develops wildland fire use plans on a case-by-case basis for those areas where a prescribed fire is planned. To implement the plan, a cooperative agreement with private land owners and other fire and land management agencies must be pursued. Fire management plans under Alternative A identify areas where grading of roads and (or) firebreaks are most needed for fire suppression, as well as areas where protection from wildland fires is most critical. Alternative A would use unlimited tactics of wildland fire in forestlands.

Alternative A manages wildland fire according to a limited number of restrictions and specific proactive management actions. The restrictions in Alternative A are anticipated to have short- and long-term adverse impacts to wildland fire management. For example, the ability to construct and grade roads in the Jackson Canyon ACEC will facilitate fire containment and suppression. Conversely, use of unlimited tactics of wildland fire in forestlands may result in long-term buildup of hazardous fuels, thereby increasing the risk of catastrophic fire.

Alternative B

Restrictions. Similar to current management, Alternative B would not allow heavy equipment use in sensitive cultural resource areas, riparian/wetland habitats, big game crucial winter range, greater sage-grouse leks, and areas of highly erosive soils, except where human safety is at risk. For areas not identified as full protection, Alternative B would limit the use of heavy equipment to existing roads and trails or immediately adjacent to them. In addition, Alternative B also prohibits tree cutting within 200 yards of identified bald eagle roosts during suppression activities. Restricting use of heavy equipment to

existing roads and trails is expected to minimize impacts to soils and revegetation from fire suppression; however, this restriction is also anticipated to hamper fire suppression.

Alternative B would use full protection strategies in WUIs, developed recreation sites, and developed electronics sites. In all other areas, Alternative B will use appropriate management response strategies and tactics considering resource values at risk, proximity to private land, firefighting resource availability, and firefighter safety.

Proactive Management Actions. Alternative B would manage wildland fire and suppression in the Jackson Canyon ACEC in a manner similar to current management, except that road construction would not be allowed. For the entire planning area, Alternative B would develop wildland fire use plans as opportunities arise for public lands with aspen, juniper, and true mountain mahogany communities where contiguous public lands exceed 160 acres. Alternative B would allow natural ignitions within an area with a wildland fire use plan to burn to meet the desired management objectives. Cooperative agreements would be required to implement fire use on a landscape scale. Alternative B would utilize wildland fire to achieve desired future conditions (DFC) for watershed stability and wildland habitats, which is anticipated to benefit fire-adapted ecosystems in the planning area.

The restrictions associated with Alternative B are more restrictive than those identified in Alternative A; however, Alternative B's proactive management action to use wildland fire to achieve management objectives is anticipated to result in a beneficial impact to wildland fire management. The combination of more restrictions and beneficial actions for Alternative B are anticipated to have more overall benefits to wildland fire management relative to Alternative A.

Alternative C

Restrictions. Alternative C would have similar fire suppression and heavy equipment restrictions to Alternative B, except no full protection areas are identified under Alternative C.

Proactive Management Actions. Alternative C would manage wildland fire and suppression in the Jackson Canyon ACEC in the same manner described for Alternative B. The use of natural ignitions and wildland fire use plans also would be similar to Alternative B, except Alternative C would set the contiguous public lands minimum at 640 acres. Alternative C would use wildland fire in commercial forests to reduce fuel loads and (or) satisfy stand prescriptions.

The lack of identified full protection areas will allow fire management more discretion with tactics and the allowable use of wildland fire is anticipated to benefit management objectives. The combination of restrictions and proactive management actions of Alternative C are anticipated to have more overall benefits to wildland fire management relative to Alternative A.

Alternative D

Restrictions. Alternative D would use full protection strategies and tactics across the entire planning area, as well as employ similar fire management as described for current management, except grading of roads would not be allowed.

Proactive Management Actions. Alternative D would manage wildland fire and suppression in the Jackson Canyon ACEC in the same manner described for Alternative A. The use of natural ignitions and wildland fire use plans also would be similar to Alternative B, except Alternative D would set the contiguous public lands minimum at 1,280 acres, thereby limiting use of natural ignitions relative to alternatives B and C. Alternative D would suppress all wildland fire in commercial forests, which is expected to result in a buildup of hazardous fuels.

Alternative D would place fewer restrictions on wildland fire management; however, Alternative D also would limit, relative to alternatives B and C, the use of wildland fire to achieve management objectives. The use of full suppression throughout the planning area is anticipated to contribute to maintaining high fuel loads in the planning area, with an increased risk of high-intensity fire recurrence. Under Alternative D, consistent use of unlimited tactics is anticipated to decrease the number of acres burned annually during wildland fires compared to Alternative A. Overall, Alternative D is anticipated to have similar adverse impacts to wildland fire management relative to Alternative A.

Alternative E (Proposed Casper RMP)

Restrictions. Alternative E would restrict fire suppression tactics similar to Alternative B and be more restrictive than Alternative A. As in Alternative A, Alternative E would designate all federal properties adjacent to the Jackson Canyon ACEC as priority full suppression and identify areas where grading of roads and (or) firebreaks are most needed for fire suppression.

Proactive Management Actions. Alternative E would manage wildland fire and suppression in the Jackson Canyon ACEC in the same manner described for Alternative A. Alternative E would use natural ignitions and wildland fire to achieve management objectives similar to Alternative D; however, Alternative E also would use wildland fire in all forest stands to reduce fuel loads and (or) satisfy stand prescriptions. Using wildland fire for fuels management is a beneficial impact to fire management because it reduces the potential for high-intensity fire recurrence.

Alternative E would place restrictions on wildland fire management; however, it also would utilize wildland fire to achieve management objectives. Overall, Alternative E is anticipated to have less adverse and more beneficial impacts to wildland fire management relative to A.

4.3.1.3 Conclusion

The allowable uses and management actions for resources and resource uses are anticipated to result in a mix of beneficial and adverse impacts relative to wildland fire management. Based on a balance of restrictions and proactive management actions, Alternative E has the least adverse impact to wildland fire management. Although Alternative D has the least restrictions, the unrestricted full suppression tactics could result in a long-term adverse impact by contributing toward maintaining high fuel loads and a continuing high risk of wildland fires. Based on the potential for long-term impact, Alternative D has the most adverse impact to wildland fire management. Conversely, while alternatives B and C have the most restrictions, these restrictions could indirectly benefit fire management in the long-term because greater reliance on limited tactics is likely to result in a higher acreage of land burned during wildland fires, thus contributing toward a reduction of fuel loads. Overall, alternatives B and C are anticipated to have similar and more potential beneficial impacts to wildland fire management relative to Alternative A.

4.3.2 Planned/Prescribed Fire

Prescribed burning can be used to achieve measurable landscape-level or site-specific level objectives, such as reducing hazard fuel loads, creating diversity within vegetative communities, enhancing livestock management, improving wildlife habitat, regenerating decadent vegetative communities, and improving watershed health. It is anticipated that most of the prescribed burning in the planning area will occur in sagebrush and mountain shrub communities. Stipulations from other resources allowing or preventing prescribed burns to be conducted in certain areas or at certain times of the year are direct impacts to prescribed fire management.

4.3.2.1 Methods and Assumptions

Prescribed fire is a tool used to manage vegetative communities and can result in short-term adverse impacts with long-term beneficial impacts to wildlife, wildlife habitats, and vegetative communities. (See also the Methods and Assumptions section for Unplanned/Wildland Fire.)

4.3.2.2 Analysis of Alternatives

Refer to the Analysis of Alternatives section for Unplanned/Wildland Fire.

Impacts Common to all Alternatives

Approximately 20,000 acres of short-term disturbance are anticipated from prescribed fire within the planning area under any alternative (Appendix M). The short- and long-term impacts from prescribed fire are anticipated to be beneficial to fire management and ecology and to other resources; however, by removing existing vegetation and exposing soil, fire does provide an opportunity for the establishment of INPS. Smoke from fire temporarily degrades local air quality. Wind and other factors can cause prescribed fire to escape, becoming a wildland fire.

Where livestock grazing occurs, it is BLM policy that prescribed burn areas be deferred or rested from grazing a minimum of two growing seasons, with some exceptions based on environmental conditions and management objectives consistent with Wyoming's standards for healthy rangelands. 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 financially unable to withstand two growing seasons rest, as required by BLM policy. This policy may impact prescribed fire management because it restricts the ability to use prescribed fire as a management tool. Conflicting resource demands also can adversely impact prescribed fire management.

Alternative A

Under Alternative A, prescribed burns would continue to be decided by the BLM on a case-by-case basis. Conducting prescribed burns in big game crucial winter range would continue to require granting of an exception, either during the site-specific analysis or after consultation with the Wyoming Game and Fish Department (WGFD) (in general, no surface disturbance is allowed in crucial big game winter range between November 15 and April 30).

Restrictions. Current management does not limit the use of prescribed fire on highly erosive soils. Prescribed fire currently is used to manipulate vegetation on areas identified for treatment in the range, forestry, and wildlife programs; however, Alternative A annually prohibits prescribed fire within bald eagle roosts from November 1 to March 31.

Proactive Management Actions. Current management does not specifically identify an integrated management approach to manage fuels in the planning area; therefore, prescribed fire is not integrated with mechanical, chemical, and biological techniques or with post-fire reseeding to reduce fuels and to protect high priority areas or resource values.

Alternative B

Restrictions. Unlike Alternative A, Alternative B would prohibit the use of prescribed fire on highly erosive soils. In addition, Alternative B would use prescribed fire to achieve measurable landscape level objectives identified for other resource programs, for reduction of hazardous fuels, and for reintroducing fire into fire adapted ecosystems.

Proactive Management Actions. Alternative B would use an integrated management approach to manage fuels in the planning area, including the use of prescribed fire; mechanical, chemical, and biological techniques; and reseeding. This approach would result in a beneficial impact to fire management in the planning area and is expected to result in more-effective reclamation and less INPS invasion relative to Alternative A.

Alternative C

Restrictions. Alternative C would limit the season and intensity of prescribed fire on highly erosive soils. Alternative C would use prescribed fire to achieve measurable landscape level objectives, the same as Alternative B. These restrictions would provide additional benefits to prescribed fire management relative to Alternative A.

Proactive Management Actions. Alternative C would use an integrated management technique approach to manage fuels, the same as Alternative B. Use of the integrated management approach is expected to improve the effectiveness of prescribed fire and reclamation relative to Alternative A.

Alternative D

Restrictions. Similar to Alternative A, Alternative D would allow prescribed fire on highly erosive soils. Alternative D, similar to Alternative B, would use prescribed fire to achieve measurable landscape-level objectives.

Proactive Management Actions. Alternative D would use an integrated management technique approach to manage fuels, as would Alternative B. Using the integrated management approach is expected to improve the effectiveness of prescribed fire and reclamation relative to Alternative A.

Alternative E (Proposed Casper RMP)

Restrictions. Alternative E would limit the use of prescribed fire on highly erosive soils, as would Alternative C. Alternative E would use prescribed fire to achieve measurable 5th Order Watershed objectives, similar to Alternative B. These restrictions are anticipated to protect high priority areas and resource values.

Proactive Management Actions. Alternative E would use an integrated management technique approach to manage fuels, similar to Alternative B. Use of the integrated management approach is expected to improve the effectiveness of prescribed fire and reclamation relative to Alternative A.

4.3.2.3 Conclusion

Using prescribed fire to achieve measurable objectives for other resource programs and using an integrated management approach to manage fuels are anticipated to benefit prescribed fire management. All Action Alternatives are anticipated to have similar potential beneficial impacts to prescribed fire management and more potential beneficial impacts relative to Alternative A. Benefits include protecting high-priority areas and resource values; improving the effectiveness and timeliness of reclamation; and reducing the potential for resource conflicts related to using prescribed fire.

4.3.3 Rehabilitation

Rehabilitation (contour-felling, mulching, seeding, and control of invasive plants) can be required following fires and following fire-suppression activities. The spread of cheatgrass, in particular, is possible in areas that have been burned or disturbed due to fire-suppression activities. Widespread presence of cheatgrass can alter the local fire regime and fire-recurrence interval. Resource management actions with the potential to restrict rehabilitation efforts are primarily the wildlife and cultural resources

programs. Impacts are measured by the ability to conduct rehabilitation efforts and the potential for rehabilitation success. Restrictions to rehabilitation are considered a direct adverse impact. Indirect impacts could occur where rehabilitation introduces a long-term risk of recurrent fire, requiring new rehabilitation efforts.

4.3.3.1 Methods and Assumptions

Refer to the Methods and Assumptions section for Unplanned/Wildland Fire.

4.3.3.2 Analysis of Alternatives

Refer to the Analysis of Alternatives section for Unplanned/Wildland Fire.

Impacts Common to all Alternatives

The types and context of impacts anticipated for rehabilitation as a result of the various alternatives are similar. Impacts to rehabilitation from restrictions and proactive management actions, therefore, are described under individual alternatives.

Alternative A

Under Alternative A, no specific restrictions or guidelines concerning rehabilitation and stabilization following wildland fires exist; rehabilitation is conducted on a case-by-case basis. Since there are no specific requirements for rehabilitation, this approach is anticipated to limit rehabilitation success and allow the invasion of INPS.

Alternative B

Alternative B would rehabilitate suppression-related damage, including the use of chemical treatments where INPS are present. This alternative would focus on suppression-related damage only, and not on rehabilitation of areas affected from fire severity. Since rehabilitation will be required where suppression-related damage occurs, this would increase the potential for rehabilitation success relative to Alternative A.

Alternative C

Alternative C would rehabilitate all fires on public lands, including damage from suppression activities and fire severity and use chemical treatments where INPS are present. This alternative would require all fires to be rehabilitated, as well as increase the potential for rehabilitation success relative to alternatives A and B.

Alternative D

Alternative D would evaluate all fires and rehabilitate, as needed, for suppression and fire-severity impacts. Rehabilitation could include chemical treatment where INPS are present. This alternative is similar to Alternative A, except all fires have to be evaluated for rehabilitation. It is also more realistic, as all fires do not need rehabilitation. This approach would increase the potential for rehabilitation success, as all fires would be evaluated and rehabilitation conducted as determined by the resource staff. This approach is not limited to suppression damage and fire-severity damage; it also looks at both types of rehabilitation concerns.

Alternative E (Proposed Casper RMP)

Alternative E would evaluate all fires and rehabilitate as described for Alternative D. This would increase the potential for rehabilitation success relative to Alternative A.

4.3.3.3 Conclusion

The specified management actions for alternatives B, C, D, and E are anticipated to have a beneficial impact to rehabilitation efforts relative to Alternative A. Alternative C has the most beneficial impact due to the anticipated rehabilitation of all fires and suppression activity impacts. Alternative C requires all fires be rehabilitated, which is not always necessary or practical. Alternative B is similar to Alternative C, except only damage caused from suppression-related actions will be rehabilitated. Alternatives D and E have similar beneficial impacts, but less than alternatives B and C because the requirement to rehabilitate areas disturbed by fires and associated suppression activities is evaluated on a case-by-case basis. Although alternatives B and C are the most beneficial by rehabilitating all fires, alternatives D and E rehabilitate only damaged areas when deemed necessary. Overall, the order of alternatives in descending order of most-to-least beneficial impacts to rehabilitation is C, B, E, D, and A.

4.4 Biological Resources

This section describes compliance with the Endangered Species Act (ESA) for special status species, as well as the anticipated environmental consequences (i.e., impacts) each alternative could have on habitat fragmentation and biological diversity. The potential environmental consequences to individual biological resources (i.e., vegetation, fish, wildlife, and special status species) are described following the Habitat Fragmentation and Biological Diversity section.

Special Status Species

Section 7 of the ESA requires that federal agencies (such as BLM) address impacts on species listed under the ESA through consultation with the USFWS. Informal conferencing and consultation with the USFWS occurs for authorized federal activities that potentially affect habitats for endangered, threatened, proposed, and candidate species within the planning area (USFWS 2003c). As part of the consultation, the BLM's Casper Field Office receives an annual list of species listed or proposed for listing as threatened or endangered.

Casper's Biological Assessment (BA) for the Final EIS analyzes the potential affects of the proposed alternative on those species listed as threatened or endangered and occurring in the planning area (BLM 2006e). Habitat conservation measures identified in the BA are applied to surface-disturbing and disruptive activities, as appropriate, to protect species listed as threatened or endangered. In addition, surveys for threatened and endangered species on federal land or on split-estate land are conducted in potential habitats prior to approval of projects or activities that could impact these species. Reasonable and prudent measures and terms and conditions identified in Statewide Programmatic BAs and Biological Opinions for listed plant and wildlife species within the planning area will also be implemented, as appropriate.

Habitat Fragmentation and Biological Diversity

Habitat fragmentation and biological diversity are not resources or resource uses, but rather they are conditions within the planning area that can be impacted by BLM management actions and allowable uses as expressed in the alternatives (see Chapter 2). As such, habitat fragmentation and biological diversity are described immediately following this introduction and prior to the descriptions of anticipated impacts to individual biological resources. Habitat fragmentation is anticipated to continue and incrementally increase in the future commensurate with surface-disturbing activities and associated development. Of particular concern is oil and gas leasing in areas with relatively large blocks of contiguous habitats. 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" in 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 Tenth Circuit Court of Appeals in Sierra Club vs. Peterson (717F.2d 1409, 1983) found that "on land leased without an NSO stipulation, the DOI cannot deny the permit to drill…once the land is leased the DOI no longer has the authority to preclude surface-disturbing activities even if the environmental impact of such activity is significant. The Department can only impose mitigation upon a lessee who pursues surface-disturbing exploration and/or drilling activities." The court goes on to say "notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the DOI has made an irrevocable commitment to allow some surface-disturbing activities, including drilling and road building." For these reasons and to minimize habitat fragmentation, large blocks of contiguous habitat with low oil and gas development potential are administratively unavailable for the life of the plan for oil and gas leasing in alternatives B, C, and E.

The extent or intensity of fragmentation is expected to vary by alternative. The extent of fragmentation under each alternative is primarily anticipated to be a function of the amount of long-term surface disturbance in the planning area and proactive management actions anticipated to minimize fragmentation.

Management challenges regarding habitat fragmentation and future management of the planning area include balancing the requirement for multiple use and sustained yield with management of a diversity of resources and resource uses that sometimes conflict. These challenges are complicated by the intermingled public and private ownership pattern that exists within the planning area and the relatively small and isolated tracts of BLM-administered surface found in the eastern part of the planning area comprising Converse, Goshen, and Platte counties. On the other hand, relatively large blocks of contiguous habitats are in the planning area west of Casper and Interstate 25 (I-25) in Natrona County. Future challenges regarding habitat fragmentation include managing the location and constructing, maintaining, and operating infrastructure required for mineral, energy, transportation, and other development, all while adhering to habitat requirements of wildlife and special status species occurring in the planning area. Additional management challenges in the planning area include controlling the spread of INPS; managing fire suppression and rehabilitation activities; and integrating activities of resources affecting habitat fragmentation. Management actions anticipated to address the challenges of habitat fragmentation are included as part of the alternatives (primarily vegetation) described in Chapter 2.

Under all alternatives and for the life of the plan, biological diversity is anticipated to remain within the range of conditions bounded by the current situation; however, the rate of change in biological diversity is anticipated to vary by alternative. Allowable uses and management actions primarily anticipated to impact biological diversity are described below under the topics of surface-disturbing activities, proactive management actions, fire management and ecology, and INPS.

Actions affecting biological diversity include BLM-authorized actions within the planning area, as well as external actions beyond the control of the BLM. External factors influencing biological diversity include changes to the natural fire regime, urbanization (e.g., WUI), agricultural conversion of rangelands, INPS, and energy development. Maintaining the diversity and distribution of habitats within the planning area is complicated by existing conditions of land ownership, lack of a natural fire regime, conflicting land use, INPS, WUI, and habitat fragmentation. The impacts of potential habitat changes on wildlife and special status species are discussed under Fish and Wildlife Resources and Special Status Species elsewhere in this chapter.

Surface-disturbing Activities. Surface-disturbing activities on BLM-administered land varies with the alternatives. Under Alternative A, surface-disturbing activities are evaluated on a case-by-case basis and are allowed on highly erosive soils. In addition, except for the South Bighorns, surface disturbance and occupancy are currently allowed on slopes greater than 25 percent with the BLM authorized officer's permission. Alternative D allows surface-disturbing activities on highly erosive soils. Such activities are either restricted or not allowed under the other three action alternatives. Alternative B places an NSO restriction on highly erosive soils, while alternatives C and E require that surface-disturbing activities be modified (located) to avoid areas of highly erosive soils to the greatest extent practicable. Under all alternatives, guidance BMPs are applied to minimize impacts of surface-disturbing activities, whether they are on highly erosive soils or not. As shown in Table 4-1, projected long-term surface disturbance is lowest for Alternative B and approximately double for the other alternatives. The actions proposed under alternatives B, C, and E to address fragmentation of habitat indirectly reduce the amount of surface disturbance occurring in contiguous blocks of native vegetation in the planning area.

In general, surface-disturbing activities are anticipated to result in long-term loss, degradation, and fragmentation of habitats, thereby impacting biological diversity of the planning area. Construction of well pads and roads, pits and reservoirs, and pipelines and powerlines; mining; and vegetation treatments are the kinds of surface-disturbing activities anticipated in the planning area. Surface disturbance

associated with permanent linear infrastructure (roads) is anticipated to have the greatest adverse impact on habitat fragmentation. Alternative B is expected to have the least miles of linear features of all alternatives (Appendix M).

Proactive Management Actions. Table 2-3 describes proposed management actions (see Vegetation) for addressing habitat fragmentation in accordance with the different alternatives. Maps 20 through 22 show the spatial extent of these proposed management actions. Current management does not specifically address habitat fragmentation; likewise, management actions to address habitat fragmentation are not proposed for Alternative D. Alternative B proposes to address the challenge of habitat fragmentation by retaining intact blocks of native vegetation where contiguous acreage of more than 10,000 acres is present, the development potential for coal and oil and gas are low, and public ownership exceeds 50 percent. Alternative B makes all federal mineral estate and geophysical operations on public land surface within these areas administratively unavailable for the life of the plan. oil and gas leasing and on public land surface. These areas also would be closed to renewable energy development on public surface. Moreover, this management action withdraws the areas from the operation of public land laws related to locatable minerals and closes the area to mineral material disposal. Alternatives C and E propose similar management actions with different restrictions covering less acreage. The area of BLM-administered surface managed as intact blocks of native vegetation is 413,552 acres under Alternative B, 177,035 acres under Alternative C, and 131,879 acres under Alternative E.

Fire Management and Ecology. Wildland fire and prescribed burns could impact biological diversity and are anticipated to result in similar adverse short-term impacts to habitat; however, the long-term benefits of fire, especially prescribed fire, are generally anticipated to improve the quality of habitat types and contribute to the maintenance of biological diversity. The lack of a natural fire regime is the primary fire ecology factor impacting biological diversity. Over time, lack of a natural fire regime is anticipated to reduce biological diversity in the planning area. Current management does not specifically address lack of a natural fire regime; however, it does utilize prescribed fire to manipulate vegetation to achieve resource objectives. All Action Alternatives propose to utilize prescribed fire to achieve measurable objectives for resource management, reduce hazardous fuels, and reintroduce fire into fire-adapted ecosystems within the planning area.

INPS. To various degrees, INPS are anticipated to continue to spread within the planning area under all alternatives. The spread of INPS is anticipated to contribute to the loss, degradation, and fragmentation of habitats, as well as to the reduction of biological diversity over time.

Conclusion. The conditions of habitat fragmentation and biological diversity are anticipated to be impacted by current management and by management actions proposed as part of Action Alternatives. Overall, habitat fragmentation is anticipated to have adverse impacts on biological diversity and biological resources. The primary factors impacting habitat fragmentation in the planning area are surface-disturbing activities that break blocks of habitats into smaller units and proactive actions to avoid or minimize fragmentation. The primary factors impacting biological diversity in the planning area are surface disturbance, fire management and ecology, INPS, and habitat fragmentation. Considering these factors, Alternative B is anticipated to contribute the least to habitat fragmentation and have the least adverse impact to biological diversity. For the same reasons, alternatives A and D are anticipated to contribute the most to habitat fragmentation and have the greatest adverse impact to biological diversity. Alternatives C and E are anticipated to result in similar habitat fragmentation, albeit more than Alternative B, but less than alternatives A and D. Likewise, alternatives C and E are anticipated to maintain similar conditions of biological diversity, including less adverse impacts than under alternatives A and D, but more than under Alternative B.

4.4.1 Vegetation – Forests, Woodlands, and Forest Products

Actions occurring through implementing each alternative could affect forests, woodlands, and forest products. This section describes the impacts each alternative has on forests, woodlands, and forest products in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts are described as beneficial or adverse with respect to forests, woodlands, and forest products. Refer to Map 23 for forest and woodland resources.

Actions restricting forest management practices or contributing to the decline in abundance, distribution, or health of forests, woodlands, and the availability, quality, and quantity of forest products are considered adverse impacts. Indirect impacts include any change in the forest and woodland species, vigor, health, site quality, and vegetative community type as a result of natural forces (e.g., insect and disease, fire, and drought conditions), management actions from other resources, or failure to implement management actions. Conversely, beneficial impacts include actions that enhance management, improve health, and protect and restore forests and woodlands in the planning area. For the purpose of this analysis, a short-term impact is one that is apparent within a 5 year period. A long-term impact is one that persists for more than 5 years.

Both natural and human activities could produce beneficial or adverse impacts to the forest and woodland communities. Natural regeneration is an example of this. In an old growth forest, natural regeneration restores genetic diversity, sustained yield, and an uneven-aged stand to benefit continuous production, insect and disease control, and produce economic benefits by proper land utilization, 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 stand.

4.4.1.1 Methods and Assumptions

Methods and assumptions used in this analysis include the following:

- No current forest or woodland inventory or age and species classifications are available for the planning area.
- The condition, species content, and vitality of the forest and woodland ecosystem rest on the foundation of the soils, topography, slope/aspect, and microclimate and climatic forces specific to the region.
- Forest and woodland management treatments promote forest and woodland preservation, production, health, and value.
- Distributing and managing vegetative treatments will vary in forest and woodland areas depending on the desirable goals (e.g., fuel reduction in a WUI area).
- Livestock grazing in forests and woodlands generally remain compatible with forest management under all alternatives; many forests and woodland areas are inaccessible to livestock due to steep slopes, physical barriers, or proximity to other portions of grazing allotments.
- Old growth stands or those to be managed for old growth will follow the Healthy Forests Restoration Act (HFRA) (2003) Section 102 for maintaining and managing these stands.

4.4.1.2 Analysis of Alternatives

Allowable uses and management actions potentially impacting forests, woodlands, and forest products primarily include surface-disturbing activities and proactive management actions.

As forests, woodlands, and forest products are impacted by the alternatives, forests, woodlands, and forest products can, in turn, impact other resources. The impacts of forests, woodlands, and forest products on other resource topics (i.e., physical, biological, fire management and ecology, etc.) are discussed under the appropriate impacted resource section in this chapter.

Impacts Common to All Alternatives

The types of impacts projected to occur to forests, woodlands, and forest products as a result of the various 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. The following paragraphs provide a general description of potential impacts to forests, woodlands, and forest products not anticipated to differ among alternatives.

Potential air quality restrictions on vegetative treatments vary depending on air quality conditions within the immediate area at the time of proposed treatments. Potential short-term adverse impacts to vegetative treatments include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke.

Direct long-term adverse impacts to forest management occur in localized areas where new cultural resource sites are discovered. While not typically found in forested areas, cultural sites could restrict location of vegetative treatments and access roads, thus decreasing the accessibility and the forest acreage available for treatments. However, it should also be noted that the size of a cultural site is only a small percentage of the total acreage involved.

Potential impacts from VRM classifications, soil and water resources, air quality, INPS, NHTs and Other Historic Trails, transportation, OHV use, wildlife, and special status species are anticipated to influence the size and shape of forest and woodland treatments and restrict the location and construction of access roads. Silviculture treatments in forests and woodlands (e.g., burning for regeneration purposes) defers livestock grazing for two growing seasons to allow for regeneration (BLM 2004e).

Recreation use within forestlands could result in indirect short-term adverse impacts from accidental fires, unauthorized woodcutting within and adjacent to campgrounds, and degradation of vegetation along trails and roads. Unless properly designed and managed, development of recreational trails, both motorized and nonmotorized, could have an adverse impact on forests and woodlands by eroding soil. Increased development of nonmotorized and motorized trails and trailheads could increase recreational use and associated impacts to forestlands over time.

The development of wind-energy sites is anticipated to have a localized, but direct, adverse impact on forestlands and forest management activities for all alternatives. Developing facilities and infrastructure associated with wind energy, transportation networks, minerals, reservoirs, and recreation are anticipated to increase habitat fragmentation in the planning area and remove forest acres available for management.

Short-term impacts regarding the timing or location of vegetative treatments result from temporary CSU restrictions, seasonal NSO restrictions, or no surface development restrictions within buffers for special status species, raptors, and bald eagle roost sites located within forests and woodlands. In addition, a seasonal restriction on forest management occurs under all alternatives for the Jackson Canyon ACEC. These restrictions may apply to newly developed and existing ACECs and other MAs.

Fragmentation of forests and woodlands could increase depending on the forest prescription applied; however, this impact is anticipated to be minimal because regeneration of treated areas would create forest and woodland diversity and age-class diversity. In addition, a direct long-term impact to forest

lands by the disposal of forest lands located within 5 miles of subdivisions and (or) communities is anticipated.

Alternative A

Surface-disturbing Activities. Under Alternative A, 1,000 acres of short-term surface disturbance is projected for prescribed burning and silviculture treatments in forest and woodlands. Short-term surface disturbance is anticipated to increase the potential for short-term adverse impacts to soil erosion, water quality, and INPS; however, the relatively small size of treatment areas and the use of BMPs are expected to minimize these short-term impacts. The long-term benefits from prescribed burning and silviculture treatments will outweigh the short-term impacts by reducing the fire hazard through fuel removal, increasing opportunities for natural regeneration, and controlling insects and disease. In the long term, the current practice of using full suppression to control wildland fire is expected to contribute to the increase in fuel loads, thereby increasing the risk of more intense and possibly catastrophic fires.

Proactive Management Actions. Current forest and woodland management is directed at ponderosa pine and lodgepole pine composition in the 17 Forest Management Areas (FMAs) and intended to compliment harvest and stand vigor. All silviculture treatments are available for use under current management. At least 50 percent of the lodgepole and ponderosa pine volume will be cut using select cutting or clear-cutting. This includes the immature stands, overly mature trees, and trees infested with insects and (or) disease. Clear-cutting 3 to 5 acres would provide for natural regeneration; artificial regeneration would occur if there is insufficient or no natural regeneration. Management actions are anticipated to benefit these communities by improving the overall condition of these stands and enhancing age and species diversity.

Under Alternative A, 17 FMAs are inventoried and classified. Once the inventory is complete, 17 forest management plans will be written and treatments developed to address site-specific forest conditions. Current management focuses on the ponderosa and lodgepole pine stands in these areas. An estimated 600 thousand board feet (MBF) would be harvested annually on 50 to 1,000 acres.

Forest management objectives in the Jackson Canyon ACEC include hazard reduction, timber stand improvement, and insect- and disease-control treatments. Sales of forest products are limited to individual and small harvesting operators. The site has seasonal restrictions for the bald eagle roost and transportation currently is limited to existing roads and trails.

Thinning practices will continue in the Muddy Mountain EEA as needed with approximately 200 MBF harvested annually in the next 5 years and then 25 MBF annually thereafter. These silvicutural treatments will benefit insect and disease control, fuel reduction for the protection of recreation areas, and the health and vigor of forest stands.

The forest products market also plays a vital role in assuring the removal of the sawtimber, post and poles, firewood, and hobby wood. Removing a portion of the forest and woodlands by selective harvest allows for a reduction in hazardous fuels and protection against wildland fires.

Big game habitats in forested areas require more intensive management, which could alter the forest management plans; however, forest and woodland management practices generally compliment and improve habitats for elk and mule deer. Seasonal stipulations limit some management practices, such as forest management operations.

Forest and woodland treatments could be reduced and (or) prohibited in portions of other MAs. Restriction on treatments could reduce commercial harvest, accessibility, and vegetative management for the benefit of forest and woodland health and fire protection (i.e., fuel reduction). The aspen and

woodland communities (limber pine and juniper) will be inspected, and the actions to achieve the properly functioning condition will be implemented on a case-by-case basis.

Alternative B

Surface-disturbing Activities. Anticipated impacts under Alternative B for surface-disturbing activities are expected to be similar in nature but 400 acres less (600) than under Alternative A for prescribed fire and silviculture treatments in forests and woodlands. However, Alternative B results in the lowest acreage (600) of silvicultural treatments relative to all other alternatives.

Proactive Management Actions. Under Alternative B, forestlands are inventoried and classified as commercial forestland or noncommercial woodland. Forests are managed primarily for watershed stability, wildlife habitats, and recreation, with an emphasis on forest age diversity, species vitality, and genetic diversity.

Ponderosa pine in Esterbrook, Jackson Canyon, and Little Red Creek are managed as old growth forest. Prescribed burns and harvest are designed to thin new growth, maintain old growth, and maintain desired understory. Wildland fire is utilized as a tool to achieve desired conditions for watershed stability and wildlife habitats unless it poses a risk to forest stands or recreation infrastructure. Silviculture treatments proposed are the same as in Alternative A, with the exception of two different management schemes. Insect and disease infestations are allowed to run their natural course and clear-cuts would be smaller than five acres with meandering boundaries. The lack of any attempts to eradicate or control insect and disease damage produces high fuel loading and does not conform to the fire plan, resulting in increased fragmentation due to increased tree mortality areas.

Silvicultural treatments will be applied, as needed, to achieve objectives in the aspen and woodland communities. Alternative B proposes to manage the same acreage of aspen (2,822) as Alternative A, but toward desired plant community (DPC) per criteria defined in the Aspen Ecosystems Objectives for sustaining biological diversity. Unlike Alternative A, all harvesting slash or forest and woodland residues resulting from silvicultural treatments or natural elements are scattered, piled and burned, or chipped onsite to eliminate fuel loading.

Forest management in the Jackson Canyon ACEC is similar to Alternative A and places restrictions on commercial harvest. For example, only existing roads and trails could be used to haul wood products, thereby limiting the effectiveness and efficiency of operations.

Management of the 1,419-acre Muddy Mountain EEA continues according to the Forest Plan established in 2001 and emphasizes benefits to recreation use and wildlife habitats. Casual harvest up to 100 MBF occurs where recreation and wildlife objectives are met.

Alternative C

Surface-disturbing Activities. Anticipated impacts under Alternative C for surface-disturbing activities are expected to be similar in nature, but impact 600 acres more (1,600) than under Alternative A for prescribed fire and silviculture treatments in forests and woodlands. Alternative C treats 600 more acres with silviculture treatments relative to other alternatives.

Proactive Management Actions. Forest and woodlands are managed to achieve a sustainable flow of wood products. Forest and woodlands are classified as commercial or noncommercial by inventories and classification systems. Sanitation cuts are used to control blister rust, dwarf mistletoe infestations, and insect infestations from becoming epidemic.

The forest units in Esterbrook, Little Red Creek, and Jackson Canyon receive the same management as in Alternative A; however, there is opportunity to develop roads and trails to aid in the removal of forest products and to support forest management practices. The silvicultural treatments supported in Alternative A are the same for this alternative, with the exception of the size of the clear-cuts changing to 20 acres or less with meandering boundaries. Ingress and egress are addressed on a case-by-case basis with lands having legal access taking the lead on forest management opportunities. Any isolated forest and woodland tracts utilize cooperative agreements with landowners for ingress and egress.

All opportunities to utilize wildland fire in commercial forest stands to reduce fuel loads will be taken, resulting in improved forest and woodland health in fire-dependent ecosystems.

Developing recreational trails, both motorized and nonmotorized, could have an impact on the forest and woodlands by creating soil and water erosion. Additional impacts could include damage to the vegetation, and public intrusion that creates litter, damage from campfires, and indiscriminate tree cutting.

The Muddy Mountain EEA will continue forest and woodland management practices as in Alternative B, with an annual harvest of 100 MBF.

As biomass markets are developed, slash and fuels created with the silvicultural treatments will be utilized, scattered, or burned to prevent fuel accumulations and will compliment fire-management plans.

Silvicultural treatments will be applied, as needed, to achieve objectives in the aspen and woodland communities; however, a smaller percentage (50% of Alternative B) of the aspen communities will be managed for DPC. Vegetation mosaics will be created with woodland and adjacent plant communities. Woodlands that provide thermal cover for elk and mule deer will be retained and allowed to expand, benefiting big game winter ranges, but also presenting encroachment problems in parks and grasslands.

Alternative D

Surface-disturbing Activities. Anticipated impacts under Alternative D for surface-disturbing activities are expected to be similar in nature, but impact more acreage than under Alternative A for prescribed fire, silviculture treatments, and vegetation mechanical treatments in forests and woodlands. Alternative D treats 2,200 more acres with silvicultural treatments relative to Alternative A, the most of any alternative.

Proactive Management Actions. Under Alternative D, overall conditions of the forest and woodland stands improve by placing emphasis on tree growth and production of forest products. As in the other alternatives, these stands are inventoried and classified. The ponderosa pine stands receive the benefit of a full range of silvicultural treatments and are managed as commercial forest. Forest and woodlands continue to increase in size, as there will be no management taken to disallow encroachment. No silvicultural treatments will be applied to the aspen and woodland communities.

Aspen stands continue to diminish and degrade, as there will be no active management of these stands, which must regenerate from suckers and sprouts. This would have an impact on wildlife habitats, VRM, soils and water conservation, fire plans to utilize aspen as a fire break, species diversity for forest and woodland health, and habitat fragmentation. Alternative D also utilizes an integrated management technique approach to reduce hazardous fuels in commercial timber areas.

Forestlands are inventoried and classified as commercial forestland or noncommercial woodland under Alternative D rather than in the 17 FMAs as described for Alternative A. Forests and woodlands are managed to achieve maximum wood growth and flow of wood products. Under Alternative D, overall conditions of the forest and woodland stands would be improved by placing an emphasis on tree growth

and production of forest products. Under Alternative D, there also would be fewer old growth forest and wildlife habitat improvements than under alternatives B or C.

The Muddy Mountain EEA will continue forest and woodland management practices as in Alternative A, with an increase in annual harvest after the first 5 years. The amount of the annual harvest would then be 100 MBF per year. Prescribed burns and the increased harvest decrease fire fuels and, therefore, protect the timber stands and recreational areas.

Ponderosa pine in Esterbrook, Jackson Canyon, and Little Red Creek are managed to achieve a maximum flow of wood products. Forest management in the Jackson Canyon ACEC would differ from Alternative A by maximizing harvest of wood products within bald eagle roost areas (nonroosting periods only). Commercial harvest of wood products would be allowed to construct necessary roads and trails to remove forest products.

Alternative D proposes to manage 25 percent (706 acres) of the aspen acres identified in Alternative A, but toward DPC per criteria defined in the Aspen Ecosystems Objectives for sustaining biological diversity. Woodland encroachment is not treated under Alternative D, which could increase the size of forests and woodlands. No silvicultural treatments are applied to aspen stands or other woodlands. Aspen stands, therefore, are anticipated to continue diminishing and degrading with anticipated adverse impacts to wildlife habitats, VRM, soils and water conservation, fire management, species diversity for forest and woodland health, and habitat fragmentation. Unlike Alternative A, biomass generated from silviculture treatments would be utilized.

Similar to Alternative A, forest and woodland management practices for the Muddy Mountain EEA continue; however, Alternative D accelerates harvest after the first 5 years to 100 MBF per year, thereby providing additional benefit to the forestry program compared to Alternative A. Accelerated harvest is anticipated to reduce fuel loads and improve overall stand health compared to Alternative A.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. Anticipated impacts under Alternative E for surface-disturbing activities are expected to be similar in nature, but 600 acres more (for a total of 22,100) than under Alternative A for prescribed fire, silviculture treatments, and vegetation mechanical treatments in forests and woodlands. Alternative E treats the same acres as Alternative C.

Proactive Management Actions. The forest and woodlands are managed to achieve a sustainable flow of wood products, with the forest being the primary resource. The forest and woodlands also are managed for multiple uses (i.e., watershed health and stability, wildlife, recreation, livestock grazing, etc.). The forest and woodlands are inventoried and classified, and an active forest management program is implemented to achieve desired health conditions and a sustainable flow of wood products. Insects and diseases would become endemic rather than epidemic.

Ponderosa pine stands are managed to achieve a sustainable flow of products, and silvicutural treatments (i.e., burning, thinning, etc.) are implemented to maintain health and achieve the desired overstory and understory. Wildlife trees and snags are encouraged in these stands, especially in bald eagle roosts. In the Jackson Canyon ACEC, individual and small contractors complete forest-management activities and rehabilitate all roads and trails.

The entire array of silvicultural treatments will be utilized to manage the forest and woodlands, including prescribed burning, harvesting (thinning, clear-cutting, shelterwoods, seed-tree cuts, release cuts), herbicide and insecticide treatments, planting, and seeding. Clear-cuts will be less than 20 acres with meandering boundaries. The larger clear-cut units and the lack of suppression of fires are anticipated to

cause temporary fragmentation of the vegetation, but natural and artificial regeneration would eventually revegetate these areas. Access to forest and woodlands will be determined on a case-by-case basis.

Fire will not be suppressed where it will benefit forest and woodlands and replicates the natural fire regimes of the ecosystem. Contrary to current management, Alternative E utilizes wildland fire in all forest stands to reduce fuel loads and (or) satisfy stand prescriptions, thereby improving forest and woodland health in fire-dependent ecosystems.

Forest stands within the Muddy Mountain EEA will be managed according to the forest plan with an annual harvest of 100 MBF. Aspen stands will be restored with management actions specific for the species. The overall management of the forest will benefit recreational and educational activities.

Silvicultural treatments will be applied, as needed, to achieve objectives in the aspen and woodland communities. Vegetation mosaics will be created with woodland and adjacent plant communities. Woodlands that provide thermal cover for elk and mule deer will be retained and allowed to expand, which will benefit big game winter ranges. Livestock grazing and big game browsers and grazers may be restricted in stands that have been burned and are regenerating.

Alternative E utilizes aspen communities to the greatest extent possible as natural fire breaks in WUI areas and wildlife habitats. Unlike Alternative A, Alternative E utilizes a combination of management practices to reduce hazardous fuels in commercial timber areas.

Alternative E proposes to manage the same acreage of aspen (2,822 acres) as Alternative A, but toward DPC per criteria defined in the Aspen Ecosystems Objectives for sustaining biological diversity. Aspen stands will be restored; however, woodland encroachment in other vegetative types will be treated to protect other resource values. Silvicultural treatments are applied, as needed, to achieve objectives in the aspen stands and woodlands. Vegetation mosaics are created with woodlands and adjacent plant communities. Woodlands that provide thermal cover for elk and mule deer are retained and allowed to expand. Unlike Alternative A, slash and fuels created by silviculture treatments are utilized where biomass markets are available, or scattered or burned to prevent fuel accumulations complimenting fire management plans. Management of the 1,419-acre Muddy Mountain EEA continues according to the Forest Plan established in 2001 as described for Alternative C.

4.4.1.3 Conclusion

The types of surface disturbance are anticipated to be similar for all alternatives with the primary difference attributed to the acres of silviculture treatments. All alternatives adhere to the Healthy Forests Restoration Act of 2003, the Healthy Forests Initiative, and the 10-Year Comprehensive Strategy. Alternative B treats the least acreage (600 acres), followed by Alternative A (1,000 acres), alternatives C and E (1,600 acres), and Alternative D (3,200 acres). It is anticipated that silviculture treatments will benefit forest and woodland health, including insect and disease control and fuel reduction. The lack of any control actions for insect and disease damage proposed by Alternative B is anticipated to increase fuel loading, thereby increasing the risk of wildfire and insect epidemics relative to other alternatives. However, the use of wildland fire to achieve objectives in commercial forests under alternatives B, C, and E are anticipated to reduce fuel loads and benefit forests, woodlands, and wood products in the long term relative to alternatives A and D. Management of aspen communities toward DPC also is anticipated to benefit forests, woodlands, and wood products, with the most potential benefit anticipated from alternatives B and E. Restrictions to protect other resource values are anticipated to adversely impact forests, woodlands, and wood products the most under Alternative B and the least under alternatives A and D.

The anticipated adverse impacts from treating fewer acres silviculturally under Alternative B are partially offset by the anticipated benefits of greater INPS control and fire-management actions under Alternative B relative to alternatives A and D. In addition, Alternative B's restrictions on surface disturbance in areas of highly erosive soils, slopes greater than 25 percent, and reclamation requirements are anticipated to conserve soils and site quality more so than alternatives A and D.

Meaningful differences in surface-disturbing activities and reclamation, silviculture treatments, insect and disease control, restrictions by other resources and resource uses, and fire management and ecology actions form the following conclusion: Impacts to forests, woodlands, and forest products are anticipated to be the least adverse under Alternative E and the most adverse under Alternative B. Adverse impacts to forests, woodlands, and forest products under alternatives C and D are expected to be similar to, but less than Alternative A.

4.4.2 Vegetation – Grassland and Shrubland Communities

Actions that contribute to the decline in abundance or distribution of grassland and shrubland communities are considered adverse impacts. Conversely, beneficial impacts to grassland and shrubland communities include actions that protect or restore these communities in the planning area.

Direct impacts to grassland and shrubland communities result from surface-disturbing and other activities that result in vegetation removal and mechanical damage to plants. Surface-disturbing activities generally are considered an adverse direct impact to grassland and shrubland communities. Activities such as livestock grazing, wildlife use, wildland fire and vegetative treatments (e.g., prescribed fire, chemical, or biological) also have direct impacts on these communities, which may be both adverse and beneficial. Indirect impacts to grassland and shrubland communities result from activities that alter the quality and health of these communities. For example, activities that result in soil compaction, erosion, changes in hydrology, and encroachment of INPS are considered indirect impacts. Beneficial impacts to grassland and shrubland communities include activities that minimize, reduce, or prevent the spread of INPS into these communities and vegetative treatments to improve these communities. For the purpose of this analysis, short-term impacts to grassland and shrubland communities comprise those activities that contribute to the decline in abundance or distribution of these communities within 5 years of when the activity occurs. Long-term impacts to grassland and shrubland communities are those that require more than 5 years to manifest on the surface.

4.4.2.1 Methods and Assumptions

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

- Almost all surface disturbance from oil and gas development could occur within grassland and shrubland communities.
- Based on the definition of surface-disturbing activity (mechanized actions), oil and gas development is identified as the primary source of surface disturbance in the planning area.
- Surface disturbances generally increase the potential for accelerated erosion.
- Surface disturbances substantially increase the likelihood of the introduction and spread of INPS in an area.
- Management toward DPC is assumed to exceed the requirements of managing toward DFC.
- The placement of supplements can affect the distribution of livestock grazing within grassland and shrubland communities.

- Grazing and browsing, whether by livestock or wildlife, is important for maintaining the health of grassland and shrubland communities. Improper grazing can decrease plant vigor and ground cover, lead to increased erosion, degrade soil nutrients and water retention, and impact rangeland health.
- Grazing practices can maintain, improve, or degrade rangeland health. The *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b) are designed to maintain or improve rangeland health and are applied under all alternatives. Approximately 10 percent of the public land acreage in the planning area is evaluated annually for rangeland health.
- As rangelands are evaluated, guidelines are implemented to improve undesirable conditions regardless of allotment category (see Glossary). Over time, implementing guidelines is expected to continue to improve and maintain the health of these communities. Please refer to the Livestock Grazing section in this chapter for more detailed information.
- The BLM and grazing lessees strive to manage livestock grazing to maintain or improve rangeland health.
- The primary conduit for the initial establishment of the spread of INPS is through the road network.
- 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 negative impacts with long-term beneficial impacts to wildlife and wildlife habitats.

4.4.2.2 Analysis of Alternatives

Allowable uses and management actions that could impact grassland and shrubland communities include surface-disturbing activities, livestock grazing, wildlife use, OHV use, fire management, and proactive management actions. These allowable uses and management actions are expected to result in changes that directly or indirectly influence diversity, productivity, successional stage, nutrient cycling, and continuity of grassland and shrubland communities.

Impacts Common to All Alternatives

The types of impacts projected to occur to grassland and shrubland communities as a result of the various alternatives are similar; however, the extent and intensity of impacts is anticipated to vary by alternative. Therefore, impacts to grassland and shrubland communities from surface-disturbing activities, livestock grazing, wildlife use, OHV use, fire management, and proactive management actions are described under the individual alternatives.

Surface-disturbing activities occur under all alternatives. BMPs for surface-disturbing activities are applied under all alternatives. Under normal circumstances, standard mitigation guidelines are effective in minimizing impacts to resources; however, conditions such as steep slopes, highly erosive soils, or extreme environmental events may require more aggressive management actions to mitigate adverse impacts.

The use of certified weed-free seed mixes and, in some situations, the use of nonnative species reduces the establishment and spread of INPS. Under all alternatives, 6,016 acres in the planning area are not available for livestock grazing. This could reduce the spread of INPS in these areas; however, wildlife continues to use these areas and serve as vectors for spreading INPS.

Alternative A

Surface-disturbing Activities. Under Alternative A, surface-disturbing activities are evaluated on a case-by-case basis. Surface disturbance directly impacts plant communities through vegetation removal and mechanical damage to plants. Indirect impacts of surface disturbance on vegetation include soil compaction, erosion, changes in hydrology, and encroachment by INPS. These indirect impacts can limit recovery or rehabilitation of vegetative communities following disturbance. Conversely, vegetation treatments (e.g., mechanical methods, prescribed fire, prescribed grazing, or chemical treatment), while resulting in short-term disturbance, will result in long-term beneficial impacts to grassland and shrubland communities. Vegetation treatments can successfully achieve vegetative objectives to increase plant and seral stage diversity, control INPS, improve the quality and quantity of vegetation for wildlife and livestock, and create or maintain the desired mosaic.

Fire management also can benefit grasslands and shrublands. Prescribed fire is an important vegetation management tool used to achieve a desired vegetative condition, but it also carries some risk of INPS establishment. Prescribed fire can help meet specific management objectives, such as maintaining a range of seral stages within shrublands; however, prescribed burns generally are not possible in areas with oil and gas development or WUI.

Under Alternative A, short-term and long-term disturbances from BLM actions impact the third highest acreage of all alternatives, following alternatives D and E, respectively (see Appendix M). These two amounts of acreage (21,087 acres for Alternative A and 22,080 acres for Alternative D) are within 5 percent of each other. Under Alternative A, the impacts to grassland and shrubland communities associated with surface-disturbing activities are expected to be primarily adverse. Short-term impacts occur in the 5 years following the disturbance and include damage to vegetation and spread of INPS. Long-term impacts occur beyond 5 years and primarily include loss of habitat due to development. Based on the case-by-case basis of reclamation actions under Alternative A and amount of long-term disturbance acreage projected, Alternative A is expected to have short and long-term adverse impacts to grassland and shrubland communities.

Livestock Grazing. Livestock grazing can have both beneficial and adverse impacts on health and productivity of vegetative communities. Over the last 50 years, rangeland conditions in the planning area have improved with the application of better grazing management practices. However, areas where rangeland health is most likely to be adversely impacted are areas where livestock congregate. These include areas containing water, shade, and (or) more palatable forage. Therefore, management is often geared toward improving the overall distribution of livestock within an allotment. This is accomplished through implementing BMPs, such as developing allotment management plans or coordinated RMPs, changing grazing systems, and implementing range improvement projects (i.e., fencing, water development projects, salt and mineral licks). Kovalchik and Elmore (1992) describe the compatibility of livestock grazing using different grazing systems with willow-dominated plant associations similar to those found in some riparian areas of the planning area.

In addition to congregation areas, livestock movement transports seed and propagates of INPS, thereby expanding infestations of these species. Congregation areas, transport of INPS, and adverse impacts to vegetation from livestock and native ungulates historically have contributed to the challenge of managing rangeland health and productivity in the planning area.

Through proper grazing management, livestock grazing can benefit rangeland health by improving plant vigor, increasing vegetative cover, and reducing INPS infestations. This occurs by using hoof action to break up soil crust that restricts infiltration and inhibits seedling establishment, removing old growth and decadent vegetation that inhibits new growth, increasing cover and vigor of native vegetation, and

decreasing soil erosion. Healthier plant communities are more resistant to the spread of INPS and other undesirable plant species. One tool used to decrease the spread of INPS in an area is to have livestock graze an INPS species at a crucial point in its life-cycle. For example, goats can be used to graze thistle prior to seed set and cattle can be used to graze areas infested with cheatgrass in early spring, thereby reducing its vigor and making water and nutrients more available to native vegetation.

On the other hand, over-utilization over time by livestock or wildlife in grasslands and shrublands reduces abundance of certain native plants, allows less desirable forage species to increase, and allows INPS to enter and, in some cases, dominate communities. An indirect impact of over-grazing is a decrease in ground cover, resulting in an increase in runoff and soil erosion, which can impact the health of the entire plant community. These adverse impacts can be both short-and long-term.

Under Alternative A, monitoring and preventing of over-utilization over time is emphasized on higher priority allotments (categories I and M). By emphasizing monitoring on higher priority allotments only, undesirable conditions in lower priority allotments may not be identified and deterioration or improvement occurring in vegetative communities may not be realized in a timely manner. Alternative A utilizes stock driveways (SDWs) to the fullest extent possible. No holding period is required to flush livestock to reduce the risk of INPS spread under Alternative A. Short- and long-term adverse impacts are anticipated under Alternative A to grassland and shrubland communities based on the 10 percent annual evaluation of public land acreage, full use of SDWs, and a no-holding period for livestock.

OHV Use. Alternative A is the least restrictive to OHV use. Under this alternative, the majority of the planning area is limited to existing roads and trails. OHV use is limited by legal access to public lands and the availability of existing roads and trails. Off-road use is allowed without prior approval for activities defined under casual use regulations or for other necessary tasks as defined in the 1985 RMP. Current guidelines provide for off-road and off-trail travel up to 300 feet for recreational purposes. This 300-feet guidance is common to all alternatives. Areas that allow OHV activities, but are further restricted by limiting use to designated roads and trails, include the Red Wall/Gray Wall, the Sandhills, along the North Platte River, and SRMAs. These areas generally have sensitive soils, high visual qualities, or high visitor numbers. Alternative A requires the least amount of proactive management by the BLM and, therefore, has the most impacts to grassland and shrubland communities. Areas where damage from OHV use is most likely to occur include stream crossings, areas with highly erosive soils, steep slopes, and vegetative communities with plants, such as Wyoming big sagebrush, susceptible to physical damage.

OHV use on public lands can result in adverse short-term and long-term impacts to vegetation in grassland and shrubland communities. A one-time disturbance resulting from OHV use causes physical damage to vegetation by breaking stems and branches and may disturb the soil surface depending on soil conditions, slope, and ground cover. Usually, with a one-time disturbance, plants and disturbed areas recover. However, with repeated use, new trails are established, resulting in long-term loss of vegetation, soil erosion, and introduction of INPS seeds into grassland and shrubland habitats.

Under Alternative A, OHV use in the Poison Spider OHV Park continues. The impact on vegetation in this area would be greater than other areas due to the intensity of use and is not reflective of OHV use across the planning area.

Fire Management. Wildland fire and prescribed fire have both adverse and beneficial impacts on grassland and shrubland communities. In the short term, fire results in the loss of habitats and can promote the spread of INPS, which can out-compete native plants. In the long term, because of the role fire historically played in these communities, fire can increase vegetative diversity across the landscape, rejuvenate decadent plants, and improve the overall health of these communities. In shrubland

communities, the impacts resulting from fire usually are long term and depend on the scale and severity of the disturbance. The potential for sagebrush shrublands to revert back to sagebrush depends on the acreage burned, the distance to seed sources, and the spread of INPS, such as cheatgrass, which can increase fire frequency. Limiting or protecting acreage from fire may in some cases lessen direct loss of grassland and shrubland communities and reduce the potential spread of INPS in the short term, but considering fire's historical role, the lack of fire may decrease the overall health of these communities.

Fire can have beneficial impacts in the form of enhancing age structure, restoring vigor, and restoring community types through regeneration. Fire-suppression activities can limit short- and long-term fire damage to vegetation, but can also cause mechanical and chemical damage to vegetation and increase the likelihood of INPS introduction and (or) spread into an area. Direct short- and long-term impacts to grassland and shrubland communities can occur from wildland fire and from fire-suppression tactics. Using full suppression tactics and (or) limited tactics can damage vegetation, a direct adverse impact, and potentially spread INPS, an indirect adverse impact. If INPS are already present in an area, they can spread regardless of the type of suppression used.

Under Alternative A, limitations using heavy equipment occur only in elk crucial winter range and areas containing wagon ruts of the Oregon and Bozeman trails. Using heavy equipment elsewhere is on a case-by-case basis. Fire suppression and rehabilitation and stabilization following a wildfire are on a case-by-case basis under Alternative A. No integrated management technique approach for fuels is implemented. Based on the approach to fire management, Alternative A is anticipated to have direct and indirect adverse impacts to grassland and shrubland communities.

Proactive Management Actions. Beneficial long-term impacts to grassland and shrubland health occur under each alternative to varying degrees by managing a percentage of these communities toward DFC. Managing toward DFC improves overall community health, improves plant vigor, reduces potential erosion, and improves forage for livestock and wildlife. Management actions to achieve DFC in grassland and shrubland communities are implemented on a case-by-case basis under Alternative A. This type of management could result in the smallest area of grassland and shrublands at DFC. Alternative A has the least beneficial long-term impacts of all the alternatives on improving grassland and shrubland communities because this management action is implemented on a case-by-case basis.

Alternative B

Surface-disturbing Activities. Under Alternative B, the projected short- and long-term surface disturbances from BLM actions are the lowest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative B (11,565 acres) is approximately 45-percent less. Alternative B implements the strictest reclamation requirements of all alternatives, requiring retreatment of reclaimed areas that do not have 50 or 80 percent of predisturbance vegetative cover in 3 or 5 years, respectively. In addition, all seed mixes must be certified weed-free under Alternative B, potentially reducing the spread of INPS.

Under Alternative B, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature as described under Alternative A, but differ in intensity due to the number of acres disturbed and more stringent reclamation requirements. Based on the acreage of disturbance and the management actions implemented to reduce disturbance to grassland and shrubland communities, adverse impacts under Alternative B are expected to be less than Alternative A and all other alternatives.

Livestock Grazing. The same types of impacts described under Alternative A are expected to occur under Alternative B, but the intensity of the impacts differ. Alternative B places equal emphasis on all allotments for monitoring and prevention of improper grazing and downward trends. Placing emphasis

on monitoring all allotments allows the BLM to identify and respond to undesirable conditions in all allotments in a timely manner, as well as identifying the deterioration or improvement occurring in vegetative communities. Livestock grazing is managed to maintain protective cover of the vegetation and litter, thereby reducing soil compaction and erosion. Forage utilization is limited to 40 percent of the current year's production to leave standing residual vegetation that would eventually become litter, a beneficial long-term impact to grassland and shrubland communities. Limiting forage utilization may impact livestock operations by requiring herding, fencing, rotational grazing, or limiting season of use. Under Alternative B, a livestock flushing period of 72 hours may be required to reduce the spread of INPS. The annual evaluation of all allotments, limits to forage utilization by livestock, and the livestock flushing period, are anticipated to have more beneficial impacts than Alternative A and the least adverse impact of all alternatives on grassland and shrubland communities.

OHV Use. Under Alternative B, the same types of impacts described under Alternative A from OHV use are expected to occur; however, the extent of these impacts are expected to be less. Alternative B closes the largest area to OHV use (26,027 acres), has the smallest area (909,651 acres) designated as limited to existing roads and trails, and has the largest area (425,657 acres) designated as limited to designated roads and trails. Alternative B expands the Poison Spider OHV Park to 242 acres. Based on the acreage of each designation, Alternative B is expected to be the least adverse to grassland and shrubland communities of all the alternatives.

Fire Management. The same types of impacts described under Alternative A from fire management are expected to occur under Alternative B, but the intensity of the impacts differ. Under Alternative B, appropriate management response is used on all wildland fires, designating what type of suppression activities are appropriate in certain locations of the planning area. No heavy equipment is used in areas of cultural resource sensitivity, big game crucial winter range, greater sage-grouse leks, and areas of highly erosive soils, benefiting grassland and shrubland communities by limiting damage to vegetation and reducing the risk of INPS invasion. Rehabilitation and stabilization of suppression activities also benefit grassland and shrubland communities by reducing the risk of the spread of INPS and soil erosion. Alternative B manages fuels with an integrated management approach to protect high resource values. Based on the type of management and limitations on suppression activities, adverse, short- and long-term impacts under Alternative B occur, but they would be less than Alternative A.

Proactive Management Actions. Beneficial impacts described under Alternative A are anticipated to occur under Alternative B from proactive management actions, but the intensity differs. Alternative B manages toward DPC in all sagebrush (630,183 acres) and mountain shrub communities (46,779 acres). Beneficial long-term impacts would be greater under Alternative B than under Alternative A and the greatest of all alternatives to grassland and shrubland communities.

Alternative C

Surface-disturbing Activities. The impacts under Alternative C are similar in nature to the impacts from surface-disturbing activities described under Alternative A, but differ in intensity. Under Alternative C, the projected short- and long-term surface disturbance from BLM actions is the second lowest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative C (20,358 acres) would be approximately 4-percent less. Alternative C requires retreatment of reclaimed areas that do not have 30 or 50 percent of pre-disturbance vegetative cover in 3 or 5 years, respectively. In addition, nonnative species may be used on a case-by-case basis in seed mixes. The use of nonnative species changes the plant community in reclaimed areas, but reduces the opportunity for the spread of INPS.

Under Alternative C, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature to Alternative A. However, based on the acreage of disturbance and the management actions implemented to reclaim disturbance to grassland and shrubland communities, adverse impacts under Alternative C are expected to be less than Alternative A.

Livestock Grazing. The impacts under Alternative C are similar in nature to the impacts from livestock grazing described under Alternative A, but would differ in intensity. Under Alternative C, the monitoring and prevention of improper grazing and downward trends are emphasized on category I and M allotments (see Glossary). Undesirable conditions or downward trends in rangeland conditions are not identified in lower priority allotments in a timely manner. In areas containing highly erosive soils, livestock grazing is managed to maintain protective cover of the vegetation. Forage utilization by livestock levels are established for areas with highly erosive soils to leave more residual vegetation and litter on the ground to increase ground coverage. Limits to forage utilization provide beneficial long-term impacts to grassland and shrubland communities by minimizing soil erosion and increasing nutrient recycling. Adverse impacts to livestock operations may occur based on these limitations and are discussed in more detail in the Livestock Grazing section. Under Alternative C, a livestock flushing period of 72 hours may be required in the Level I Weed Management Area, reducing the risk of INPS spread in these areas. Based on no requirement for evaluating a certain number of allotments annually, maintaining protective cover of vegetation on highly erosive soils only, and requiring flushing of livestock only in certain areas, Alternative C is expected to have short- and long-term adverse impacts to grassland and shrubland communities, although adverse impacts are less than Alternative A.

OHV Use. The impacts under Alternative C are similar in nature to the impacts from OHV use described under Alternative A; however, the extent of these impacts are expected to be less. Alternative C closes the second largest area (7,943 acres) to OHV use and designates 1,162,113 acres limited to existing roads and trails. Alternative C designates 191,236 acres as limited to designated roads and trails and expands the Poison Spider OHV Park to 285 acres. Adverse impacts under Alternative C from OHV use based on the designated acreage are less than under Alternative A.

Fire Management. The impacts under Alternative C are similar in nature to the impacts from fire management described under Alternative A, but differ in intensity. Management of wildland fires under Alternative C is similar to Alternative B, except there are no full suppression areas, and rehabilitation and stabilization include the fire area, not just the damage from suppression activities, reducing damage to vegetation, erosion, and the risk of the spread of INPS. Based on these additional management techniques, adverse short- and long-term impacts under Alternative C are expected to be less than Alternative A.

Proactive Management Actions. The impacts under Alternative C are similar in nature to the impacts from proactive management actions described under Alternative A, but differ in intensity. Alternative C manages 50 percent (315,902 acres) of existing sagebrush and 50 percent (23,390 acres) of existing mountain shrub communities toward DPC. Alternative C has greater beneficial long-term impacts to these communities than Alternative A.

Alternative D

Surface-disturbing Activities. The impacts under Alternative D are similar in nature to the impacts from surface-disturbing activities described under Alternative A, but differ in intensity. Under Alternative D, the projected short- and long-term surface disturbances from BLM actions are the highest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative D (22,080 acres) would be approximately 4-percent greater. Alternative D requires complete reclamation

within 5 years of the disturbance, but does not require any retreatment of reclaimed areas after final reclamation is complete. Nonnative species may be used in reclamation activities on a case-by-case basis.

Under Alternative D, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature to Alternative A. However, based on the acreage of disturbance and the management actions implemented to reduce disturbance to grassland and shrubland communities, adverse impacts under Alternative D are expected to be greater than under Alternative A and the highest of any alternative.

Livestock Grazing. The impacts under Alternative D are similar in nature to the impacts from livestock grazing described under Alternative A, but differ in intensity. Under Alternative D, the monitoring and preventing of improper grazing and downward trends are prioritized on the highest priority allotments. Alternative D places no restrictions on forage utilization, nor does it manage for maintaining protective vegetative cover on the allotments. In addition, no flushing period for livestock is required, increasing the risk of INPS spread. Based on the lack of forage utilization limitation, lack of flushing period, and the emphasis on preventing a downward trend on Category I allotments, Alternative D is anticipated to have short- and long-term adverse impacts to grassland and shrubland communities greater than those under Alternative A and the greatest of all alternatives.

OHV Use. Under Alternative D, the same types of impacts described under Alternative A are expected to occur. Alternative D closes 2,661 acres to OHV use (similar to alternatives A and E) and expands the Poison Spider OHV Park to 285 acres, similar to alternatives C and E. Alternative D designates 1,292,630 acres as limited to existing roads and trails and 66,001 acres as limited to designated roads and trails, similar to, but more than, Alternative A. Based on the acreage in each designation, adverse impacts under Alternative D are expected to be similar to Alternative A.

Fire Management. The impacts under Alternative D are similar in nature to the impacts from fire management described under Alternative A, but differ in intensity. Alternative D allows full suppression activities across the planning area, potentially resulting in the greatest adverse impacts of all alternatives, including damage to vegetation, erosion, and INPS spread. Rehabilitation and stabilization is conducted on a case-by-case basis. Similar to alternatives B and C, fuels management would utilize an integrated management approach. Based on these management strategies, adverse short- and long-term impacts are similar to, but less than, Alternative A.

Proactive Management Actions. The impacts under Alternative D are similar in nature to the impacts from proactive management actions described under Alternative A, but would differ in intensity. Alternative D manages 25 percent (157,546 acres) of existing sagebrush and 25 percent (11,695 acres) of existing mountain shrub communities toward DPC, resulting in greater beneficial long-term impacts to these communities than Alternative A.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. The impacts under Alternative E are similar in nature to the impacts from surface-disturbing activities described under Alternative A, but differ in intensity. Under Alternative E, the projected long-term surface disturbance from BLM actions is the second highest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative E (21,672 acres) is approximately 2-percent higher. Alternative E requires retreatment of reclaimed areas that do not have 30 or 50 percent of pre-disturbance vegetative cover in 3 or 5 years, respectively, similar to Alternative C. In addition, all seed mixes must be certified weed-free under Alternative E, although nonnative species may be used on a case-by-case basis, similar to Alternative C.

Under Alternative E, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature to Alternative A. Based on the acreage of disturbance and the management actions

implemented to reduce disturbance to grassland and shrubland communities, including reclamation activities, adverse impacts under Alternative E are expected to be less than under Alternative A.

Livestock Grazing. The impacts under Alternative E are similar in nature to the impacts from livestock grazing described under Alternative A, but differ in intensity. Under Alternative E, emphasis for monitoring and preventing improper grazing and downward trends is given to all grazing allotments. Alternative E establishes forage utilization levels for areas with a large amount of acreage of highly erosive soils. Forage utilization levels leave more standing residual vegetation, which, over time, increases the amount of litter on the ground and protects the soil from erosion. While livestock is managed to achieve forage utilization levels, it is recognized that wildlife also would be using these areas. Limits to forage utilization provide long-term beneficial impacts to grassland and shrubland communities by minimizing soil erosion and increasing nutrient recycling. Adverse impacts to livestock operations may occur based on these limitations and are discussed in more detail in the Livestock Grazing section. With proper grazing management, the health of grassland and shrubland communities can be maintained or improved. This can occur by breaking up soil crust that restricts infiltration and inhibits seedling establishment and by increasing cover and vigor of native vegetation. Increased cover and vigor of native vegetation can, in turn, minimize soil erosion. Livestock grazing can also be used to remove old growth and decadent vegetation that inhibits new growth. Under Alternative E, a livestock flushing period of 72 hours may be required in the Level I Weed Management Area, reducing the risk of INPS spread in these areas, similar to Alternative C. Based on no requirement for evaluating a certain number of allotments annually, maintaining protective cover of vegetation on highly erosive soils only, and requiring flushing of livestock only in certain areas, Alternative E is expected to have short- and long-term beneficial and adverse impacts to grassland and shrubland communities. The adverse impacts are anticipated to be less and the beneficial impacts are expected to be greater than those under Alternative A.

OHV Use. The impacts under Alternative E are similar in nature to the impacts from OHV use described under Alternative A. The extent of these impacts is expected to be less. Alternative E closes the second smallest area (2,224 acres) to OHV use and designates 1,162,244 acres limited to existing roads and trails, which is similar to Alternative C. The area limited to designated roads and trails is 196,824 acres, similar to Alternative C. Alternative E expands the Poison Spider OHV Park to 285 acres. Adverse impacts to grassland and shrubland communities under Alternative E are expected to be less than Alternative A based on the acreage in each designation.

Fire Management. The impacts under Alternative E are similar in nature to the impacts from fire management described under Alternative A, but differ in intensity. Under Alternative E, appropriate management response is used on all wildland fires, designating what types of suppression activities are appropriate in certain locations of the planning area. No heavy equipment is used in areas of cultural resource sensitivity, big game crucial winter range, greater sage-grouse leks, and areas of highly erosive soils, benefiting grassland and shrubland communities by limiting damage to vegetation and reducing the risk of INPS spread, similar to Alternative B. Rehabilitation and stabilization are conducted on a case-by-case basis, similar to Alternative D. Similar to alternatives B, C, and D, Alternative E utilizes an integrated management technique approach to reduce fuels. Based on these management strategies, long-term adverse impacts to grassland and shrubland communities under Alternative E are anticipated to be less than under Alternative A.

Proactive Management Actions. The impacts under Alternative E are similar in nature to the impacts from proactive management actions described under Alternative A, but differ in intensity. Alternative E manages toward DPC in all sagebrush (630,183 acres) and mountain shrub communities (46,779 acres), similar to Alternative B. Beneficial long-term impacts to grassland and shrubland communities are greater under Alternative E than under Alternative A, and, along with Alternative B, the greatest of all alternatives.

4.4.2.3 Conclusion

The impacts from surface-disturbing activities on grassland and shrubland communities are expected to increase as the acreage disturbed increases. Therefore, the alternatives with higher acreage disturbed result in a greater adverse impact to these communities. The alternatives with lower acreage disturbed result in lesser adverse impacts, when compared to the other alternatives. Meaningful differences in long-term disturbance acreage; reclamation requirements for surface disturbance; management of livestock including forage utilization, grazing allotment evaluation, and flushing periods; OHV use and designations; fire suppression tactics and rehabilitation; acreage available for wind-energy development; and managing toward DFC or DPC in shrubland communities form the basis for the following conclusion. Impacts to grassland and shrubland communities could be the least adverse under Alternative B and the most adverse under Alternative D. Potential adverse impacts to grassland and shrubland communities under alternatives C and E are similar and are expected to be less than Alternative A, but more than Alternative B.

4.4.3 Vegetation – Riparian and Wetland Communities

An impact to riparian and wetland areas impacts the physical, chemical, or biological components of the ecosystem. Actions that contribute to the decline in abundance, distribution, or functionality of riparian and wetland communities are considered adverse impacts. Conversely, beneficial impacts to riparian and wetland communities are activities that protect or restore these habitat types in the planning area.

Direct impacts to riparian and wetland communities result from disturbing vegetation or ground surface occurring in these communities. Indirect impacts to riparian and wetland communities result from actions within a watershed that cause a change in riparian and wetland functionality (e.g., increased rates of sediment loading or changes in hydrology), a change in water chemistry, and spread of INPS. For the purpose of this analysis, short-term impacts to riparian and wetland communities include actions contributing to the decline in abundance or distribution of these communities within 5 years of when the activity occurs. Long-term impacts to riparian and wetland communities are those requiring more than 5 years manifestation on the ground.

4.4.3.1 Methods and Assumptions

Evaluating potential impacts to riparian and wetland areas caused by changes in functionality or INPS establishment focuses on resource management actions that (1) cause surface disturbances or limit the impacts of 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 and wetland areas.

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

- 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 INPS 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 and wetland functionality.
- Placing salt and mineral supplements outside of riparian and wetland communities is one tool that can reduce wildlife and livestock use of riparian and 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 have no measurable impact on surface runoff, moderate stocking rates typically have a negligible impact on surface runoff, high stocking rates have a measurable impact on surface runoff, and consecutive years of high stocking rates have the highest potential for increasing surface runoff to streams.
- Livestock and wildlife use is typically disproportionately higher in riparian and wetland communities than in upland communities. Improper grazing can adversely impact these communities throughout the year, but generally has greater impacts in the spring and early summer, when soils are wet and, therefore, more vulnerable to compaction and streambanks are more vulnerable to sloughing. Livestock, especially cattle, tend to congregate in these communities during the hot season (mid to late summer). While stocking rates for an allotment or pasture may be low to moderate, the utilization levels in riparian and wetland areas can be high.
- Riparian areas are evaluated during application of the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b).
- Grazing practices can maintain, improve, or degrade rangeland health. The *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b) are designed to maintain or improve rangeland health. Approximately 10 percent of the public land in the planning area is evaluated annually for rangeland health.
- Livestock stocking rates in grazing allotments generally remain unchanged.
- Wildlife can adversely impact riparian and wetland areas, depending on how many, what type, and when the use occurs.
- Riparian and wetland areas possess the ability to recharge and rebound faster than other vegetative areas in the planning area.
- All riparian and wetland areas are evaluated per the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b) and managed toward proper functioning condition (PFC). Management toward DPC is assumed to exceed the requirements of managing toward PFC.

4.4.3.2 Analysis of Alternatives

Allowable uses and management actions that could impact riparian and wetland communities include surface-disturbing activities, livestock grazing, and proactive management actions. Impacts to soil and water, which may impact riparian and wetland communities, are discussed in the Soil and Water sections earlier in this chapter.

Impacts Common to All Alternatives

The types of impacts projected to occur to riparian and wetland communities as a result of the various alternatives are similar. However, the intensity of impacts is anticipated to vary by alternative, as described under the individual alternatives.

Implementing any of the alternatives may cause direct and (or) indirect impacts; however, no quantification of direct impacts to riparian and wetland areas exist for any of the alternatives. However, because the riparian and wetland areas are so limited and often the most productive lands, they are

disproportionately impacted by humans, livestock, and wildlife compared with the same types or extent of actions in upland areas. Direct impacts to riparian and wetland areas generally are avoided and minimized whenever possible under all alternatives. In general, impacts from projects or uses that involve riparian areas are minimized through applications of BMPs.

Changes in water chemistry also can affect riparian and wetland areas primarily through changes in plant specie composition, which could impact utilization of the area by wildlife and livestock. Indirect impacts caused by changes in water chemistry historically have not been a major factor in the planning area and are not expected to be in the future.

Usually, the impacts caused by wildlife are less extensive than those caused by livestock, particularly cattle. Elk, deer, and pronghorn are attracted to and often congregate in these areas; however, due to their smaller size and foraging habits, they normally do not cause the amount of disturbance that cattle do. In localized areas, elk have substantially impacted riparian habitats through trampling, wallowing, and grazing. Because of their ability to rove across large areas and because generally they are not confined by fences, big game animals can disperse INPS seed over large areas and into other riparian and wetland habitats. Beaver can dramatically change the nature of a stream and the riparian and wetland areas associated with it. In some cases, the changes to the riparian and wetland areas created by beaver activity are beneficial; in others, the overall impact is adverse (i.e., denudation of willows).

The management of special status species generally involves restricting activities in the vicinity of special status plants or wildlife either year-round or during specific times of the year. As a result, riparian and wetland areas occurring in the vicinity of buffer zones of a special status species can benefit from the lower level of use by the public. Under all alternatives, no water development or salt, mineral, or forage supplements are allowed in areas inhabited by special status plant species or other sensitive areas. This restriction will prevent trampling of plants by livestock. The size of the buffers varies by alternative. An exception to this is the bald eagle, which generally nests in mature cottonwood trees and has a ½- to 1-mile seasonal buffer under all alternatives.

The use of certified weed-free seed mixes and, in some situations, the use of nonnative species can be used to reduce the amount of bare ground where INPS could spread. In accordance with BLM policy (Manual 1745), nonnative species cannot be used when they diminish biodiversity. Applying rangeland health standards and developing guidelines to maintain or improve riparian and wetland communities is a proactive action applying to all alternatives. The BLM would work with grazing lessees to manage livestock to accomplish this.

Alternative A

Surface-disturbing Activities. In the planning area, the following types of impacts may occur in riparian and wetland communities due to surface-disturbing activities. These types of impacts may occur under all alternatives; however, the intensity of the impacts varies by alternative.

Sediment and water are the two components of streamflow. Sediment inputs into a stream occur naturally due to natural processes of erosion. Streams and the adjacent riparian and wetland areas evolve over time in response to the amount of water and sediment they carry and (or) receive. A stream system generally is considered stable if the stream is in dynamic equilibrium with its water and sediment inputs. A stream may become unstable if the rate of water or sediment inputs changes, such as with an accelerated rate of sedimentation or an increase in water quantity.

Accelerated erosion from uplands and bank erosion increase sediment loading to streams. Typical causes for increased sediment loading into a stream are flash floods, changes from a relatively undisturbed condition to a more intensive land use in a watershed, surface disturbances in a watershed, improper

livestock grazing practices, and wildlife use that alters vegetative cover. Higher sediment loads entering a stream can dramatically alter its form and, consequently, the functionality of the riparian and wetland communities adjacent to it. 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 (i.e., discharge volume) of the stream and the channel slope gradient. In segments of a stream that have lower gradients, deposition occurs and the stream channel aggrades (builds), possibly becoming braided and shallow. In some instances, the 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 depositional area and the cycle continues. In such cases, the functionality of the riparian and wetland areas in both the aggraded stream reach and the incised stream reach change.

Increases or reductions in water quantity also can impact riparian and wetland functionality. Prolonged decreases in water quantity (e.g., during times of drought, due to diversions for irrigation, or due to groundwater depletions) can cause a shift in plant species composition in riparian and wetland areas and increase the chances for INPS spread. Typically, plant species that prefer drier conditions do not bind the soil as well as riparian and wetland vegetation and, thereby, can cause a decrease in streambank stability. Drier conditions also can lead to a decrease in productivity and impact the ability of the riparian area or wetland to support wildlife species.

Increases in surface runoff can have a beneficial impact on riparian and wetland areas because more water may be available for plant growth, thereby increasing plant productivity and abundance. However, increases in surface runoff volumes also can result in an increase in channel incision. This could disconnect the stream from its floodplain (i.e., gully formation), rendering the floodplain nonfunctional. If the stream becomes incised enough, the conditions within associated riparian and wetland areas can become drier and a shift in plant species composition can occur, contributing to bank destabilization and, consequently, to increases in sediment loading.

Changes in surface runoff can occur due to natural or human causes. Natural causes include climatic cycles (e.g., periods of drought or high precipitation) and catastrophic events (e.g., flash floods, fires, earthquakes, and landslides). Human impacts to surface runoff occur primarily due to land use changes. One of the most prevalent increases in surface runoff caused by human activity is an increase in impervious cover (e.g., roads, parking lots, and rooftops). Roads are not only impervious, they also route water. For this reason, it is undesirable to have a road close to a stream or crossings where runoff from the road is more likely to reach the stream. Improper livestock grazing and sometimes wildlife use can also increase runoff within a watershed due to soil compaction and loss of vegetative cover, with the amount of bare ground being the primary factor (Lusby 1970). Proper livestock grazing can increase vegetative cover and reduce peak runoff quantities to streams and levels of erosion.

Water production from CBNG wells and traditional oil and gas development represents a new water source within a watershed that augments existing water flows. As discussed previously, this can be both beneficial and detrimental to a water course. Both wildland fires and prescribed burns also can increase runoff and sediment to streams and other water bodies in the short term. In fact, a rainstorm following a fire can overwhelm downstream water bodies by contributing excessive amounts of sediment, large woody debris, and water to the system in a short period. Vegetation response after a fire can have beneficial impacts on a watershed by helping to recharge water tables and increasing the amount of herbaceous cover, thereby improving livestock distribution and lessening erosion.

INPS are particularly undesirable in riparian and wetland areas because they do not have the same high level of soil-binding properties that many native riparian and wetland species (e.g., willows and sedges) have. The proximity of surface disturbances to riparian and wetland areas is one of the primary ways in

which INPS can spread in these areas. INPS are typically spread through road networks, water courses and wind, and most easily become established in disturbed areas. Livestock and wildlife also can disperse INPS seed. The interrelationships of livestock grazing, INPS control, and rangeland health are discussed in the Livestock Grazing section.

Salt cedar is a shrubby INPS and a concern in some riparian and wetland areas because it transpires large amounts of water, resulting in salinization of soil around the plant. This species is a phreatophyte, which is a deep-rooted plant that obtains water from the water table. As a result, salt cedar could exclude native riparian shrubs and herbaceous plants, thereby radically altering wildlife habitats and impacting other functions. Salt cedar is somewhat different from other INPS species in that surface disturbances outside of the riparian zone do not increase its ability to invade riparian and wetland areas. In other words, salt cedar is invasive even in areas of low surface disturbance.

Under Alternative A, surface-disturbing activities are evaluated on a case-by-case basis on BLM-administered land; no requirement exists to apply BMPs to all surface-disturbing activities in the planning area. Surface-disturbing activities can occur on highly erosive soils under Alternative A. While most surface-disturbing activities will not occur in riparian and wetland areas, these areas may be indirectly impacted due to erosion and an increase of sediment going into streams. Complete reclamation activities are implemented on a case-by-case basis. These management actions could result in indirect, adverse impacts to riparian and wetland communities, including the spread of INPS.

Under Alternative A, short-term and long-term disturbances from BLM actions are the third highest of all alternatives, following alternatives D and E, respectively (see Appendix M). These long-term disturbance acres (21,087 acres for Alternative A and 22,080 acres for Alternative D) are within 5 percent of each other. Under Alternative A, the impacts to riparian and wetland communities associated with surface-disturbing activities are mostly indirect impacts and expected to be primarily adverse. Short-term impacts occur in the 5 years following the disturbance and include increased sediment into streams and the spread of INPS. Long-term impacts occur beyond 5 years and primarily include loss of habitat due to development. This is based on the case-by-case management of reclamation under Alternative A and the long-term disturbance acreage projected.

Livestock Grazing. With proper grazing management and implementation of rangeland improvement projects, the health of riparian and wetland areas can be sustained or improved. All alternatives involve management of livestock grazing in riparian areas. The degree and extent of grazing-related impacts to riparian and wetland areas over the long-term are expected to continue to improve. On the other hand, improper livestock grazing practices decrease the functionality of riparian and wetland areas through soil compaction and hummocking, physical removal and destruction of vegetation, and trampling of streambanks causing bank failure. Clary and Kinney (2000) indicate that the damage to riparian habitats as a result of bank alterations is greater than or equal to the damage caused by changes in vegetation biomass. Livestock grazing in riparian areas can prevent regeneration of woody and herbaceous riparian vegetation necessary to stabilize streambanks. Kovalchik and Elmore (1992) state that improper livestock grazing adversely impacts the stability of some riparian areas dominated by willow.

Placement of salt and mineral supplements is considered on a case-by-case basis under Alternative A with respect to locations of water sources, special status plants, and riparian and wetland communities. Under all alternatives, 6,016 acres in the planning area are not available for livestock grazing. By emphasizing monitoring on only higher-priority allotments (categories I and M, see Glossary) undesirable conditions in lower-priority allotments may not be identified and deterioration or improvement that is occurring in vegetative communities may not be realized in a timely manner. No holding period is required to flush livestock to reduce the risk of INPS spread under Alternative A.

Proactive Management Actions. Management actions that strive to improve streams and conserve riparian and wetland areas generally result in long-term, beneficial impacts to riparian and wetland communities. Under Alternative A, 350 miles of lotic and adjacent riparian habitat and 10,000 acres of lentic habitat would be managed toward PFC, benefiting riparian and wetland communities. No management action under Alternative A emphasizes eradication of salt cedar. Managing riparian and wetland areas toward PFC would result in long-term, beneficial impacts to these communities under Alternative A.

Alternative B

Surface-disturbing Activities. The types of impacts to riparian and wetland communities under Alternative B for surface-disturbing activities are expected to be the same as described under Alternative A, except in intensity. Under Alternative B, the projected short- and long-term surface disturbance from BLM actions are the lowest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative B (11,565 acres) is approximately 45-percent less. Alternative B implements the strictest reclamation requirements of all alternatives, requiring retreatment of reclaimed areas that do not have 50 or 80 percent of pre-disturbance vegetative cover after 3 or 5 years, respectively. Under Alternative B, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature, but less in intensity compared to Alternative A. Surface-disturbing activities under Alternative B have the least adverse impact to riparian and wetland communities of all alternatives.

Livestock Grazing. The types of impacts to riparian and wetland communities under Alternative B for livestock grazing are expected to be the same as described under Alternative A, except in intensity. Salt and mineral supplements are placed at least ½ mile away from all water sources and riparian and wetland areas. Exceptions to this management action are made on a case-by-case basis based on NEPA analysis. Placing supplements away from riparian and wetland communities will attract livestock away from these areas, improve livestock distribution in an allotment, and reduce impacts to these communities. Alternative B places equal emphasis on all allotments for monitoring and preventing improper grazing and downward trends, which would allow the BLM to identify and respond to undesirable conditions on an allotment in a timely manner. Livestock grazing is managed to maintain protective cover of the vegetation and litter and reduce soil compaction and erosion. Forage utilization by livestock is limited to 40 percent of the current year's production to leave standing residual vegetation that eventually becomes litter, a beneficial, long-term impact. Limiting forage utilization may impact livestock operations by requiring herding, fencing, rotational grazing, or limiting season of use. Under Alternative B, a livestock flushing period of 72 hours may be required to reduce the spread of INPS. Based on the placement of supplements away from riparian and wetland areas, the annual evaluation of all allotments, limitation of forage utilization by livestock, and the livestock flushing period, Alternative B is anticipated to have less adverse impact than Alternative A, and the least adverse impact of all alternatives on riparian and wetland communities.

Proactive Management Actions. Under Alternative B, 350 miles of lotic and adjacent riparian habitats and 10,000 acres of lentic habitats are managed toward DPC. In addition, Alternative B emphasizes improving floodplain connectivity and function on 350 stream miles and restores 108 miles of incised streams and 90 acres of lentic habitats. Alternative B eradicates 1,700 acres of salt cedar. All these management actions could improve riparian and wetland functionality and result in direct long-term beneficial impacts to these areas. Alternative B also implements more protective measures than the other alternatives for riparian, wetland, and surface water areas from fire-suppression activities and has the least adverse impact due to these activities of all the alternatives. The beneficial impacts under Alternative B are greater than under Alternative A and the greatest of all alternatives.

Alternative C

Surface-disturbing Activities. The types of impacts to riparian and wetland communities under Alternative C for surface-disturbing activities are expected to be the same as described under Alternative A, except in intensity. Under Alternative C, the projected short- and long-term surface disturbance from BLM actions is the second lowest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative C (20,358 acres) is approximately 4-percent less. Alternative C requires retreatment of reclaimed areas that do not have 30 or 50 percent of predisturbance vegetative cover in 3 or 5 years, respectively. In addition, nonnative species may be used on a case-by-case basis to reclaim disturbed areas. Since some nonnative species are more easily established on some soils than native species, their use could reduce soil erosion and the amount of sediment going into riparian and wetland areas. Their use also could reduce the spread of INPS. Under Alternative C, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature to those in Alternative A. Based on the acreage of disturbance and the management actions implemented to reduce disturbance to riparian and wetland communities, adverse impacts under Alternative C are expected to be less than under Alternative A.

Livestock Grazing. The types of impacts to riparian and wetland communities under Alternative C for livestock grazing are expected to be the same as described under Alternative A, except in intensity. Salt and mineral supplements are placed at least ¼ mile away from all water sources and riparian and wetland areas. Exceptions to this management action are made on a case-by-case basis based on NEPA analysis. Under Alternative C, the monitoring and preventing of improper grazing on downward trends are emphasized on I and M Category allotments (see Glossary). Undesirable conditions or downward trends in rangeland conditions are not identified in lower-priority allotments in a timely manner. In areas containing highly erosive soils, livestock grazing is managed to maintain protective cover of the vegetation. Forage utilization by livestock levels is established for areas with highly erosive soils to leave more residual vegetation and litter on the ground, thereby increasing ground cover. Limits to forage utilization provide beneficial long-term impacts to riparian and wetland communities by minimizing soil erosion and increasing nutrient recycling. Adverse impacts to livestock operations may occur based on these limitations and are discussed in more detail in the Land Resources section under Livestock Grazing. Under Alternative C, a livestock flushing period of 72 hours may be required in Level I Weed Management Areas, reducing the risk of INPS spreading in these areas. Alternative C, based on the placement of supplements requirement, there being no requirement for evaluating a certain number of allotments annually, maintaining protective cover of vegetation on only highly erosive soils, and requiring flushing of livestock only in particular areas, is expected to have less short- and long-term adverse impacts to riparian and wetland communities than Alternative A.

Proactive Management Actions. Under Alternative C, 175 miles of lotic and adjacent riparian habitats and 5,000 acres of lentic habitats are managed toward DPC. In addition, 108 miles of floodplain connectivity and function will be improved. Alternative C restores 75 miles of incised streams and 47 acres of lentic habitats. Alternative C eradicates 1,275 acres of salt cedar. These management actions would improve riparian and wetland areas and functionality and result in greater beneficial impacts under Alternative C than under Alternative A.

Alternative D

Surface-disturbing Activities. The types of impacts to riparian and wetland communities under Alternative D for surface-disturbing activities are expected to be the same as described under Alternative A, except in intensity. Under Alternative D, the projected short- and long-term surface disturbances from BLM actions are the highest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative D (22,080 acres) is approximately 4-percent greater. Alternative D requires complete reclamation within 5 years of disturbance, but does not require any retreatment of reclaimed

areas after final reclamation is complete. Nonnative species could be used in reclamation activities on a case-by-case basis. Under Alternative D, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature to Alternative A. Based on the acreage of disturbance and the management actions implemented to reduce disturbance to riparian and wetland communities, adverse impacts under Alternative D are expected to be greater than under Alternative A and the highest of any alternative.

Livestock Grazing. The types of impacts to riparian and wetland communities under Alternative D for livestock grazing are expected to be the same as described under Alternative A, except in intensity. Salt and mineral supplements are placed at least ¼ mile away from all water sources and riparian and wetland areas, similar to Alternative C. Exceptions to this management action are made on a case-by-case basis according to NEPA analysis. Under Alternative D, the monitoring and preventing of improper grazing and downward trends emphasize the highest priority allotments. Alternative D places no restrictions on forage utilization, nor does it manage for maintaining protective vegetative cover on the allotments. In addition, no flushing period for livestock would be required, increasing the risk of INPS spreading. Based on the placement of supplements requirement, lack of forage utilization limitation, lack of a flushing period, and the emphasis on preventing a downward trend on Category I allotments (see Glossary), Alternative D is anticipated to have short- and long-term adverse impacts greater than those under Alternative A and the greatest of all alternatives.

Proactive Management Actions. Under Alternative D, 88 miles of lotic and adjacent riparian habitats and 2,500 acres of lentic habitats are managed toward DPC. In addition, 75 miles of floodplain connectivity and function are improved. Alternative D restores 33 miles of incised streams and 43 acres of lentic habitats. Alternative D eradicates 850 acres of salt cedar. These management actions would improve riparian and wetland areas and functionality and result in greater beneficial impacts under Alternative D than under Alternative A.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. The types of impacts to riparian and wetland communities under Alternative E for surface-disturbing activities are expected to be the same as described under Alternative A, except in intensity. Under Alternative E, the projected long-term surface disturbance from BLM actions is the second highest of all alternatives. Compared with Alternative A, the long-term surface disturbance under Alternative E (21,672 acres) is approximately 3-percent higher. Alternative E requires retreatment of reclaimed areas that do not have 30 or 50 percent of pre-disturbance vegetative cover in 3 or 5 years, respectively, similar to Alternative C. In addition, all seed mixes must be certified weed-free under Alternative E, although nonnative species may be used on a case-by-case basis, similar to Alternative C. Under Alternative E, the adverse impacts anticipated from surface-disturbing activities are expected to be similar in nature to Alternative A. Based on the acreage of disturbance and the management actions implemented to reduce disturbance to riparian and wetland communities, including reclamation activities, adverse impacts under Alternative E are expected to be less than under Alternative A.

Livestock Grazing. The types of impacts to riparian and wetland communities under Alternative E for livestock grazing are expected to be the same as described under Alternative A, except in intensity. Under Alternative E, salt and mineral supplements are placed at least ¼ mile away from all water sources and riparian and wetland areas, similar to Alternative C. Exceptions to this management action are made on a case-by-case basis according to NEPA analysis. Under Alternative E, an emphasis on monitoring and preventing downward trends is given to all grazing allotments. Alternative E establishes forage utilization levels for areas with substantial acreage of highly erosive soils. Forage utilization levels leave more standing residual vegetation that, over time, increase the amount of litter on the ground and protect

the soil from erosion. While livestock is managed to achieve forage utilization levels, it is recognized that wildlife are also using these areas. Limits to forage utilization on upland vegetative communities provide an indirect long-term beneficial impact to riparian and wetland communities by minimizing soil erosion and increasing nutrient recycling. Adverse impacts to livestock operations could occur based on these limitations and are discussed in more detail in the Land Resources section under Livestock Grazing. With proper grazing management, the health of vegetative communities within a watershed can be maintained or improved by breaking up soil crust that restricts infiltration and inhibits seedling establishment, and by increasing cover and vigor of native vegetation. Increased cover and vigor of native vegetation can, in turn, minimize soil erosion. Under Alternative E, a livestock flushing period of 72 hours may be required in Level I Weed Management Areas, reducing the risk of INPS spread in these areas, similar to Alternative C. Alternative E, based on the ¼-mile minimum distance requirement for placing supplements, maintaining protective cover of vegetation on highly erosive soils, and requiring flushing of livestock only in particular areas, is expected to have short- and long-term adverse impacts less than those under Alternative A. For the same reasons, Alternative E is expected to have short- and long-term beneficial impacts that are greater than those under Alternative A.

Proactive Management Actions. Under Alternative E, 350 miles of lotic and adjacent riparian habitats and 10,000 acres of lentic habitats are managed toward PFC and identified DPC. In addition, 75 miles of floodplain connectivity and function are improved. Alternative C restores 33 miles of incised streams and 43 acres of lentic habitat. Alternative E would develop a plan to eradicate salt cedar. These management actions would improve riparian and wetland areas and functionality and result in greater beneficial impacts under Alternative E than under Alternative A.

4.4.3.3 Conclusion

Meaningful differences in long-term disturbance acreage; reclamation requirements for surface disturbance; management of livestock, including placement of supplements, forage utilization, grazing allotment evaluation, and flushing periods; acreage/mileage of habitats managed toward PFC or DPC; and acreage/mileage of stream and lentic habitat restoration form the following conclusion. Impacts to riparian and wetland communities are anticipated to be the least adverse under Alternative B and the most adverse under Alternative D. Potential adverse impacts to riparian and wetland communities from alternatives C and E are expected to be similar to, but less than, Alternative A.

4.4.4 Vegetation – Invasive, Nonnative Plant Species and Pest Control

Actions that could occur through implementing each alternative could be impacted by the spread of INPS. This section describes the impacts of each alternative according to INPS in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as being beneficial or adverse.

The presence of INPS in the planning area is considered an adverse impact. Actions that contribute to the introduction of INPS, the spread of existing INPS populations, or that avoid, reduce, or prohibit INPS control activities in the planning area also are considered adverse impacts.

The direct INPS impacts typically result from actions that disturb the soil or that otherwise create habitats (i.e., seedbed) for the establishment of INPS. Indirect impacts result from activities that avoid, reduce, or prohibit INPS control activities in the planning area. The transport by wildlife, livestock, vehicles, wind, or water of INPS seed or other plant parts to other locations, thereby expanding the distribution or increasing the rate of spread of INPS, is also considered an indirect impact.

4.4.4.1 Methods and Assumptions

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

- INPS occur in greatest density in areas of past or current surface disturbance. Areas disturbed in the past and reclaimed may contain populations of INPS, but the abundance and distribution of these populations do not vary by alternative.
- Though there are exceptions, most INPS are less likely to invade relatively undisturbed and healthy natural vegetative communities.
- Roadways, trails, ROW, and corridors are major routes of spreading INPS through the transport on motor vehicles and OHVs. INPS also can be spread through water courses, wind, and by wildlife and livestock movement.
- The total amount of new surface disturbance associated with an alternative is a good index of potential impact to INPS. The larger the acreage of surface disturbance, the greater the adverse impact by INPS.
- Success of reclamation measures prescribed as a condition of development is unknown and could underestimate the potential impact from INPS, but is not expected to vary by alternative.
- Enforcement of restrictions related to recreation and OHV and dispersed travel can be assumed only if adequate funding and personnel are available to do the job.
- Seeds from some INPS 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 may serve to reintroduce INPS to reclaimed sites without additional surface disturbance.
- The area evaluated for potential impacts includes the planning area and Natrona, Converse, Platte, and Goshen county weed control districts.
- The total acreage of long-term disturbance (Appendix M) includes facilities that cannot be reclaimed and that, in most cases, will not provide long-term habitats for INPS. For example, well pads, communication sites, powerlines, roads, wind-energy facilities, and other infrastructure will replace existing native vegetation with pervious or impervious surfaces for a period exceeding 5 years.

4.4.4.2 Analysis of Alternatives

Allowable uses and management actions that could be impacted by INPS include all surface-disturbing activities, concentrated livestock and native ungulate grazing, fire management, recreation, OHV and dispersed travel, and proactive management actions.

As INPS are affected by the alternatives, INPS can, in turn, impact other resources. Impacts of INPS on other resources are described in the Fire Management and Ecology section and in other biological resources sections. Spread of INPS also can fragment landscapes, providing habitats for INPS invasion. Fragmented landscapes contain fewer intact ecosystems (Noss 1987). Refer to Map 24 for INPS.

Impacts Common to All Alternatives

The impacts of Pest Control are common to all alternatives. The BLM will coordinate with individuals, groups, and other agencies to control pests as needed.

The types of impacts projected to occur as a result of the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts resulting from surface-

disturbing activities, concentrated livestock and native ungulate grazing, OHV use, fire management, recreation and dispersed travel, and proactive management actions are described under individual alternatives.

Alternative A

Surface-disturbing Activities. Surface-disturbing activities on BLM-administered land under Alternative A are evaluated on a case-by-case basis. As a result, there may be minimal restrictions on surface-disturbing activities, occupancy, and prescribed fire on highly erosive soils under this alternative. In addition, except for the South Bighorns, surface disturbance and occupancy are allowed on slopes greater than 25 percent with permission of the BLM authorized officer.

Under Alternative A, the projected short- and long-term disturbances, prior to and following reclamation, result in the third highest disturbance acreage following alternatives D and E, respectively (see Appendix M). The impacts from surface-disturbing activities under Alternative A are anticipated to be commensurate with the intensity of RFAs shown in Appendix M. Moreover, the impacts from surface disturbance projected for Alternative A are anticipated to be primarily adverse. Both short- and long-term adverse impacts are anticipated from surface disturbance. Short-term impacts will occur during the 5 years following disturbance while the soil is bare of vegetation and reclamation activities strive to stabilize the soil and revegetate the area. Relative to reclamation, Alternative A does not require the use of certified weed-free seed when reclaiming disturbed areas. Long-term impacts will occur beyond 5 years due to reclamation efforts that are not 100-percent effective in preventing INPS establishment. For example, the seeds and other plant parts of INPS that establish along roads are anticipated to be spread by cars and wind to other sites within the planning area throughout the life of the plan. In addition, some INPS seeds have the ability to lie dormant in the soil beyond the 5-year reclamation period. For the reasons stated, most adverse impacts are anticipated to be long-term. Based on discretionary management actions for surface disturbance on highly erosive soils and slopes exceeding 25 percent, projected long-term disturbance for BLM actions, and lack of requirements for certified weed-free seed for reclamation, current management (Alternative A) is anticipated to allow short- and long-term adverse impacts.

Livestock and Native Ungulate Grazing. Kay (1995) indicates that high densities of native ungulates can reduce or eliminate shrub seed production and impair recruitment of young shrubs. In addition, Hall and Bryant (1995) indicate that as vegetation stubble height is reduced, a shift in cattle preference and damage to vegetation can occur. The impacts described by Kay (1995) and Hall and Bryant (1995) would be expected to adversely impact INPS; however, the impacts described by these studies are expected to remain uncommon and occur in isolated instances within the planning area under all alternatives due to livestock grazing management and employment of guidelines associated with the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b).

The impacts of livestock and native ungulate grazing on INPS from all alternatives are anticipated to result in a mix of beneficial and adverse impacts. Short- and long-term beneficial impacts are anticipated from improvements to vegetative cover and plant vigor and control of INPS infestations that can occur under proper livestock grazing. Short- and long-term adverse impacts associated with livestock and native ungulate grazing are anticipated to occur primarily in animal concentration areas (e.g., water sources, trails, favored forage) and include transport of INPS seeds and propagates and disturbance of soil, creating habitats for the spread of INPS.

Because the acreage open to livestock grazing under all alternatives is similar (i.e., 6,016 acres not available for livestock grazing for all alternatives) and because all alternatives would be managed according to the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management*

for Public Lands Administered by the Bureau of Land Management in the State of Wyoming (BLM 1998b), the types of adverse impacts from livestock grazing vegetation and soil disturbance are expected to be similar among alternatives. The number and distribution of native ungulates also are anticipated to be similar among alternatives. The difference in impacts from livestock and native ungulate grazing are anticipated to vary by alternative as a result of specific management actions, as described below.

The transport of INPS seeds and propagates by livestock and native ungulates occur when they attach to the animals' coats and feet or are ingested. One method to control the spread of INPS ingested by livestock is holding the animals in one area before they are allowed to move to other areas. A holding period of 72 hours allows the animals to flush the ingested INPS material from their systems so they will not transport the ingested material to uninfected areas. Alternative A does not require a holding period prior to moving livestock onto or within public lands. Therefore, Alternative A is expected to contribute to the spread of INPS seeds and propagates, via livestock, more so than alternatives (alternatives B, C, and E) that have a holding period.

Currently, grazing allotments are evaluated to determine if they are meeting the standards for healthy rangelands. Approximately 10 percent of the grazing allotments are evaluated each year under Alternative A. Based on discretionary management actions, lack of a holding period for livestock, and the 10-percent annual evaluation of grazing allotments, current management (Alternative A) is anticipated to allow short- and long-term adverse impacts.

Fire Management. Beneficial and adverse, direct and indirect, short- and long-term impacts from fire management are anticipated under all alternatives. By destroying or damaging INPS plants and seeds, beneficial impacts can be realized based on the timing and location of fire. Conversely, adverse impacts from suppression activities that disturb soil and from fires that remove native vegetation and expose soil result in conditions that provide a seedbed for INPS establishment. The adverse impacts from fire management may be considered direct or indirect because the impact(s) may or may not occur immediately. Alternative A utilizes case-by-case management of heavy equipment use, fire suppression, and rehabilitation and stabilization following wildland fire. Moreover, Alternative A does not manage fuels according to an established integrated management technique approach, does not advocate reintroduction of fire into fire adapted ecosystems within the planning area, and does not prohibit the use of prescribed fire on highly erosive soils. For the reasons stated, fire management under Alternative A is anticipated to have an adverse, short- and long-term impact within the planning area.

Recreation, OHV, and Dispersed Travel. Indirect, adverse, short- and long-term impacts from transportation of materials, people, and vehicles into and out of the planning area occur at recreation sites, trailheads, trails, and transportation routes. INPS are established in some of these areas and their seeds are spread to other areas by vehicles and people. Due to the permanent nature of most recreation sites, trails, and transportation routes, most associated adverse impacts are anticipated to be long-term. The resulting impact is the spread of INPS into new areas within the planning area. Restrictions to off-road, road, and other travel corridor use would have to be initiated, and a comprehensive inspection and decontamination procedure for animals, equipment, materials, and vehicles would have to be adopted to completely halt the spread of INPS onto and within BLM-administered lands. However, some management actions (i.e., the use of certified weed-free seed, mulch, and forage) are available under this alternative to lessen the threat of INPS from being established via seed. Because Alternative A contains only minimal management actions to reduce or prohibit the introduction and transport of INPS, adverse short- and long-term impacts are anticipated to continue under the No Action Alternative.

Proactive Management Actions. Alternative A manages INPS on a case-by-case basis, whereas the action alternatives include some degree of proactive INPS eradication. For example, Alternative A does not include specific management actions to control habitat fragmentation. In addition, Alternative A

currently has an inadequate INPS inventory and conducts monitoring and treatment on a case-by-case basis. The lack of adequate inventory and monitoring data prohibits accurate mapping of INPS distribution and encroachment, as well as prohibits risk assessment. The current management under Alternative A adversely impacts INPS on an estimated 952,100 acres (70%) of the planning area containing mostly scattered parcels of public land with scattered infestations of INPS. Without a comprehensive effort to control the spread of INPS, populations typically increase 14-percent annually (BLM 1985b). Ultimately, the spread of INPS is anticipated to exceed the point where it can be effectively controlled. Therefore, continuing current management under the No Action Alternative is anticipated to allow long-term adverse impacts regarding the control and spread of INPS.

Alternative B

Surface-disturbing Activities. Under Alternative B, NSO is allowed on highly erosive soils or on slopes greater than 25 percent. In addition, prescribed fire is prohibited on highly erosive soils under Alternative B.

Under Alternative B, the projected long-term disturbance acreage (11,565 acres) from BLM actions, following reclamation, would be the lowest of any alternative (see Appendix M). The projected long-term disturbance acreage for Alternative B is approximately 45-percent less compared to Alternative A. Relative to Alternative A and other alternatives, Alternative B has the strictest requirements (i.e., one growing season completion, reseeding if less than 50% to 80% vegetative cover in 3 to 5 years, use of certified weed-free seed, and full topsoil salvage and segregation) regarding reclamation of disturbed areas.

The impacts from surface-disturbing activities under Alternative B are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts from surface-disturbing activities under Alternative B are anticipated to be less than Alternative A and the least relative to all other alternatives.

Livestock and Native Ungulate Grazing. Alternative B's proposed management action allows the authorized officer, on a case-by-case basis, to hold livestock that ingested INPS material and seed for a period of 72 hours. This allows the animals to flush the ingested INPS material from their systems before being allowed to move on to or within public lands. The 72-hour holding and flushing period allowed by Alternative B is anticipated to reduce the adverse, indirect impacts associated with livestock transporting INPS relative to Alternative A and the least relative to all other alternatives.

Fire Management. Alternative B incorporates specific management actions to address heavy equipment use, fire suppression, and rehabilitation and stabilization following wildland fire. Moreover, Alternative B manages fuels according to an established integrated management technique approach, would advocate reintroduction of fire into fire-adapted ecosystems within the planning area, and would prohibit the use of prescribed fire on highly erosive soils. For the reasons stated, adverse short- and long-term impacts under Alternative B are anticipated to be less than Alternative A, and the least relative to other alternatives.

Recreation, OHV, and Dispersed Travel. Under Alternative B, decreases in recreational and OHV and dispersed travel opportunities will correspondingly result in the decreased transport of INPS seed. Travel and use restrictions help lessen the adverse impacts resulting from INPS seed transport. Alternative B requires certified weed-free seed and native vegetation for reclaiming disturbed areas. These management actions are anticipated to have less adverse impacts relative to Alternative A and the least relative to other alternatives. See the OHV section in this chapter for more details involving limits to OHV use by alternative.

Proactive Management Actions. Alternative B proposes developing a comprehensive INPS management program consistent with or by adopting the provisions of the Partners Against Weeds Plan (BLM 1996). This alternative also proposes the most eradication of acreage (1,700 acres) for salt cedar and to control habitat fragmentation on 16 blocks of land primarily in public ownership. Under Alterative B, it is anticipated that the degradation of native vegetation communities and rangeland currently invaded by INPS would decline, and their spread to additional acres be more effectively halted or slowed compared to Alternative A. Designated weed-management areas established in the planning area are shown in Map 24 and include two categories for management of INPS: Level I Weed Management Areas comprise large blocks of public land where the emphasis is on containment of INPS, and Level II Weed Management Areas comprise smaller blocks of public land containing small patches and isolated infestations, where the emphasis is on eradication and stopping invasion to uninfected areas. The described proactive management actions are anticipated to have more beneficial impacts relative to Alternative A and the most beneficial impacts relative to all other alternatives.

Alternative C

Surface-disturbing Activities. Under Alternative C, surface disturbance on highly erosive soils is minimized to the extent practicable and NSO is allowed on slopes greater than 25 percent with highly erosive soils. In addition, prescribed fire on highly erosive soils is restricted by season and intensity to limit impacts.

Under Alternative C, the projected long-term disturbance acreage (20,358 acres) from BLM actions, following reclamation, is less than, but within 3 percent of, the acreage projected for Alternative A (Appendix M). The projected long-term disturbance acreage for Alternative C is approximately 76-percent higher compared to Alternative B. Relative to Alternative A, Alternative C has more stringent reclamation requirements (i.e., three growing seasons completion, reseeding if less than 30% to 50% vegetative cover in 3 to 5 years, use of certified weed-free seed, and limited topsoil salvage and segregation) for disturbed areas.

The impacts from surface-disturbing activities under Alternative C are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts from surface-disturbing activities under Alternative C is anticipated to be less compared to Alternative A.

Livestock and Native Ungulate Grazing. Alternative C includes a management action regarding a livestock flushing/holding period of 72 hours in the Level 1 Weed Management Area, and would allow for maintaining a protective cover of vegetation and litter with emphasis on the condition of allotments with highly erosive soils. These options are anticipated to reduce the adverse, indirect impact associated with livestock transporting INPS relative to Alternative A.

Fire Management. Alternative C incorporates similar, but less restrictive, management actions than those described for Alternative B. For the reasons stated, adverse, short- and long-term impacts under Alternative C are anticipated to be less than Alternative A, but more than Alternative B.

Recreation, OHV, and Dispersed Travel. Alternative C requires certified weed-free seed and native vegetation for reclaiming disturbed areas similar to Alternative B. The management actions described for Alternative C are anticipated to have less adverse impacts relative to Alternative A and similar impacts as described for Alternative B. See the OHV section in this chapter for more details involving limits to OHV use by alternative.

Proactive Management Actions. Alternative C proposes developing a comprehensive INPS management program as described for Alternative B; however, Alternative C proposes eradicating less

(1,275 acres) salt cedar and involving less control of habitat fragmentation than Alternative B. For the reasons stated above, Alternative C is anticipated to have more beneficial impact on the control and spread of INPS compared to Alternative A, but less than Alternative B.

Alternative D

Surface-disturbing Activities. Under Alternative D, surface disturbance on highly erosive soils and slopes greater than 25 percent is allowed. In addition, prescribed fire is allowed on highly erosive soils. Under Alternative D, the projected long-term disturbance acreage (22,080 acres) from BLM actions, following reclamation, is the most of any alternative (Appendix M). The projected long-term disturbance acreage for Alternative D is approximately 5-percent higher compared to Alternative A and 91-percent higher than Alternative B.

The impacts from surface-disturbing activities under Alternative D are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. The intensity of adverse impacts from surface-disturbing activities under Alternative D is anticipated to be greater than under Alternative A and the highest of any alternative.

Livestock and Native Ungulate Grazing. A livestock holding period is not required under Alternative D. Other management actions are similar to the current management. For these reasons, Alternative D is anticipated to result in similar adverse impacts (type and intensity) relative to Alternative A.

Fire Management. Alternative D would evaluate all fires and rehabilitate as needed for suppression and fire-severity impacts, including chemical treatment where INPS are present. For the reasons stated, adverse, short- and long-term impacts under Alternative D are anticipated to be less than Alternative A.

Recreation, OHV, and Dispersed Travel. Alternative D does not require BMPs or mitigation for reclaiming disturbed areas. These management actions are anticipated to have similar adverse impacts relative to Alternative A. See the OHV section in this chapter for more details involving limits to OHV use by alternative.

Proactive Management Actions. Alternative D does not require development of a comprehensive INPS management program; however, Alternative D does propose eradicating 850 acres of salt cedar. For the reasons stated above, Alternative D is anticipated to have more beneficial impact on the control and spread of INPS compared to Alternative A, but less than alternatives B and C.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. Under Alternative E, surface disturbance on highly erosive soils is managed similarly to the actions described under Alternative C. Management of surface disturbance on slopes greater than 25 percent is allowed in the entire planning area with the BLM authorized officer's approval. Prescribed fire is limited under Alternative E, similar to the restrictions described under Alternative C. Under Alternative E, the projected long-term disturbance acreage (21,672) from BLM actions, following reclamation, is the second highest after Alternative D (Appendix M). The projected long-term disturbance acreage for Alternative E is approximately 3-percent higher compared to Alternative A and approximately 87-percent higher than Alternative B.

The impacts from surface-disturbing activities under Alternative E are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. The intensity of adverse impacts from surface-disturbing activities under Alternative E is anticipated to be less than the intensity described for Alternative A.

Livestock and Native Ungulate Grazing. A livestock holding period could be required under Alternative E in the Level 1 Weed Management Area only, which would most likely reduce the rate of INPS invasion in the planning area. Alternative E is anticipated to result in less adverse impacts relative to Alternative A, but more than Alternative B.

Fire Management. Alternative E evaluates all fires and rehabilitates suppression-related damage as needed, similar to Alternative D. For the reasons stated, adverse, short- and long-term impacts under Alternative E are anticipated to be less than under Alternative A and similar to Alternative D.

Recreation, OHV, and Dispersed Travel. Alternative E requires certified weed-free seed and, when practical, use of locally harvested seed for reclaiming disturbed areas. These management actions are anticipated to have less adverse impacts relative to Alternative A and similar impacts to Alternative C. See the OHV section in this chapter for more details involving limits to OHV use by alternative.

Proactive Management Actions. Alternative E requires developing a comprehensive INPS management program and managing habitat fragmentation similar to that described for Alternative B. Alternative E proposes to inventory and develop a treatment plan to eradicate salt cedar over the life of the plan. For the reasons stated above, Alternative E is anticipated to have more beneficial impact on the control and spread of INPS compared to Alternative A.

4.4.4.3 Conclusion

Meaningful differences in long-term disturbance acreage; surface disturbance and prescribed fire management on highly erosive soils and slopes greater than 25 percent; use of certified weed-free seed, timing, and reseeding requirements in reclamation of disturbed areas; management of livestock including holding periods, forage utilization, and grazing allotment evaluations; areas open, closed, and limited for OHV use; management of heavy equipment use for fire suppression, as well as rehabilitation and stabilization following wildland fire; requirements for a comprehensive INPS management program; and eradication of salt cedar form the basis for the following conclusion. Potential impacts from alternatives are anticipated to be similar in type, primarily adverse, short- and long-term, but different in intensity. Potential adverse impacts from Alternative D are anticipated to be the most adverse, whereas impacts from Alternative B are anticipated to be the least adverse. Potential impacts from alternatives C and E are anticipated to be similar in intensity and less than Alternative A.

4.4.5 Fish and Wildlife Resources – Fish

Actions that could occur through implementing each alternative could affect fish resources. This section describes the impacts of each alternative on fish resources in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as beneficial or adverse.

Both natural events and human activities that influence water quality and water quantity can produce beneficial or adverse impacts to fisheries habitats. Direct impacts can result from onsite disturbance to fisheries habitats. Indirect impacts can result from changes in water quality and quantity. Management actions that increase rates at which sediment is transported to and through streams increase deposition within the streams and could adversely impact fish. Refer to Appendix M for data regarding surface disturbance acreage and number of actions by alternative.

There are 10 species recognized by the WGFD as Status 1-3 (Native Species Status [NSS] 1-3, refer to the Glossary) known to occur within the planning area: including lake chub, flathead chub, hornyhead chub, black bullhead, common shiner, finescale dace, pearl dace, plains topminnow, plains minnow, and suckermouth minnow (Appendix E). The impacts to NSS1-3 species are similar to the impacts described in this section.

In addition to their ecological importance, fish are a valuable resource for humans. Management actions that impact access to this resource for recreational use by the public would be a direct impact on fisheries management.

4.4.5.1 Methods and Assumptions

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

- Activities that cause substantial disturbance to soils and vegetation may adversely impact water quality and quantity, which adversely impacts fisheries habitats.
- Surface disturbances accelerate runoff and sediment delivery to stream channels, which alters streamflows and reduces habitat quality for fish that require clear water, moderated streamflows, and clean substrates.
- Increased sedimentation adversely affects most fish species in the planning area. This analysis, therefore, focuses on the degree of surface disturbance anticipated to occur under each alternative.
- Activities affecting water quantity are regulated by the Wyoming State Engineer's Office.
- Activities affecting water quality are regulated by the Wyoming DEQ.
- Management toward DPC is assumed to exceed the requirements of managing toward PFC.
- The potential for sedimentation of streams and rivers is minimized through using BMPs.

4.4.5.2 Analysis of Alternatives

Allowable uses and management potentially impacting fish include all surface-disturbing activities, concentrated livestock and native ungulate grazing, OHV use, fire management, and proactive management actions. Potential impacts to fisheries generally occur in two categories—water quality and water quantity—due to the limited number of fish-bearing stream segments occurring on public lands. These categories serve to organize the description of potential impacts for each alternative.

Impacts Common to All Alternatives

The types of impacts projected to occur to fish as a result of the various alternatives are similar; however, the intensity of impacts varies by alternative. Impacts to water quality and quantity are described in general below and in more detail in the Water Resources section in this chapter. Impacts to fish from changes in water quality and water quantity are described under individual alternatives.

Water Quality. Under all alternatives, fisheries resources could be affected by resource management actions that alter water quality through sedimentation and related degradation from surface-disturbing activities, water temperature changes, water chemistry changes, and riparian management and restoration.

Sedimentation of streams and rivers could be caused by any surface disturbance that removes vegetation and loosens the surface soil, which ultimately is deposited in streams and rivers. The amount of sediment that reaches streams and rivers depends on many factors, including slope gradient, soil type, sediment control measures, distance from the disturbance to the channel, and the type and amount of vegetative cover. The highest potential for surface disturbance under all alternatives is anticipated from BLM actions in fire management and ecology, mineral development, road construction, pipelines and powerlines, and vegetation treatments (Appendix M). Soil disturbance also could result from forest management activities, OHV use, livestock grazing, and the reclamation of disturbed areas.

Livestock and wildlife grazing can increase sediment entering streams from animal concentration areas, the collapsing of banks, stream-channel alteration, and removal of vegetation in riparian areas. Livestock and wildlife grazing in riparian areas can prevent regeneration of woody and herbaceous riparian vegetation necessary to stabilize streambanks. Soil disturbance from livestock grazing is minimized through implementing the *Standards for Healthy Rangeland and Guidelines for Livestock Grazing Management for Public Lands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b) under all alternatives. In addition, salt, mineral, and other livestock supplements near riparian areas, wetlands, and other waters have the potential to adversely impact water quality.

Increased sediment in streams, rivers, and reservoirs decreases the potential for wild fish to naturally reproduce, fills in pools, leads to channel degradation, and increases stream temperatures. Changes in water temperature also would result from changes in the amount of vegetative cover. Changes in aquatic habitats would lead fish to alter their uses of the stream, moving to different areas for feeding and spawning, depending on habitat conditions. Changes in water chemistry result from fire and fuels management and the use of retardant or foam near riparian areas and water sources.

Water Quantity. Water quantity may be impacted by activities that alter water runoff and water discharge. In areas with little vegetation, more rainfall may reach the stream systems because it does not infiltrate the soil. However, greater runoff can cause accelerated erosion and increased sediment loading in streams. Impervious surfaces and compacted soils may result in higher volumes of water reaching the stream system in shorter time periods, thus increasing flooding frequency, volume, and erosion.

Produced water from CBNG wells and conventional wells is sometimes discharged to the surface, contributing additional flows to the surface water system. These discharges can alter the timing, location, and volume of local streamflow patterns. Produced water discharge also can increase erosion rates in stream channels along with instream flows and augment sedimentation in streams. However, BLM policies and BMPs, required as COAs, minimize and mitigate, to the extent possible, erosion resulting from produced water surface discharge. Aquatic species may be impacted by the amount of produced water discharge to the surface, especially during periods of low flow and spawning. Overall, however, the quantity of produced water is anticipated to be similar and have negligible beneficial and adverse impacts for all alternatives.

Surface water modeling conducted for the *Powder River Basin Oil and Gas Project Final EIS and Proposed Plan Amendment* (BLM 2002c) calculated discharge increases from produced water in major tributaries in CBNG development areas ranging between 7 and 15 cfs. In most watersheds, this increased discharge was predicted for much higher well numbers (greater than two orders of magnitude) and greater well densities than occur in the planning area (BLM 2003g). The surface water bodies receiving produced water discharges would be supplemented, but the amount of supplemental water reaching the surface water system would be determined by whether the produced water were discharged into impoundments or wetlands, injected into an aquifer, or allowed to flow to a stream.

Alternative A

Water Quality. Compared to Action Alternatives, Alternative A allows the second greatest acreage of BLM mineral estate (1,136,855 acres) open to oil and gas and other leasables with standard constraints. Some of this development is projected to occur in areas that drain into Class 1 or 2 streams. The State of Wyoming requires an antidegradation policy for Class 1 streams, whereas Class 2 streams require that the designated uses be sustained.

Other activities proposed under Alternative A that could result in surface disturbance and contribute to sedimentation include OHV use, the mining of coal and salable and locatable minerals, the development of wind-energy sites, and forest management. For example, Alternative A designates the smallest acreage closed to OHV use. In addition, Alternative A allows OHV use on highly erodible soils in the planning area. Without limits on the disturbance of these soils, OHV use could contribute sedimentation to surface water bodies. Structures associated with road and trail construction could intercept surface water runoff and divert sediment to the stream systems. Approximately 10 percent of the grazing allotments are evaluated each year to determine whether they meet the standards for healthy rangelands. Increased sedimentation resulting from the activities identified above would likely impact fisheries habitats within the planning area.

Water Quantity. Alternative A imposes the second fewest restrictions on activities that remove vegetation and compact soils. This would result in increased stormwater runoff entering streams. This alternative is projected to have the highest number of federal wells drilled (i.e., 1,823 wells). Because approximately 25 percent of federal wells drilled are estimated to be CBNG, Alternative A is also expected to produce the most water associated with the development of CBNG wells.

Alternative B

Water Quality. Alternative B proposes less surface disturbance over the long term compared to Alternative A. Initially, surface disturbance would reclaim unnecessary roads, but over the long term, the reclamation should improve watershed health by reducing sedimentation created by the roads. Compared to Alternative A, fewer opportunities exist for surface-disturbing activities, including oil and gas development and forest management. More areas are designated as having NSO and CSU restrictions along perennial streams, riparian areas, and water bodies under this alternative. Alternative B restrictions on surface-disturbing activities and surface occupancy on highly erodible soils are expected to result in the least adverse impacts to Class I and II streams relative to Alternative A and other Action Alternatives. Alternative B is the only alternative without any acreage of highly erosive soils protected by minor or no restrictions (see Soils and Water sections).

Under this alternative, the Bates Hole MA would be created to protect highly erosive soils and watershed values. Formation of this MA is expected to have beneficial impacts on water quality in Bates Hole and the North Platte River.

Adverse impacts to water quality from OHV use are expected to be less under Alternative B than under Alternative A due to upgrades, rerouting, or closure of roads and trails causing excessive erosion. With the most area closed to OHV use, the most area limited to designated roads and trails for OHV use, and the least area limited to existing roads and trails for OHV use, Alternative B is anticipated to result in the least adverse impacts to water quality compared to Alternative A and other Action Alternatives. The use of prescribed fire on highly erosive soils is prohibited under Alternative B, which provides some limitations on damage to vegetation that helps minimize erosion and reduce sedimentation in surface water bodies. The stringent requirements to revegetate all disturbed areas within one growing season reestablish soil cover more quickly than under Alternative A, also resulting in fewer opportunities for soil erosion and sedimentation. Other restrictions on surface disturbance proposed under Alternative B that would minimize potential impacts to surface water quality through sedimentation include (1) the establishment of larger areas that limit the extraction of salable minerals around bald eagle roost sites, especially in areas with highly erodible soils; (2) opening fewer areas to renewable energy development; and (3) the prohibition of new road and trail construction. All rangelands are managed to maintain healthy and vigorous vegetation and minimize soil erosion.

Alternative B implements riparian habitat improvements, including restoring 108 miles of incised streams, restoring 90 acres of lentic habitat, improving floodplain connectivity and function on 350 stream miles, and managing 350 miles of lotic and adjacent riparian habitats and 10,000 acres of lentic habitats toward DPC. The restrictions on surface-disturbing activities under Alternative B, along with proposed actions to improve riparian habitats in selected streams, reduce impacts to water quality and fish habitats compared to Alternative A and benefit fisheries in the planning area.

Water Quantity. Alternative B results in the least amount of change to surface water quantity because the fewest federal wells are drilled (190 wells) and more restrictions on surface-disturbing activities are implemented than under Alternative A or any of the other alternatives. Alternative B proposes constructing 1,000 acres of fish and wildlife reservoirs in the planning area, more than Alternative A and other Action Alternatives. While additional reservoirs are anticipated to benefit planning area fisheries and provide additional recreational opportunities to the public compared to Alternative A, water depletion from new reservoirs may adversely impact downstream species in the Platte River (see Special Status Species section). Water depletion to the Platte River System is anticipated to be greatest under Alternative B relative to Alternative A and other Action Alternatives.

Alternative C

Water Quality. Alternative C is expected to produce approximately 1,301 less acres of short-term surface disturbance relative to Alternative A and approximately 22,000 more acres compared to Alternative B. Alternative C's proposed restrictions on highly erodible soils and reclamation requirements are anticipated to result in less adverse impacts to water quality compared to Alternative A, but more than Alternative B.

Water Quantity. Alternative C proposes constructing 500 acres of fish and wildlife reservoirs in the planning area, half of the acreage proposed under Alternative B and 500 acres more than proposed under Alternative A. Fish and wildlife reservoirs are anticipated to benefit fisheries in the planning area compared to Alternative A, but may adversely impact downstream species in the Platte River (see Special Status Species section). Water depletion to the Platte River System is anticipated to be greater under Alternative C relative to Alternative A.

Alternative D

Water Quality. Alternative D has the most potential of all alternatives to degrade water quality through increased sedimentation due to having the least restrictions on surface-disturbing activities. Surface disturbance on highly erosive soils and on slopes greater than 25 percent is allowed, and the largest number of acres is open to mineral development and subjected to the fewest requirements for reclamation and revegetation activities. OHV restrictions are similar to those described under Alternative A, but more area would be closed to OHV use under Alternative D so the potential for surface disturbance and sedimentation from OHV use would be slightly less. Alternative D restores 33 miles of incised streams compared to Alternative A. Because similar acreage of surface disturbance and similar restrictions are proposed by Alternative D, the anticipated impacts to water quality are anticipated to be similar to Alternative A.

Water Quantity. Alternative D proposes constructing 100 acres more of fish and wildlife reservoirs in the planning area as compared to Alternative A, but only 10 percent of the acreage proposed by Alternative B. Fish and wildlife reservoirs are anticipated to benefit fisheries in the planning area compared to Alternative A, but may adversely impact downstream species in the Platte River (see Special Status Species section). Water depletion to the Platte River System is anticipated to be greater under Alternative D relative to Alternative A.

Alternative E (Proposed Casper RMP)

Water Quality. In the short and long term, surface disturbance from BLM actions are similar under alternatives E and A. Under Alternative E, disturbance on highly erodible soils is anticipated to be less than in Alternative A, potentially causing less sedimentation in fisheries habitats. Alternative E specifies more measures to protect water quality compared to Alternative A.

Water Quantity. Alternative E proposes constructing 100 acres more of fish and wildlife reservoirs in the planning area as compared to Alternative A, but only 10 percent of the acreage is proposed by Alternative B. Fish and wildlife reservoirs are anticipated to benefit fisheries in the planning area compared to Alternative A, but may adversely impact downstream species in the Platte River System (see Special Status Species section). Water depletion to the Platte River System is anticipated to be greater under Alternative E relative to Alternative A.

4.4.5.3 Conclusion

Alternatives A and D have the greatest potential of adverse impacts to fisheries because these alternatives have the largest areas open to mineral development and the least restrictions on surface-disturbing activities. Alternative B results in the least adverse impacts to fisheries due to more restrictions on surface-disturbing activities and the potential of limiting activities for the entire length of the North Platte River. Compared to Alternative A, limitations on surface disturbance and mineral development under Alternative B lessen degradation of water quality; however, proposed new fish and wildlife reservoirs under Alternative B deplete more water to the Platte River System. Alternative C provides similar beneficial impacts as under Alternative B, but similar to other alternatives, Alternative C could still allow surface-disturbing activities on highly erodible soils, contributing more sediment to the streams and adversely impacting watershed health more than Alternative B. Alternative E provides slightly more beneficial impacts to fisheries by limiting surface disturbance on highly erodible soils compared to Alternative A, but less than Alternative B.

4.4.6 Fish and Wildlife Resources – Wildlife

Actions that remove, degrade, or fragment wildlife habitats are considered adverse. Beneficial impacts include actions that conserve or improve habitats, such as big game crucial winter range, nest sites, or leks.

Direct impacts to wildlife could result from the loss of habitats or key habitat features, such as a nest site or lek area, or from the immediate loss of life. Wildlife also can be directly disturbed by human activities, potentially causing wildlife to abandon a nest, lek, or home range. Disturbance during sensitive periods (e.g., winter, nesting) is known to adversely impact wildlife. Human activities, such as OHV use, recreation, and noise from equipment associated with development and surface-disturbing activities, impact some wildlife species. These activities are considered to be particularly detrimental to nesting and lekking grouse, nesting raptors, and wintering big game. Disturbance impacts range from short-term displacement and shifts in activities to long-term abandonment of home range (Yarmaloy et al. 1988; Miller et al. 1998; Connelly et al. 2000).

Habitats can be lost and fragmented by activities such as vegetation treatments, fire management and ecology, mineral exploration and extraction, construction and maintenance of roads and trails, and development of wind-energy facilities.

Indirect impacts to wildlife can occur by changing habitat characteristics or quality. Habitat quality can be impacted by various surface-disturbing activities and other actions that remove vegetation and disturb soil. Indirect impacts to potential habitats for wildlife also could occur when specific actions change the habitats in a way that would make them unsuitable for future habitation.

For the purpose of this analysis, short-term impacts to wildlife are activities that an individual or species respond to immediately, but do not affect the population viability of the species. For example, many disturbance impacts are short term in that a species may temporarily abandon an area, nest, or lek, but return immediately following the cessation of the disturbance, such as a passing-by OHV. Short-term construction may cause an animal to abandon an area, nest, or lek, but the wildlife are often able to return to the area and reproduce successfully the following season. Refer to maps 19 and 23 for vegetation types and to maps 25 and 26 for wildlife.

4.4.6.1 Methods and Assumptions

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

- The BLM is responsible for managing habitats, whereas state and federal wildlife management agencies (e.g., WGFD, USFWS) oversee management of wildlife species. Therefore, this analysis primarily relies on changes to vegetation types to estimate impacts to wildlife 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 on wildlife species.
- Disturbance impacts to wildlife are evaluated by comparison to current management practices in the planning area; increased protection in time or space are beneficial, where as reduced protection result in adverse impacts.
- Diverse and optimal habitats foster healthy, abundant, and diverse biological communities.
- Disturbance during sensitive periods adversely impacts wildlife.
- Habitat fragmentation adversely impacts wildlife.
- The BLM controls livestock grazing only on BLM-administered surface lands.
- Prescribed fire is a tool used to manage vegetative communities and can result in short-term adverse impacts with long-term beneficial impacts to wildlife and wildlife habitats.
- Forest management actions managing wildlife habitats instead of or in addition to managing forest products are anticipated to benefit wildlife habitats.
- Management actions aimed at benefiting specific wildlife species can have adverse or beneficial impacts on other wildlife species.
- Alternatives with a larger acreage managed toward DPC will exhibit a correspondingly greater benefit to wildlife than alternatives managing a smaller number of acres toward DPC. Management toward DPC is assumed to exceed the requirements of managing toward DFC.
- Alternatives with a larger number of acres of surface water developed will exhibit a greater benefit to migratory game birds and other riparian/wetland wildlife species when compared to alternatives with smaller acreage of surface water developed.
- The potential for adverse and beneficial impacts to wildlife is anticipated to be commensurate with the intensity of allotment monitoring and the amount of forage utilization from livestock grazing in the planning area.
- Alternatives providing the greatest protection of water sources beneficial to wildlife are anticipated to have the greatest benefit to wildlife.
- The more acreage of habitats protected from fragmentation, the greater the benefit to big game and other wildlife species.

- Surface disturbance causes adverse impacts to wildlife habitats. Lesser amounts of surface disturbance in wildlife habitats have a corresponding lesser adverse impact to wildlife compared to more surface disturbance.
- Alternatives proposing to protect the most habitats from fragmentation are anticipated to have the most beneficial impact on wildlife.
- The greater the distance from development that baiting for trophy game is allowed, the less conflict will occur between trophy game and people. Correspondingly, the larger the amount of prohibited acreage, the greater the beneficial impact will be to trophy game.
- Prohibiting surface disturbance or occupancy is more restrictive and provides more protection for wildlife than avoiding surface disturbance or occupancy.
- The more surface disturbance that occurs on steep slopes or on highly erosive soils, the greater the potential for adverse impacts to wildlife habitats.
- The higher the road density in the planning area, the greater the potential to degrade adjacent wildlife habitat quality in the planning area.
- All known raptor nests from BLM's GIS database were used in the analysis and all raptor nests of unknown species are assumed not to be special status species.
- 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 within the planning area. Impact acreage for vegetation types are not absolute, but serve as a relative comparison among alternatives.
- Conversion of wells for wildlife and livestock are anticipated to benefit the distribution and health of wildlife within the planning area.
- The more area used by OHVs and the higher the density of OHV use, the more adverse impacts are anticipated to wildlife habitats.
- The BLM will utilize best available information, management and conservation plans, and other research and related directives, as appropriate, to guide wildlife habitat management on BLM-administered lands (see appendices B and K).

4.4.6.2 Analysis of Alternatives

Allowable uses and management actions that could impact wildlife habitats include all surface-disturbing activities, concentrated livestock grazing, fire management and ecology, forest management, INPS, OHV use, recreation, transportation, and proactive management actions.

Impacts Common to All Alternatives

The impacts projected to occur to wildlife as a result of the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts to wildlife from surface-disturbing activities, concentrated livestock grazing, fire management and ecology, forest management, INPS, OHV use, recreation, transportation, and proactive management actions are described under individual alternatives. For organization purposes, impacts to wildlife from alternatives generally are grouped into categories of surface-disturbing activities, wildlife-disturbing activities that remove vegetation and disturb soil, spread of INPS, transportation, and proactive management actions anticipated to impact wildlife. The impacts described for each alternative are organized according to the statutory wildlife categories described in the Fish and Wildlife Resources – Wildlife section in Chapter 3.

Table 4-8 summarizes the anticipated short- and long-term surface disturbance from BLM actions in the planning area over the life of the plan. RFAs contributing to this surface disturbance are identified in Appendix M. Because the precise location of foreseeable actions in the planning area is not known at this

time, Table 4-8 and associated types of development were used to estimate the relative impact of alternatives on statutory categories of wildlife. Please note, with the exception of the title, this is the same table as Table 4-1, included here for the reader's benefit.

Table 4-8. Reasonable Foreseeable Actions – Surface Disturbance Acres in the Casper Planning Area

Restriction	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Total Acres Short-Term Disturbance from BLM Actions	59,990	36,650	58,689	63,649	61,274
Total Acres Reclaimed from BLM Actions	38,903	25,085	38,331	41,569	39,602
Total Acres Long-Term Disturbance from BLM Actions	21,087	11,565	20,358	22,080	21,672

Source: Appendix M, Table M-1
BLM Bureau of Land Management

Animal damage control is conducted by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) Wildlife Services and would not differ among alternatives (BLM 1994a). Animal damage control typically applies to coyote, red fox, and skunk. No difference in adverse impacts to predatory animals is anticipated across alternatives.

Potential impacts to wildlife species are anticipated from surface-disturbing activities, wildlife-disturbing activities that remove vegetation and disturb soil, spread of INPS, and proactive management actions. Although lumped for discussion purposes under surface disturbance, oil and gas development is anticipated to be the greatest single contributor to disturbance of wildlife habitats in the planning area. The WGFD (2004a) provides a more thorough discussion of the impacts of oil and gas development on crucial and important wildlife habitats. At various intensities, the actions of all alternatives could adversely impact wildlife through the loss, degradation, and fragmentation of habitats, and benefit wildlife through the protection, enhancement, and restoration of habitats. Potential impacts from each category of activities are described below as they apply to all alternatives and statutory wildlife categories.

Surface-disturbing Activities. Because the precise location of surface disturbance from alternatives is unknown and because wildlife species utilize more than one vegetation type, the degrees 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 reclamation restores habitats, thereby reducing long-term surface disturbance acreage, the location of permanent facilities (e.g., roads, well pads, etc.) adjacent to reclaimed areas can reduce the utility of reclaimed habitats. For example, the higher the density of permanent facilities in an area, the more a habitat is fragmented and the more adverse impact anticipated for wildlife. Table 4-9 summarizes select conservation measures anticipated to offset some of the impacts to habitats.

Table 4-9. Summary of Select Conservation Measures and Potential Habitat Impacts for Wildlife

Actions Affecting Wildlife	Acreage Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Buffer Acres Around Raptor Nests	Total Area	82,938-157,220	82,940-270,914	82,940-270,913	82,940-257,625	82,940-257,625
	BLM-Administered Surface	82,938-123,622	64,572-213,876	64,572-213,875	64,572-204,177	64,572-204,177
Acres Closed to OHV Use	BLM-Administered Surface	2,661	26,027	7,943	2,661	2,224
Acres Open to OHV Use	BLM-Administered Surface	187	242	285	285	285
Acres Limited to Existing Roads and Trails for OHV Use	BLM-Administered Surface	1,311,715	909,651	1,162,113	1,292,630	1,162,244
Acres Limited to Designated Roads and Trails for OHV Use	BLM-Administered Surface	47,014	425,657	191,236	66,001	196,824
Sharp-Tailed Grouse Strutting/Dancing Ground Buffer Acres	Total Area	500	2,012	Same as Alternative A	Same as Alternative A	Same as Alternative A
	BLM-Administered Surface	0	0	Same as Alternative A	Same as Alternative A	Same as Alternative A
Sharp-Tailed Grouse Nesting and Early Brood-Rearing Buffer Acres	Total Area	32,134	121,672	Same as Alternative A	Same as Alternative A	Same as Alternative A
	BLM-Administered Surface	80	1,672	Same as Alternative A	Same as Alternative A	Same as Alternative A
Acres Protected from Habitat Fragmentation	Total Area	0	660,498	279,305	0	192,545
	BLM-Administered Surface	0	413,552	177,035	0	131,879
	BLM-Administered Minerals	0	580,007	238,724	0	168,386
Acres Protected from Habitat Fragmentation by Vegetation Types						
Agricultural Lands (Altered by Human)	Total Area	0	3	3	0	0
	BLM-Administered Surface	0	0	0	0	0
Grasslands	Total Area	0	175,000	85,552	0	64,302
	BLM-Administered Surface	0	109,692	52,589	0	40,032
Desert Shrublands (Including Greasewood)	Total Area	0	137,327	18,252	0	5,115
	BLM-Administered Surface	0	83,675	9,652	0	2,902
Mountain Shrubland	Total Area	0	37,495	37,610	0	32,325
	BLM-Administered Surface	0	27,318	27,350	0	23,380
Riparian	Total Area	0	9,701	3,234	0	2,104
	BLM-Administered Surface	0	3,086	115	0	107

Table 4-9. Summary of Select Conservation Measures and Potential Habitat Impacts for Wildlife *(Continued)*

Actions Affecting Wildlife	Acreage Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Rock Outcrops/Badlands	Total Area	0	3,087	3,095	0	2,001
	BLM-Administered Surface	0	2,962	2,967	0	1,952
Sagebrush	Total Area	0	241,450	97,976	0	63,082
	BLM-Administered Surface	0	146,598	58,418	0	44,510
Acres Managed toward DFC or DPC for Aspen	BLM-Administered Surface	DFC 2,822	DPC 2,822	DPC 1,411	DPC 706	DPC 2,822
Acres Managed toward DFC or DPC for Sagebrush	BLM-Administered Surface	DFC 630,183	DPC 630,183	DPC 315,902	DPC 157,546	DPC 630,183
Acres Managed toward DFC or DPC for Mountain Shrub	BLM-Administered Surface	DFC 46,779	DPC 46,779	DPC 23,390	DPC 11,695	DPC 46,779
Acres Managed toward DPC: Miles of Lotic/ Acres of Lentic Habitat	BLM-Administered Surface	PFC 350/10,000	DPC 350/10,000	DPC 175/5,000	DPC 88/2,500	DPC 350/10,000
Incised Stream Miles/Lentic Habitat Restored	BLM-Administered Surface	N/A	108/90	75/47	33/43	Same as Alternative D
Stream Miles of Improved Floodplain Connectivity	BLM-Administered Surface	N/A	350	108	75	75
Acres of Salt Cedar Eradication Proposed	BLM-Administered Surface	N/A	1,700	1,275	850	Inventory and Develop a Plan
Livestock Holding/Flushing Period for INPS Control	BLM-Administered Surface	0	72 hours	72 hours	0	72 hours
Acres of Proposed Surface Water for Fish and Wildlife	BLM-Administered Surface	1,500	2,500	2,000	1,600	1,600

BLM Bureau of Land Management
DFC Desired Future Condition
DPC Desired Plant Community
N/A Not Applicable
PFC Proper Functioning Condition
OHV Off-highway vehicle
INPS Invasive, nonnative plant species

In addition to temporarily or permanently removing wildlife habitats, surface disturbance can degrade the quality of adjacent habitats. For example, erosion and runoff from surface disturbance can extend onto adjacent habitats, thereby 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 have short- and long-term impacts to wildlife. For example, Towry (1984) indicates that deficiencies in summer range habitat quality can lead to mortality of wildlife in the winter and reduce reproductive success in mule deer.

Surface-disturbing actions typically require BMPs to avoid or minimize impacts to soil resources and, ultimately, to habitats. Temporary protective surface treatments can benefit reclamation of habitats on steep slopes or on soils with high potentials for water or wind erosion because these areas are more difficult and often take more time to reclaim compared to other areas.

Once surface disturbance occurs, timely reclamation is important to avoid or minimize soil erosion and the spread of INPS. The longer reclamation takes to restore disturbed areas, the greater the adverse impact is to habitats and wildlife species.

Runoff from roads and other impervious surfaces or disturbed areas is an example of an impact from surface disturbance that can be short-term and long-term. Multiple disturbances on steep slopes or highly erosive soils are anticipated to exacerbate habitat degradation by soil erosion and runoff into wildlife habitats.

Vegetation treatments, such as silviculture, are used to manage forests that can, in turn, impact wildlife habitats. McAninch et al. (1984) observe that forest clear-cuts alter wildlife habitats more than other silviculture treatments because they set back plant succession to an early stage, disturb soil, alter microclimatic conditions, and completely remove forest habitats.

Roads remove vegetation and disturb soil when they are constructed and thereafter. Forman et al. (2003) identify mortality, habitat loss, and reduced habitat connectivity as the three impacts roads have on wildlife. Mortality of wildlife and loss of habitats due to road construction are direct impacts; vehicle speed and traffic volume generally have increased the mortality of wildlife due to vehicle collisions (Forman et al. 2003).

Road construction also causes habitat loss by converting wildlife habitats to permanent road surfaces and ROW (Forman et al. 2003). In addition, because roads typically are void of vegetation and exhibit impervious surface or compacted soil, they often promote increased surface runoff and lead to soil erosion and transport of pollutants to nearby streams, wetlands, or riparian areas.

In addition to direct impacts, roads also contribute to habitat fragmentation and can establish barriers to some wildlife species. For example, Towry (1984) indicates that roads generally decrease habitat quality for mule deer for a distance of ½ mile on either side of the road. Forman et al. (2003) acknowledge that buffer areas around roads generally are avoided by ungulates and large carnivores. Forman et al. (2003) also identify two wildlife responses to roads and their associated disturbances: numerical responses and behavioral responses. Numerical responses pertain to reductions in wildlife abundance or density; behavioral responses pertain to wildlife that has learned to avoid roads. While the impacts identified are considered adverse, roads can also create beneficial impacts to wildlife. For example, exclusion fencing along roads can increase the amount of forage available to small mammals (Forman et al. 2003).

In addition to roads, ROWs and corridors occur in the planning area under all alternatives and impact wildlife in varying 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 in raptors through electrocution and collisions (USFWS 2002a). In addition to raptors, other species, such as ravens, crows, magpies, small flocking birds, and wading birds, are subject to electrocution by utility structures (USFWS 2002a). Erecting artificial nest platforms on utility structures may benefit birds such as osprey, eagles, and hawks, and nest boxes constructed on utility structures may benefit cavity-nesting birds (e.g., bluebirds) and bats (USFWS 2002a).

Wildlife-disturbing Activities. Planned and unplanned wildland fire removes vegetation and disturbs soils. Although wildland fire adversely impacts wildlife habitats in the short term by removing vegetation and disturbing soil, the long-term benefits of wildland fire often outweigh the short-term adverse impacts. For example, prescribed fire can be used to restore conditions benefiting wildlife species favoring early plant succession stages and young age classes of woody plants (McAninch et al. 1984). Wallmo (1980) suggests that fire improves the palatability of forage and fire causes browse plants to resprout close to the ground, putting the current season's growth within reach of deer for several years.

Fire suppression removes vegetation and disturbs soil and can have both short- and long-term impacts to big game and other habitats. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation in the short term. Moreover, if not rehabilitated, these fire lines can cause erosion and provide opportunities for the spread of INPS, thereby resulting in long-term adverse impacts to wildlife habitat. Timely rehabilitation following fire, therefore, is important to maintaining the quality of wildlife habitats.

Wildland fire can also have beneficial and adverse impacts to wildlife habitats. For example, fuels tend to build under repeated fire suppression, sometimes resulting in intense wildland fires that can cause long-term adverse impacts to wildlife habitats. Repeated fire suppression in forests also can result in encroachment of fire-induced wildlife habitats (Wishart 1980). On the other hand, wildland fire can improve the quality of wildlife habitats by releasing soil nutrients, reducing fuel load, or setting back trees encroaching into shrubland or grassland habitats. Preparing wildland fire use plans and coordinating with adjacent land owners prior to prescribed or wildland fires can provide opportunities for taking advantage of the benefits wildland fire can provide to wildlife habitats.

OHV use is another wildlife-disturbing activity which, through removal of vegetation, disturbance of soil, and transport of INPS, can degrade wildlife habitats. In addition to direct impacts of vegetation removal and soil disturbance, the disturbance to wildlife associated with OHV use includes the movement and noise from vehicles and riders. In addition to OHV use, construction, mineral exploration and extraction, recreation, and vehicles traveling on roads can cause noise that adversely impacts wildlife.

Some species of wildlife are more sensitive to noise and disturbance than other species, while other species habituate to types of noise or disturbance. For example, The Nature Conservancy (TNC 2000) indicates that male sharp-tailed grouse "…are tolerant of a variety of disturbance but are displaced by human presence." On the other hand, certain magnitudes and frequency of noise may interrupt wildlife communication and adversely impact wildlife. For example, Brattstrom and Bondello (1983) found that the magnitudes and frequencies of occurrence of intense off-road vehicle use in the California desert constitute a potential threat to the well-being of the desert kangaroo rat. In addition, 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. 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 abandoning nests due to disturbance. USFWS (2002a) also indicates that human activities resulting in disturbance to raptors can cause population declines. In general, the more area that is subject to noise and human-disturbing activities, such as intense OHV use, or the higher the density of these activities, the more disturbance and adverse impacts to wildlife habitats are anticipated.

Failure to implement proper livestock grazing management can degrade wildlife habitats through removal of vegetation, disturbance and compaction of soil, and transport of INPS. Aside from transporting INPS, the most impact to wildlife habitats from livestock is anticipated in concentrated areas, such as water

sources and riparian areas. Proper management of livestock grazing, deferring grazing on pastures exposed to wildland fire, monitoring forage utilization, and managing allotments to healthy rangeland standards can avoid or minimize adverse impacts to wildlife.

The spread of INPS contributes to loss of wildlife habitats, increased soil erosion, reduced water quantity and quality, and reduced structural and species diversity. Controlling the spread of INPS is necessary to maintain the carrying capacity of wildlife habitats. Comprehensive management plans including controlling and monitoring the spread of INPS are anticipated to be effective in controlling the adverse impacts of INPS. Targeting and eradicating INPS particularly detrimental to certain wildlife habitats are anticipated to benefit wildlife. For example, salt cedar is an INPS often found adjacent to or within water courses, wetlands, and riparian areas, habitats that are important to numerous wildlife species. If the spread of INPS in the planning area continues, adverse impacts to wildlife habitats are anticipated to be commensurate with the amount of wildlife habitats affected.

Proactive Management Actions. All alternatives propose to manage aspen, sagebrush, mountain shrub, lentic, lotic, and forest habitats in the planning area. The focus of management and the acreage managed varies by alternative.

A proactive management action under all alternatives is the annual prohibition of surface development from November 15 through April 30 on all big game crucial winter ranges (see maps 25 and 26). The exceptions to this restriction vary by alternative; however, in general, this restriction is anticipated to benefit big game.

Habitat fragmentation is a condition resulting from actions dissecting and isolating habitats. All alternatives protect wildlife habitats to some degree. Developing ROW and corridors, roads, fences, wind energy, minerals, recreational facilities, and urban areas all contribute to habitat fragmentation. The impacts of fragmentation include, but are not limited to, reduction in biological diversity, habitat isolation, impediments to movement, and, in some cases, mortality.

Management actions and allowable uses that protect surface water from impacts associated with soil erosion and pollutants are anticipated to benefit wildlife habitats. In arid climates such as the planning area, the distribution and quality of water are important factors in the distribution and health of wildlife.

Wildlife species that use water sources and riparian/wetland habitats benefit from management actions common to all alternatives that promote protecting, developing, restoring, and improving water sources. For example, the BLM will, on a case-by-case basis, convert suitable abandoned oil and gas wells to water supply wells for use by wildlife and livestock, as appropriate.

All alternatives will continue to manage public lands within the Table Mountain (1,549 acres), Springer/Bump-Sullivan (593 acres), and Rawhide (200 acres) areas according to the WGFD's Wildlife Management Areas (WMAs), which have specific goals benefiting waterfowl and riparian and wetland habitats. Transfer of these areas to WGFD under some alternatives is not anticipated to have measurable differences in impacts to wildlife across alternatives.

Alternative A

Potential impacts to statutory wildlife categories are described in this section in relation to the allowable uses and management actions comprising Alternative A and in the context of the types of impacts described in Impacts Common to All Alternatives earlier in the Fish and Wildlife Resources – Wildlife section.

Surface-disturbing Activities. Alternative A requires the BLM to evaluate all surface-disturbing activities to determine the need for BMPs to minimize impacts on soil resources on a case-by-case basis; however, there is no requirement to apply BMPs to all surface-disturbing activities. Alternative A also considers NSO or other disturbance on slopes greater than 25 percent. Moreover, Alternative A has the most BLM-administered surface with high potential for water erosion and the second most BLM-administered surface with high potential for wind erosion subject to no or only minor restrictions on surface-disturbing activities. Alternative A generally controls the spread of INPS on a case-by-case basis without the use of a comprehensive planning area-wide management plan.

Wildlife-disturbing Activities. Alternative A uses prescribed burning to manipulate vegetation to benefit the BLM's range, forestry, and wildlife programs. Under Alternative A, the BLM develops wildland fire use plans on a case-by-case basis for those areas where prescribed fires are planned; however, to implement the plan, cooperative agreements are needed with adjacent private landowners and other fire and land management agencies. Wildland fire use plans offer the opportunity to treat vegetation for the benefit of wildlife and other resource programs.

Alternative A generally does not allow use of heavy equipment to construct fire lines in elk crucial winter range. Alternative A also requires consultation with the BLM wildlife biologist when fire threatens elk crucial winter range. If heavy equipment is used to construct fire lines, rehabilitation work begins immediately under Alternative A. In other cases, where no specific plan decisions are identified, rehabilitation and stabilization following wildland fire are performed on a case-by-case basis. Alternative A uses full suppression of wildland fires within forestlands, which contributes to fuel loading. In general, fire, suppression activities, and rehabilitation post wildland fire are anticipated to have adverse and beneficial impacts to big game habitats under Alternative A.

Proactive Management Actions. Alternative A includes proactive management actions anticipated to benefit wildlife within the planning area. For example, Alternative A proposes to manage aspen communities in the planning area toward DFC. For other woodland communities, Alternative A strives to achieve DFC on a case-by-case basis. Aspen provide important forage and cover for big game, so management of this community is important to maintaining vigorous and productive aspen stands. Alternative A also manages forests and proposes to develop detailed forest-management activity plans for 17 FMAs. Forest management under Alternative A uses silviculture treatments to achieve stand vigor. In general, forest management and silviculture treatments under Alternative A are anticipated to have adverse and beneficial impacts to big game. Alternative A also proposes to achieve DFC in sagebrush and mountain shrub communities. Both of these communities are used by wildlife, and achieving DFC on all acreage within the planning area is anticipated to benefit wildlife.

Under Alternative A, the BLM may grant exceptions, waivers, or modify restrictions in big game crucial winter range in writing (see Appendix F). These restrictions do not apply to maintaining existing facilities. In addition, no surface development is allowed on certain parcels of Muddy Mountain elk crucial winter range. Although exceptions can be granted, this management action is anticipated to benefit elk.

As developing resources and resource use increases in the planning area, continued habitat fragmentation—a detriment to big game and other wildlife—is anticipated. Alternative A does not specifically identify proactive management actions to avoid or minimize the adverse impacts from habitat fragmentation.

Alternative A does provide some protection of surface water from impacts associated with soil erosion and runoff from disturbed areas and from other actions by prohibiting surface occupancy (NSO) within ¼ mile of the North Platte River; within 500 feet of live streams, lakes, reservoirs, canals, and associated

riparian habitats; and within 500 feet of water wells, springs, or artesian and flowing wells. In some cases, Alternative A requires the fencing of wells and reservoirs to exclude livestock or wildlife to avoid the degradation of these water sources. Ducks Unlimited (2004) indicates that concentrations of livestock around wetlands, especially in the summer, can have localized impacts on wetland habitats important to waterfowl. Older water source developments (e.g., wells and springs) are redeveloped under Alternative A as issues arise or springs become nonfunctional. These restrictions are anticipated to benefit water quality and wetland and riparian areas.

Management of runoff from roads and other impervious surfaces or disturbed areas is accomplished under Alternative A through a Stormwater Management Program (SWMP) for all new BLM actions disturbing more than 5 acres. Although individually, sites smaller than 5 acres of disturbance are anticipated to have less adverse habitat impacts compared to individual and larger disturbances, multiple small disturbances collectively can have greater adverse impacts compared to isolated larger disturbances.

Alternative A designates the existing Jackson Canyon ACEC for bald eagles, but does not provide any additional special designations or other MAs anticipated to benefit wildlife. Based on the challenges and existing conditions, the impacts described under Impacts Common to All Alternatives, and the management actions and allowable uses described for Alternative A, impacts to populations in all 11 statutory wildlife categories, described in the following paragraphs, are expected to continue.

Big Game

The WGFD (2005b) identifies one or more of the following management challenges currently facing pronghorn, deer, elk, and bighorn sheep herd units in the planning area: habitat loss and fragmentation due to development, roads, trails, fences, agricultural conversion, and competition from livestock; poor public access for hunting; drought; conifer encroachment; increasing OHV use violations; human disturbance; spread of INPS; urbanization; poor nutrient value in shrubs; degradation, lack of regeneration, or high mortality in aspen and limber pine stands; and poor conditions and lack of understory in some riparian areas (see Appendix E). Although the BLM authorized officer may, under the existing plan, approve exceptions, waivers, or modifications, no surface development is allowed annually from November 15 through April 30 on all big game crucial winter ranges in the planning area. Alternative A does not identify large contiguous blocks of intact native vegetation in the planning area for protection from habitat fragmentation. Moreover, Alternative A does not restrict wind-energy development. Alternative A manages aspen, mountain shrub, grassland and shrubland, and habitats in the planning area toward DFC on a case-by-case basis, and manages riparian and wetland habitats in the planning area toward PFC on a case-by-case, basis. In addition, Alternative A maintains the current acreage of surface water in the planning area and does not identify specific actions to reduce salt cedar or other INPS that may adversely impact big game habitats. The management actions for Alternative A are generally expected to maintain existing conditions for big game in the planning area.

Trophy Game

Trophy game in the planning area include black bears and mountain lions. Black bear baiting around developed recreational areas is a management challenge for the BLM. Although bear baiting is regulated by the WGFD, baiting near recreational areas can result in conflicts between humans and bears. Under Alternative A, the BLM prohibits bear baiting within ½ mile of developments in the Muddy Mountain EEA. Black bears are affected by management actions in forest and woodland habitats, which, generally, are not focused on providing habitats for black bears or mountain lions.

Mountain lions generally utilize similar habitats as mule deer—their primary prey. Russell (1980) indicates that the mountain lion's adaptability and wide distribution precludes designating much habitat as critical for this species; however, human encroachment into habitats supporting mountain lions and their

prey reduce opportunities to manage this species. Although no specific management actions for mountain lions in the alternatives exist, mountain lions are impacted by management actions for mule deer and big game habitats.

Furbearing Animals

Furbearing animals include badger, beaver, bobcat, marten, mink, muskrat, and weasel. No specific management actions for furbearing animals exist, but these species are impacted by other management actions. Indeed, Storm and Tzilkowski (1982) indicate that land use and habitats markedly influence populations of furbearing animals. Badger, bobcat, and weasel are habitat generalists and, therefore, are impacted by actions in a variety of habitats. Impacts to various vegetation types can be found throughout this section.

The American marten is found in the planning area's forests and woodlands. American martens generally prefer older coniferous forest stands and aspen. Under Alternative A, no specific management actions aimed at maintaining late-successional forests and woodlands to benefit wildlife exist. Alternative A implements actions toward achieving DFC in aspen and woodlands on a case-by-case basis.

Beaver, muskrat, and mink also can be found in association with aspen, but are always near wetland and riparian areas. Under Alternative A, the BLM manages toward PFC on lotic and adjacent riparian and lentic habitats. An estimated 1,500 acres of water sources beneficial to riparian and wetland species currently exist in the planning area. Under Alternative A, the BLM pursues new water sources opportunistically. Livestock and wildlife tend to congregate at water sources, resulting in damage to critical riparian habitats. Under Alternative A, fencing of streams on BLM-administered land is evaluated on a case-by-case basis.

Predatory Animals

Predatory animals in the planning area include coyote, jackrabbit, porcupine, feral cat, red fox, raccoon, striped skunk, and spotted skunk. The BLM does not conduct any specific habitat management activities for predatory animals. Regardless, predatory animals will be affected by BLM management actions for wildlife habitats. These animals are largely habitat generalists and, therefore, would be impacted by actions for a variety of habitat types. Impacts to various vegetation types can be found throughout this section.

Small Game

Small game includes the cottontail rabbit, snowshoe hare, red squirrel, fox squirrel, and gray squirrel. No specific management actions for small game exist under Alternative A, but these species would be impacted by other biological resource management actions. Habitat fragmentation is an issue for small game populations because they tend to be especially disadvantaged by isolation (Temple 1985). Cottontail rabbits are habitat generalists and would be impacted by a variety of actions in all habitat types. Snowshoe hare and red squirrel inhabit forests and woodlands. Impacts to these habitats are discussed under Nongame (Neotropical Migrants). Fox squirrel and gray squirrel occur in riparian forests. Impacts to riparian areas also are discussed under Nongame (Neotropical Migrants).

Game Birds

BLM (1992b) identifies modifying grazing, prescribed burning, installing water developments, and building roost structures as methods for improving habitats for upland game birds. Sharp-tailed grouse, as well as Hungarian partridge and chukar, inhabit grassland on the planning area and, therefore, would be impacted by management actions in grassland habitats. Under Alternative A, there are no specific management actions for game birds that utilize grassland. These species would be impacted by actions in

grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing.

To minimize impacts to sharp-tailed grouse under Alternative A, surface disturbance or occupancy would be avoided within ¼ mile of occupied leks. Within this buffer, a TLS restriction would apply between 8 p.m. and 8 a.m. from March 1 to May 15 to minimize human disturbance. To protect associated nesting and early brood-rearing habitats, surface disturbance is avoided within 2 miles of leks from March 15 to July 15. Additional identified nesting and early brood-rearing habitats outside this 2-mile buffer also are protected. TNC (2000) indicates that populations of sharp-tailed grouse respond favorably to increases or protection of food sources and habitats (i.e., nesting and winter). Moreover, TNC (2000) suggests that at the proper frequency and scale, fire can be used to improve habitats for sharp-tailed grouse.

Other game birds are impacted by management actions in their preferred vegetation types. Ring-necked pheasants generally need undisturbed grass and weedy vegetation (BLM 1992b). This species occurs primarily on private lands in the planning area and likely would not be affected by BLM actions. Blue grouse inhabit forested areas and grass or sagebrush habitats and, therefore, are affected by management actions in these habitats; impacts to these habitats are discussed under Nongame (Neotropical Migrants). Wild turkeys use a variety of habitats, including river bottoms, pine forests, and foothills habitats. Impacts to these habitats are discussed under Nongame (Neotropical Migrants).

Migratory Game Birds

Although there are no specific management actions for migratory game birds (waterfowl), these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Under Alternative A, the BLM manages toward PFC for lotic and adjacent riparian and lentic habitats. An estimated 1,500 acres of water sources beneficial to waterfowl currently exist in the planning area. Under Alternative A, the BLM pursues new water sources opportunistically.

Nongame (Raptors)

BLM (1992c) identifies declining habitat quantity and quality as the major causes of decreases in raptor populations. In the planning area, disturbance impacts to raptors are minimized by buffer zones around raptor nests. Under Alternative A, the BLM determines the sizes of buffer zones around raptor nests on a case-by-case basis from February 1 through July 31; buffer zones typically are ¼- to ½-mile wide. Including special status raptor nests, Alternative A protects 82,938 to 123,622 acres surrounding raptor nests. Protective buffers help to minimize, but cannot completely prevent, impacts to raptors because most species are highly mobile well beyond any buffers. Parrish et al. (1994) summarize field-tested mitigation techniques to reduce impacts to raptors.

Wind-energy facilities can be a source of mortality for raptors because raptors can collide with wind tower blades. High mortality could result if wind towers are placed along a migration path or within nesting territories. Wind-energy facilities also result in habitat loss and human disturbance through construction and maintenance of wind towers and associated facilities. Alternative A allows for the development of wind-energy facilities throughout the planning area.

Nongame (Neotropical Migrants)

BLM (1992c) states that viable nongame bird populations and biological diversity can be promoted by improving livestock management, prescribed burning, removal of INPS, seeding, and erosion control. These actions are managed under Alternative A; however, prescribed burning is limited and the spread of INPS is expected to continue under Alternative A.

All neotropical migrants could be adversely impacted by wind-energy facilities, as discussed for nongame raptors. Wind-energy facilities, as well as other linear features (e.g., roads, utility corridors), fragment habitat. Paton (1994) indicates that the success of nongame bird nests declines near habitat edges.

Because of the diversity of bird species and habitat requirements, the descriptions of impacts are categorized under the following habitat guilds (note: a guild is a group of species that tend to occur in similar types of habitats): Forest and Woodland Species, Mountain Shrub Species, Sagebrush and Desert Shrub Species, Grassland Species, and Riparian and Wetland Species.

Forest and Woodland Species – No specific management actions exist under Alternative A to manage forests for wildlife. BLM actions for silviculture treatments, forest products, and insect control result in short-term disturbance. Clear-cuts that have not naturally regenerated within 3 years are artificially regenerated, thereby maintaining long-term sustainability. In aspen and other woodland communities, the BLM implements actions to achieve DFC on a case-by-case basis. Because of their diverse habitat requirements, some neotropical migrants are adversely impacted and some benefit from these management actions.

Mountain Shrub Species – Under Alternative A, the BLM manages mountain shrub communities toward DFC on a case-by-case basis. Management toward DFC is anticipated to maintain existing conditions for neotropical migrants dependent on mountain shrub habitats.

Sagebrush and Desert Shrub Species – Species that utilize or depend on sagebrush habitats benefit from management actions for greater sage-grouse as discussed in the Special Status Species – Wildlife section. Alternative A manages buffers around greater sage-grouse leks and nesting or early brood-rearing habitats. Because the breeding season of greater sage-grouse and neotropical migrants coincide, many species of neotropical migrants benefit from this restriction.

Under Alternative A, the BLM manages sagebrush habitats and implements actions to achieve DFC on a case-by-case basis. Management actions in sagebrush habitats could impact habitats for many neotropical migrants. Such actions include surface-disturbing activities, reclamation, control of INPS, and livestock and wildlife grazing. Surface-disturbing activities can result in habitat loss and fragmentation and reduce habitat quality. Alternative A does not provide specific guidance or management actions for the prevention of habitat fragmentation. Reclamation from surface disturbance and spread of INPS is handled on a case-by-case basis. Under Alternative A, the BLM continues to monitor rangeland health and prevent overutilization by livestock, with an emphasis on higher priority allotments (i.e., I and M allotments, see Glossary).

Grassland Species – Under Alternative A, there are no specific management actions for neotropical migrants that utilize grassland. These species would be impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Under Alternative A, grassland habitats could be impacted by long-term surface disturbance on BLM-administered land in the planning area.

Riparian and Wetland Species – Although there are no specific management actions for neotropical migrants that use riparian and wetlands, these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Under Alternative A, the BLM manages toward PFC on lotic and adjacent riparian habitats and lentic habitats. An estimated 1,500 acres of water sources beneficial to riparian and wetland species currently exist in the planning area. Under Alternative A, the BLM pursues new water sources opportunistically. Livestock and wildlife tend to congregate at water sources, resulting in damage to critical riparian habitats. Under Alternative A, fencing of streams on BLM-administered land is evaluated on a case-by-case basis.

Salt cedar, an exotic riparian shrub, has invaded 1,700 acres of BLM-administered land in the planning area. No specific management for the eradication of salt cedar and no comprehensive management plan for controlling INPS exist under Alternative A.

Nongame (Mammals)

Although there are no specific management actions for nongame mammals, these species would be impacted by other biological resource management actions. Nongame mammals are found in a variety of habitats and are affected by management actions in the preferred vegetation type of each species. Impacts to the various vegetation types are described above for nongame neotropical migrants and are expected to similarly impact nongame mammals.

Although bats also can utilize a variety of habitats, caves and abandoned mines are important features for most species. Bats that use caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. Abandoned mine closure and recreational caving have been identified as the two major threats to bat habitats (Priday and Luce 1995). Priday and Luce (1999) refer to caves and abandoned mines as "crucial habitat" for some species of bats. As with other species in the planning area, water in close proximity to other habitat features is important to bats, especially maternity colonies (Priday and Luce 1995).

There are 9,663-acres of identified "rock outcrops/badlands" on BLM-administered land that could contain potential bat habitats. These areas are steep to very steep. Under Alternative A, the BLM restricts surface-disturbing activities on slopes greater than 25 percent on a case-by-case basis. No specific management actions for abandoned mines exist under Alternative A. All bats could be adversely impacted by wind-energy facilities, as discussed for raptors.

Nongame (Reptiles and Amphibians)

Although there are no specific management actions for reptiles and amphibians under Alternative A, these species are impacted by other biological resource management actions. Snakes occur in a variety of habitat types, while lizards typically occur in the drier habitats, particularly those with rock outcrops and cliffs. Aquatic turtles and amphibians require riparian and wetland habitats. The impacts of management actions on these habitat types are discussed throughout this section.

Anticipated impacts are the result of increasing demand for resources in the planning area; lack of proactive management actions to minimize habitat fragmentation; lack of a comprehensive management plan to control the spread INPS; amount of land predicted to be disturbed by OHV use and surface-disturbing activities; lack of forest management focus on providing for wildlife habitats; and current management of wildland fire, prescribed fire, and fire suppression. Alternative A is anticipated to adversely and beneficially impact 10 of the 11 wildlife categories over the long term. Big game is the only category anticipated to not be beneficially impacted in some manner over the long term.

Alternative B

Potential impacts to statutory wildlife categories are described in this section in relation to the intensity of allowable uses and management actions comprising Alternative B and in the context of the types of impacts described in Impacts Common to All Alternatives. Potential impacts to statutory wildlife categories from Alternative B are described relative to Alternative A.

Surface-disturbing Activities. Alternative B includes more restrictions regarding surface disturbance than Alternative A. For example, Alternative B does not allow surface occupancy (NSO) on highly erosive soils or surface disturbance on slopes greater than 25 percent. Alternative B also requires

temporary protective surface treatment on disturbed areas. Moreover, Alternative B has the least BLM-administered surface with high potential for water erosion and the least BLM-administered surface with high potential for wind erosion subject to no, or only minor, restrictions on surface activities. The additional restrictions on surface disturbance are anticipated to benefit wildlife habitats.

Once surface disturbance occurs, reclamation requirements under Alternative B are anticipated to reduce adverse impacts to wildlife habitats. Alternative B closes and reclaims all existing roads and trails on BLM-administered surface not being utilized to meet public demand. The closure of roads and trails is anticipated to benefit wildlife habitats by reducing habitat fragmentation and erosion and pollutant runoff stemming from such roads and trails. OHV use under Alternative B is more restricted and, therefore, more beneficial to wildlife habitats. OHV use in the planning area under Alternative B is managed by four designations, as shown in Table 4-9. Overall, the tactical constraints, fuel management approach, rehabilitation, and use of prescribed fire under Alternative B are anticipated to benefit wildlife habitats.

Wildlife-disturbing Activities. Alternative B allows natural ignitions within areas with wildland fire use plans to proceed to meet desired management objectives. Moreover, Alternative B focuses wildland fire use plans within aspen, juniper, and true mountain mahogany communities, which are anticipated to benefit wildlife.

Seventeen-hundred acres of salt cedar are treated under Alternative B. In addition, Alternative B develops and implements a comprehensive management plan for controlling the spread INPS in the planning area. Part of this plan would be to hold livestock for 72 hours prior to movement on or within public lands to control the spread of INPS on BLM-administered lands. The plan and specific actions to control INPS identified for Alternative B are anticipated to slow the spread of INPS within the planning area and, thereby, benefit wildlife habitats.

Proactive Management Actions. Proactive management actions under Alternative B are anticipated to benefit wildlife because of management toward DPC under Alternative B rather than management toward PFC or DFC under Alternative A. Forest management under Alternative B benefits wildlife habitat. For example, Alternative B manages forestlands specifically for watershed stability and wildlife habitats and maximizes opportunities to promote species diversity, species vitality, and genetic diversity. Alternative B also treats woodland encroachment in grassland, sagebrush, aspen, and other vegetative communities where it is determined to be detrimental to other resource values and uses, benefiting grassland, sagebrush, and shrubland wildlife species. The construction of an additional 1,000 acres of surface water in the planning area under Alternative B benefits aquatic habitats.

No exceptions are granted to the restriction for big game crucial winter range under Alternative B; therefore, the benefits to big game and other wildlife under Alternative B are anticipated to be greater in these areas. In addition, Alternative B proposes a proactive management action to avoid or minimize the adverse impacts from habitat fragmentation. The protected contiguous blocks of land would prohibit wind-energy development; Alternative B limits wind-energy development to the smallest area (power classes 6 and 7; refer to Chapter 3, Table 3-26, for a description of these classes) of all alternatives. Minimizing the adverse impacts of habitat fragmentation is anticipated to benefit all wildlife categories described in this section.

Alternative B provides more protection to surface water from potential impacts associated with soil erosion and runoff from disturbed areas and other actions. For example, Alternative B institutes a CSU restriction within ¼ mile of perennial streams, riparian and wetland habitats, and water bodies (lakes and ponds). Alternative B also requires the fencing of all existing wells and reservoirs to exclude livestock or wildlife to avoid the degradation of these water sources. Alternative B also rehabilitates or redevelops all BLM-authorized well and spring developments, regardless if issues arise (as with Alternative A), thereby

benefiting water sources and associated wildlife habitats. These restrictions are anticipated to benefit water quality and wetland and riparian areas.

Alternative B also protects or enhances riparian, wetland, and streamside habitats. For example, Alternative B, as necessary, uses fencing, development of alternative water sources, livestock herding, placement of supplements, adjustments to pasture boundaries, and adjustments to season of use to protect riparian, wetland, and streamside habitats. Management of runoff from roads and other impervious surfaces or disturbed areas is accomplished under Alternative B through an SWMP for all new BLM actions, regardless of area. This requirement under Alternative B is more restrictive than Alternative A and anticipated to benefit water quality and associated wildlife habitats.

The establishment of other MAs and designation of ACECs for special status and wildlife species are anticipated to add restrictions on resource use and uses in these areas, thereby limiting human-disrupting activities and associated habitat loss, degradation, and fragmentation. Overall, the designations under Alternative B are anticipated to benefit wildlife.

Alternative B maintains the existing Jackson Canyon ACEC for bald eagles, but also proposes to add two MAs and the most ACECs of any alternative. For example, Alternative B establishes the Bates Hole MA to benefit greater sage-grouse and watershed values. The benefit of establishing the Bates Holes MA is anticipated to extend to other sagebrush and grassland species beyond the greater sage-grouse. Alternative B also designates an ACEC for black-tailed prairie dogs that would benefit other grassland wildlife species as well. Alternative B would designate the North Platte River ACEC and the South Bighorns/Red Wall ACEC, both of which are anticipated to benefit wildlife habitats.

Big Game

Alternative B reduces habitat loss and fragmentation due to restrictions on development that lessen the amount of disturbed surface and protects large contiguous blocks of land from fragmentation. Moreover, Alternative B restricts wind-energy development, OHV use, and livestock grazing in favor of wildlife habitats. Alternative B also utilizes forest management and fire management as tools to benefit wildlife habitats. The addition of more surface water acres and the greater protection of existing water sources also are anticipated to enhance wildlife habitats to a greater extent under Alternative B. Alternative B restores and protects important riparian and wetland habitats and manages the most acreage of different vegetation types (e.g., sagebrush, aspen, etc.) deemed important to wildlife toward DPC compared to all alternatives. Alternative B also more effectively controls the spread of INPS.

Trophy Game

Alternative B prohibits bear baiting within 1 mile of all BLM recreational developments in the planning area. Relative to Alternative A, this restriction minimizes the potential conflicts between people and bears. Black bears also are affected by management actions in forest and woodland habitats.

Mountain lions generally utilize similar habitats as mule deer—their primary prey. Although there are no specific management actions for mountain lions in the alternatives, mountain lions are impacted by management actions for mule deer and big game habitats.

Furbearing Animals

Alternative B actions to promote old-growth characteristics benefit the American marten. For example, Alternative B manages ponderosa pine stands for old growth (including snags) in Little Red Creek, Esterbrook, and Jackson Canyon. Moreover, Alternative B places increased importance on the value of aspen communities by managing toward DPC.

Alternative B actions to manage toward DPC on lotic and adjacent riparian habitats and lentic habitats benefit riparian and wetland species, such as the beaver. Moreover, the addition of 1,000 acres of surface water under Alternative B is anticipated to increase the amount of habitats for beaver, muskrat, and mink. These species benefit by improved habitats, water quality, and improved floodplain connectivity and function anticipated under Alternative B.

Alternative B actions protect and enhance riparian and wetland habitats by more restrictive management of livestock in these areas. Management actions include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and making adjustments to pasture boundaries and season of use. These actions are anticipated to ultimately result in riparian systems with increased vegetation and structural diversity throughout the planning area, with benefits for beaver, muskrat, mink, and other riparian and wetland species.

Predatory Animals

Alternative B actions benefiting different vegetative types in the planning area are anticipated to benefit habitat generalists, such as predatory animals.

Small Game

Alternative B actions benefiting forests, woodlands, riparian areas, and other habitat types are anticipated to benefit the habitat generalist cottontail rabbit, as well as more habitat-specific species, such as the snowshoe hare, red squirrel, fox squirrel, and gray squirrel.

Game Birds

The sharp-tailed grouse is the only game bird (except for the greater sage-grouse discussed in the Special Status Species – Wildlife section) with specific management actions. Sharp-tailed grouse buffer zones increase under Alternative B. Sharp-tailed grouse, as well as Hungarian partridge and chukar, inhabit grassland on the planning area and are anticipated to benefit from actions conserving this vegetative type. Ring-necked pheasants, blue grouse, and wild turkey are also anticipated to benefit from Alternative B actions, which conserve other habitat types.

Migratory Game Birds

Alternative B actions pertaining to water and riparian and wetland habitats are anticipated to benefit migratory game birds. Under Alternative B, the BLM manages toward DPC on lotic and adjacent riparian habitats and lentic habitats, constructs 1,000 acres of water reservoirs, improves floodplain connectivity and function on 350 miles of stream, and restores 108 miles of incised streams and 90 acres of lentic habitat.

Nongame (Raptors)

Restrictions around raptor nests are more extensive under Alternative B, since seasonal restrictions are not exempted and all buffers are ½ mile, resulting in fewer direct impacts to nesting raptors. In addition, Alternative B limits wind-energy development to outstanding/superb power classes, thereby limiting potential collisions and electrocution of raptors. Currently, 21 raptor nests and 4 bald eagle roosts occur on BLM-administered land rated as outstanding/superb. Alternative B also manages sagebrush, aspen, and other vegetative types toward DPC, restores and protects riparian areas, restricts livestock grazing, and increases control of INPS. These actions are anticipated to benefit birds and small mammals comprising raptor prey in the planning area.

Nongame (Neotropical Migrants)

Alternative B actions pertaining to forest management; management of sagebrush, aspen, mountain shrub, lotic, and lentic habitats toward DPC; INPS control; habitat fragmentation; creation and protection of water sources; and fire management are anticipated to benefit nongame neotropical migrants in the planning area.

Forest and Woodland Species – Specific management actions in Alternative B are aimed at managing forests and woodlands to benefit wildlife. Alternative B promotes forest management that emphasizes forest diversity, which is anticipated to support an abundance and diversity of neotropical migrants. Alternative B actions that manage ponderosa pine stands for old growth (including snags) in Little Red Creek, Esterbrook, and Jackson Canyon also are anticipated to benefit other wildlife. Alternative B limits clear-cuts to 5 acres with meandering boundaries, which would minimize impacts of habitat fragmentation for some species. Alternative B places increased importance on the value of aspen communities by managing toward DPC.

Mountain Shrub Species – Under Alternative B, the BLM places an increased importance on mountain shrub communities by managing these communities toward DPC.

Sagebrush and Desert Shrub Species – Species that utilize or depend on sagebrush habitats would benefit from management actions for greater sage-grouse, as described in the Special Status Species – Wildlife section. Because the breeding season of greater sage-grouse and neotropical migrants coincide, many species of neotropical migrants would benefit from these restrictions. Alternative B protects larger buffers around greater sage-grouse leks and nesting or early brood-rearing habitats, thereby benefiting sagebrush and desert shrub neotropical migrants.

Alternative B provides more restrictions to minimize habitat loss and fragmentation in all habitat types, including sagebrush and desert shrubs. The area disturbed would be smaller and reclamation of disturbed areas would be faster (one growing season), thereby maintaining long-term habitat quality in all habitat types, including sagebrush. Alternative B seeks to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing a comprehensive weed management plan. Furthermore, Alternative B monitors all allotments for rangeland health and limits forage utilization to 40 percent of the current year's growth. Alternative B also limits wind-energy development and habitat fragmentation to a greater extent compared to all other alternatives, thereby protecting more sagebrush habitats.

Grassland Species – Under Alternative B, grassland species benefit by less surface-disturbing activities, more reclamation requirements, more INPS control, and less livestock grazing in grassland habitats. In addition, Alternative B actions limiting habitat fragmentation are anticipated to benefit grassland neotropical migrants.

Riparian and Wetland Species – Alternative B actions that protect, enhance, and restore water and riparian and wetland habitats are anticipated to benefit neotropical migrants using riparian areas and wetlands. For example, Alternative B manages toward DPC on lotic and adjacent riparian habitats and lentic habitats; develops an additional 1,000 acres of surface water, which is expected to increase habitat for neotropical migrants; protects water sources from water quality degradation; improves floodplain connectivity and function on 350 miles of stream; and restores 108 miles of incised streams and 90 acres of lentic habitat.

Alternative B treats 1,700 acres of salt cedar in the planning area, thereby minimizing the adverse impact of INPS on riparian habitat diversity. Treatment of salt cedar results in improved breeding and migratory

habitats for neotropical migrants. The proposed comprehensive management plan for INPS under Alternative B is anticipated to improve riparian and wetland habitats.

Alternative B protects and enhances riparian and wetland management by restricting livestock grazing in these areas through the use of fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and making adjustments to pasture boundaries and season of use. These actions are anticipated to ultimately result in a riparian system with increased vegetation and structural diversity, leading to an increase in abundance and diversity of neotropical migrants.

Nongame (Mammals)

Although there are no specific management actions for nongame mammals, these species are impacted by other biological resource management actions. Nongame mammals are found in a variety of habitats and are impacted by management actions in the preferred vegetation type of each species. Impacts to the various vegetation types are discussed above for nongame neotropical migrants and are expected to similarly impact nongame mammals.

Approximately 9,663 acres of identified "rock outcrops/badlands" on BLM-administered land could contain bat habitats. These areas include steep terrain. Alternative B prohibits surface-disturbing activities on slopes greater than 25 percent, which is anticipated to benefit bat species. All bats could be adversely impacted by wind-energy facilities. Because Alternative B limits wind-energy development, adverse impacts to bats from wind energy are anticipated to be less than under Alternative A.

Nongame (Reptiles and Amphibians)

Although there are no specific management actions for reptiles and amphibians, these species are impacted by other biological resource management actions under Alternative B. The impacts of management actions on these habitat types are discussed throughout this section.

Based on all the factors described and the current challenges within the planning area, Alternative B is anticipated to have the most beneficial and the least adverse impacts to all 11 wildlife categories in the planning area.

Alternative C

Potential impacts to wildlife categories are described in this section in relation to the intensity of allowable uses and management actions comprising Alternative C and in the context of the types of impacts described in the Impacts Common to All Alternatives section. Potential impacts to wildlife categories from Alternative C are described relative to Alternative A.

Surface-disturbing Activities. Alternative C includes more restrictions regarding surface disturbance, but less compared to Alternative B. For example, Alternative C allows, but minimizes, surface occupancy (NSO) on highly erosive soils and prohibits surface disturbance on slopes greater than 25 percent on highly erosive soils. Alternative C also requires temporary protective surface treatment on disturbed areas. Moreover, Alternative C has less BLM-administered surface with a high potential for water erosion and less BLM-administered surface with a high potential for wind erosion subject to no or only minor restrictions on surface activities. Whereas Alternative A restricts use of heavy equipment to construct fire lines in elk crucial winter range, Alternative C prohibits use of heavy equipment in all big game crucial winter range, except where human safety is at risk. Alternative C also differs from Alternative A in that the former does not identify any full suppression areas. Alternative C rehabilitates all suppression-related damage compared to the case-by-case approach of Alternative A and includes use

of chemicals to control INPS when present. Alternative C also uses an integrated management approach to reduce fuels to protect high priority areas or resources including, but not limited to, sensitive wildlife habitats. Overall, the tactical constraints, fuel management approach, rehabilitation, and use of prescribed fire under Alternative C are anticipated to benefit wildlife habitats.

Once surface disturbance occurs, reclamation requirements under Alternative C are anticipated to reduce adverse impacts to wildlife habitats. For example, Alternative C requires reclamation to be completed in three growing seasons. In addition, Alternative C requires salvage and segregation of topsoil or alternative soil-handling methods, use of native species of vegetation, and use of certified weed-free seed for reclaiming disturbed areas.

Alternative C closes and reclaims all existing roads and trails on BLM-administered surface in areas designated as highly erosive soils and not being utilized to meet public demand. The closure of roads and trails is anticipated to benefit wildlife habitats by reducing habitat fragmentation and erosion and pollutant runoff coming from roads and trails. In addition, OHV use under Alternative C is more restricted and, therefore, more beneficial to wildlife habitats.

Wildlife-disturbing Activities. Use of prescribed fire under Alternative C is anticipated to benefit wildlife habitats. For example, Alternative C uses prescribed burning to achieve measurable landscape level objectives for wildlife and other resource programs, reduce hazardous fuels, and reintroduce fire into fire-adapted ecosystems in the planning area. Alternative C develops wildland fire use plans; however, Alternative C also allows natural ignitions within areas with wildland fire use plans to meet desired management objectives. Moreover, Alternative C focuses wildland fire use plans within aspen, juniper, and true mountain mahogany communities, which are anticipated to benefit wildlife.

Salt cedar is treated under Alternative C. In addition, Alternative C develops and implements a comprehensive management plan for controlling INPS in the planning area. Part of this plan could require holding livestock for 72 hours prior to movement on or within public lands to control the spread of INPS on BLM-administered lands. The plan and specific actions to control INPS identified for Alternative C are anticipated to slow the spread of INPS within the planning area.

Proactive Management Actions. Proactive management actions under Alternative C are anticipated to benefit wildlife because of management toward DPC under Alternative C compared to management toward PFC or DFC. Forest management under Alternative C achieves a sustainable flow of wood products; however, Alternative C identifies snags to be left for wildlife. Alternative C also treats woodland encroachment in grassland, sagebrush, aspen, and other vegetative communities, where it is determined to be detrimental to other resource values and uses. Treating encroachment of woodland species could benefit grassland, sagebrush, and shrubland wildlife species. Alternative C constructs an additional 500 acres of surface water in the planning area, resulting in more beneficial impacts to aquatic habitats compared to Alternative A.

Exceptions to the big game crucial winter range seasonal restriction could be granted by BLM under Alternative C; however, a wildlife mitigation plan would be required under Alternative C, thereby providing additional protection to big game habitats.

Alternative C proposes a proactive management action to avoid or minimize the adverse impacts from habitat fragmentation. Alternative C protects the second most (behind Alternative B) habitat of any alternative from fragmentation. The protected contiguous blocks of land also prohibit wind-energy development and Alternative C limits wind-energy development to power classes 4 through 7 (see Table 3-26). Minimizing the adverse impacts of habitat fragmentation is anticipated to benefit all statutory wildlife categories described in this section.

Alternative C provides more protection to surface water from potential impacts associated with soil erosion and runoff from disturbed areas and from other actions. For example, Alternative C institutes a CSU restriction as described for Alternative B, except this restriction would be applied only to Class 1 streams (refer to Glossary). Alternative C also requires fencing all existing wells and reservoirs constructed after 1995 to exclude livestock or wildlife, thereby avoiding degradation of these water sources. Alternative C also rehabilitates or redevelops all BLM-authorized well and spring developments producing 10 or more gallons per minute, regardless of whether issues arise (as with Alternative A), thereby benefiting water sources and associated wildlife habitats. These restrictions under Alternative C are anticipated to benefit water quality and wetland and riparian areas.

Alternative C also protects or enhances riparian, wetland, and streamside habitats. For example, Alternative C would, as necessary, use fencing, develop alternative water sources, manage livestock, place supplements, and adjust pasture boundaries and season of use to protect streams that are nonfunctional or functional at-risk. Management of runoff from roads and other impervious surfaces or disturbed areas is accomplished under Alternative C through requirement of an SWMP for all new BLM actions impacting more than 1 acre. This requirement is more restrictive and is anticipated to benefit water quality and associated wildlife habitats.

The establishment of MAs and designation of ACECs for special status and wildlife species are anticipated to add restrictions on resource use and uses in these areas, thereby limiting human-disrupting activities and associated habitat loss, degradation, and fragmentation. Overall, the designations under Alternative C are anticipated to benefit wildlife.

Alternative C maintains the existing Jackson Canyon ACEC for bald eagles, but also proposes to establish the Bates Hole MA to benefit greater sage-grouse and watershed values. The benefit of the Bates Holes MA is anticipated to extend to other sagebrush and grassland species beyond the greater sage-grouse. Alternative C designates an ACEC for black-tailed prairie dogs that benefits other grassland wildlife species as well. Alternative C also designates the North Platte River ACEC and establishes the South Bighorns/Red Wall MA, both of which are anticipated to benefit wildlife habitats.

Big Game

Alternative C requires development of a wildlife mitigation plan for all development occurring in the big game crucial winter range. This requirement benefits big game more compared to Alternative A. Alternative C also restricts wind-energy development and OHV use in favor of wildlife habitats. The addition of more surface water acres and the greater protection of existing water sources are also anticipated to enhance wildlife habitats to a greater extent under Alternative C. Alternative C restores and protects important riparian and wetland habitats and manages different vegetation types (e.g., sagebrush, aspen, etc.) deemed important to wildlife toward DPC compared to management toward DFC. Alternative C also more effectively controls INPS.

Trophy Game

Alternative C prohibits bear baiting within ½ mile of all BLM recreational developments in the planning area. This restriction minimizes potential conflict between humans and bears. Black bears also are affected by management actions in forest and woodland habitats.

Mountain lions generally utilize similar habitats as mule deer—their primary prey. Although there are no specific management actions for mountain lions in the alternatives, mountain lions are impacted by management actions for mule deer and big game habitats.

Furbearing Animals

Alternative C does not include specific management actions aimed at maintaining late-successional forest and woodlands stands to benefit American marten; rather, the goal is to maintain sustainable flow of wood products. Selected wildlife snags are retained in Little Red Creek, Jackson Canyon, and Esterbrook. Alternative C places increased importance on the value of aspen communities by managing toward DPC. Overall, Alternative C includes few management actions specifically benefiting the American marten.

Alternative C manages lotic and adjacent riparian habitats and lentic habitats toward DPC to the benefit of beaver, muskrat, and mink. Alternative C's action to develop an additional 500 acres of surface water increases habitats for beaver, muskrat, and mink. These species also benefit by improving habitats and water quality, including improved floodplain connectivity and function.

To minimize damage to critical riparian habitats, Alternative C protects and enhances riparian and wetland management by managing livestock in these areas. Management actions could include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting pasture boundaries and season of use. These actions apply to streams only on BLM-administered lands rated as nonfunctional or functional at-risk; however, these actions are anticipated to ultimately result in riparian systems with improved vegetation and structural diversity throughout the planning area, leading to an increase in habitats for beaver, muskrat, mink, and other wetland and riparian species.

Predatory Animals

Alternative C actions benefiting different vegetative types in the planning area are anticipated to benefit habitat generalists, such as predatory animals.

Small Game

Alternative C actions benefiting forests, woodlands, riparian areas, and other habitat types utilized by small game are anticipated to benefit habitat generalists, such as the cottontail rabbit and more habitat-specific species, such as the snowshoe hare, red squirrel, fox squirrel, and gray squirrel.

Game Birds

The sharp-tailed grouse is the only game bird (except for the greater sage-grouse, discussed in the Special Status Species – Wildlife section) with specific management actions. Sharp-tailed grouse buffer zones are the same under Alternative C, except the language would be changed from "avoid" to "prohibit." Sharp-tailed grouse, as well as Hungarian partridge and chukar, inhabit grassland on the planning area and are anticipated to be impacted by actions affecting this vegetative type. Ring-necked pheasants, blue grouse, and wild turkey also are anticipated to be impacted by Alternative C actions, which also affect other habitat types.

Migratory Game Birds

Alternative C actions pertaining to water and riparian and wetland habitats are anticipated to benefit migratory game birds. Alternative C manages lotic and adjacent riparian habitats and lentic habitats toward DPC compared to PFC under Alternative A. Alternative C also constructs 500 acres of water reservoirs, improves floodplain connectivity and function, and restores incised streams and lentic habitats. Based on actions to manage habitat types toward DPC, increase INPS control, restore and protect riparian and wetland habitats, avoid habitat fragmentation, create new water reservoirs, and protect existing water

sources, Alternative C is anticipated to be more beneficial and have less adverse impacts to migratory game birds compared to Alternative A.

Nongame (Raptors)

Alternative C restrictions around raptor nests are slightly more because all buffers will be ½-mile buffers. However, Alternative C limits wind-energy development, thereby limiting potential collisions and electrocution of raptors. Three bald eagle roosts and 167 raptor nests currently occur on BLM-administered land rated as outstanding/superb and good/excellent. Without proper siting, Alternative C could adversely impact raptor species. Alternative C also manages sagebrush, aspen, and other vegetative types toward DPC, restores and protects riparian areas, restricts livestock grazing, and increases control of INPS. These actions are anticipated to benefit birds and small mammals comprising raptor prey in the planning area.

Nongame (Neotropical Migrants)

Alternative C actions pertaining to forest management; management of sagebrush, aspen, mountain shrub, lotic, and lentic habitats toward DPC; INPS control; habitat fragmentation; and creation and protection of water sources are anticipated to benefit nongame neotropical migrants in the planning area.

Forest and Woodland Species – Alternative C does not include specific management actions aimed at managing forests and woodlands to benefit wildlife; rather, the goal is to maintain a sustainable flow of wood products. Selected wildlife snags are retained in Little Red Creek, Jackson Canyon, and Esterbrook. Clear-cuts could be up to 20 acres in size, which could increase impacts of habitat fragmentation for forest-interior species. However, Alternative C places increased importance on the value of aspen communities by managing toward DPC.

Mountain Shrub Species – BLM places an increased importance on mountain shrub communities under Alternative C by managing these communities for DPC compared toward DFC.

Sagebrush and Desert Shrub Species – Species that utilize or depend on sagebrush habitats benefit from management actions for greater sage-grouse as discussed in the Special Status Species – Wildlife section. Because the breeding season of greater sage-grouse and neotropical migrants coincide, many species of neotropical migrants benefit from buffers around greater sage-grouse leks and nesting and early brood-rearing habitats. Alternative C protects larger buffers around greater sage-grouse leks and the same-size buffers around nesting and early brood-rearing habitats, thereby benefiting sagebrush and desert shrub neotropical migrants.

Alternative C provides more restrictions to minimize habitat loss and fragmentation in all habitat types, including sagebrush and desert shrubs. The area disturbed is smaller and reclamation of disturbed areas is faster (three growing seasons) than Alternative A, thereby maintaining long-term habitat quality in all habitat types, including sagebrush. Alternative C seeks to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing a comprehensive weed-management plan. Alternative C focuses monitoring on category I and M grazing allotments for rangeland health and limits forage utilization to 40 percent of the current year's growth. Alternative C also limits wind-energy development and habitat fragmentation to a greater extent, thereby protecting more sagebrush habitats.

Grassland Species – Under Alternative C, grassland species benefit from less surface-disturbing activities, more INPS control, and treatment of woodland encroachment into grassland habitats where it is detrimental to grassland species. In addition, Alternative C actions limiting habitat fragmentation are anticipated to more often benefit grassland neotropical migrants.

Riparian and Wetland Species – Alternative C actions protecting, enhancing, and restoring water and riparian and wetland habitats are anticipated to benefit neotropical migrants that use riparian and wetlands. For example, Alternative C manages lotic and adjacent riparian habitats and lentic habitats toward DPC compared to DFC. Alternative C also develops more (500) acres of surface water, which is expected to improve habitat for neotropical migrants. Alternative C also would improve more acres of floodplain connectivity and function, restore more incised stream miles, and restore more lentic habitats.

Alternative C treats more acres of salt cedar in the planning area, thereby minimizing the adverse impact of the spread of INPS on riparian habitat diversity. Treatment of salt cedar under Alternative C is anticipated to improve breeding and migratory habitats for neotropical migrants. The proposed comprehensive management plan for INPS under Alternative C also is anticipated to improve riparian and wetland habitats. To minimize impacts to riparian habitats, Alternative C protects and enhances riparian and wetland management by managing livestock in streams on BLM-administered lands rated as nonfunctional or functional at-risk. These actions are anticipated to ultimately result in riparian systems with improved vegetation and structural diversity throughout the planning area, leading to an increase in abundance and diversity of neotropical migrants.

Nongame (Mammals)

Approximately 9,663 acres of identified "rock outcrops/badlands" on BLM-administered land could contain bat habitats. These areas typically include steep terrain. Because Alternative C prohibits surface-disturbing activities on slopes greater than 25 percent in areas designated as highly erosive soils, benefits to bat species are anticipated. However, all bats could be adversely impacted by wind-energy facilities. Because Alternative C limits wind-energy development, adverse impacts to bats from wind energy under Alternative C are anticipated to be less than Alternative A.

Nongame (Reptiles and Amphibians)

Although there are no specific management actions for reptiles and amphibians, these species are impacted by other biological resource management actions under Alternative C. The impacts of management actions on these habitat types are discussed throughout this section.

Based on all the factors described and the current challenges within the planning area, Alternative C is anticipated to have more beneficial and less adverse impacts to all 11 wildlife categories in the planning area.

Alternative D

Potential impacts to statutory wildlife categories are described in this section in relation to the intensity of allowable uses and management actions comprising Alternative D and in the context of the types of impacts described in the Impacts Common to All Alternatives section. All potential impacts to wildlife categories from Alternative D are described relative to Alternative A.

Surface-disturbing Activities. Alternative D includes fewer restrictions regarding surface disturbance. For example, Alternative D allows surface-disturbing activities on highly erosive soils and on slopes greater than 25 percent. Alternative D does not require use of temporary protective surface treatment on disturbed areas. Alternative D has the most BLM-administered surface with high potential for water erosion and the most BLM-administered surface with high potential for wind erosion subject to no or only minor restrictions on surface activities. This alternative utilizes full protection strategies throughout the planning area and rehabilitates suppression-related damage on a case-by-case approach; however, it includes use of chemicals to control INPS when present. Alternative D utilizes an integrated management approach to reduce fuels to protect high priority areas or resources including, but not limited to, sensitive

wildlife habitats. However, Alternative D also suppresses all wildland fire in commercial forest stands. Overall, the fire management approach under Alternative D is anticipated to have more beneficial and less adverse impacts to wildlife habitats.

Once surface disturbance occurs, reclamation requirements under Alternative D are anticipated to produce similar impacts to wildlife habitats. For example, Alternative D requires reclamation be completed in five growing seasons; however, Alternative D does not require salvage and segregation of topsoil or alternative soil-handling methods, use of native species of vegetation, and use of certified weed-free seed for reclaiming disturbed areas. The fewer restrictions on surface disturbance under Alternative D are anticipated to adversely impact wildlife habitats.

OHV use under Alternative D would exhibit similar designations and, therefore, similar adverse impacts to wildlife habitats. Alternative D utilizes all existing roads and trails on BLM-administered surface, regardless of the level of public demand.

Wildlife-disturbing Activities. Use of prescribed fire under Alternative D is anticipated to benefit wildlife habitats. For example, Alternative D uses prescribed burning to achieve measurable landscape level objectives for wildlife and other resource programs, reduce hazardous fuels, and reintroduce fire into fire-adapted ecosystems in the planning area. Alternative D develops wildland fire use plans; however, it allows natural ignitions within areas with wildland fire use plans to proceed to meet desired management objectives. Moreover, Alternative D focuses wildland fire use plans within aspen, juniper, and true mountain mahogany communities, which are anticipated to benefit wildlife.

There are 850 acres of salt cedar treated under Alternative D; however, Alternative D does not develop or implement a comprehensive management plan for controlling INPS in the planning area, nor does it require holding livestock for 72 hours prior to movement on or within public lands. Control of salt cedar is anticipated to slow the spread of this species within the planning area and thereby benefit riparian and wetland wildlife habitats. However, the lack of a comprehensive plan for controlling INPS is expected to continue the spread of INPS and degradation of other wildlife habitats in the planning area under Alternative D.

Proactive Management Actions. Proactive management actions under Alternative D are anticipated to benefit wildlife because of management toward DPC compared to management toward PFC or DFC. Forest management under Alternative D maximizes wood growth and flow of wood products, including maximizing harvest of wood products within bald eagle roost areas. Alternative D does not treat woodland encroachment in grassland, sagebrush, aspen, and other vegetative communities where determined to be detrimental to other resource values and uses. Not treating encroachment of woodland species could adversely impact grassland, sagebrush, and shrubland wildlife species. Aquatic habitat benefits more under Alternative D. For example, Alternative D constructs an additional 100 acres of surface water in the planning area.

Although exceptions area allowed, Alternative D prohibits surface development from November 15 through April 30 on all big game crucial winter ranges (see Map 25). Alternative D does not include a management action to avoid or minimize the adverse impacts from habitat fragmentation and, thus, fragmentation is expected to be similar. Alternative D limits wind-energy development to wind power classes 4 through 7 (see Table 3-26), which is anticipated to reduce the potential for fragmentation from this type of development.

Alternative D provides more protection to surface water from potential impacts associated with soil erosion and runoff from disturbed areas and from other actions. For example, Alternative D would institute a CSU restriction similar to that described for Alternative B, except it would require an NSO

restriction within 500 feet and a CSU restriction for the area beyond 500 feet and up to ¼ mile of perennial streams, riparian and wetland habitats, and water bodies. Alternative D requires fencing all new wells and new reservoirs constructed on BLM-administered lands to exclude livestock or wildlife to avoid the degradation of these water sources. Alternative D also rehabilitates or redevelops all BLM-authorized well and spring developments producing 20 or more gallons per minute, regardless of whether issues arise (as with Alternative A), thereby benefiting water sources and associated wildlife habitats more when compared to Alternative A. These restrictions are anticipated to benefit water quality and wetland and riparian areas.

Alternative D evaluates on a case-by-case basis the need for fencing streams on BLM-administered land. Management of runoff from roads and other impervious surfaces or disturbed areas is accomplished under Alternative D through an SWMP for all new BLM actions impacting more than 1 acre. This requirement is more restrictive and is anticipated to benefit water quality and associated wildlife.

Alternative D maintains the existing Jackson Canyon ACEC for bald eagles, but does not propose any additional designations for wildlife habitats. Alternative D does propose to establish two additional MAs for oil and gas. Establishing oil and gas MAs could adversely impact wildlife habitats through increased human disrupting activities and associated habitat loss, degradation, and fragmentation.

Big Game

Alternative D produces similar habitat loss and fragmentation from development. Alternative D restricts wind-energy development that could benefit some wildlife habitats; however, impacts from OHV use to wildlife habitats are expected to continue under Alternative D. The addition of more surface water acres may benefit more wildlife associated with aquatic habitats. Alternative D also restores and protects more important riparian and wetland habitats and manages different vegetation types (e.g., sagebrush, aspen, etc.) deemed important to wildlife toward DPC compared to management toward DFC.

Trophy Game

Alternative D prohibits bear baiting within ½ mile of all BLM recreational developments in the planning area. This restriction minimizes the potential for conflicts between humans and bears. Black bears also are impacted by management actions in forest and woodland habitats.

Mountain lions generally utilize similar habitats as mule deer—their primary prey. Although there are no specific management actions for mountain lions in the alternatives, mountain lions are impacted by management actions for mule deer and big game habitats.

Furbearing Animals

Alternative D does not include specific management actions aimed at maintaining older forests and woodland stands to benefit American marten; rather, the goal is to achieve maximum wood growth and flow of wood products. Alternative D places increased importance on the value of aspen communities by managing toward DPC. Overall, forest management under Alternative D could adversely impact the American marten by maintaining younger and denser stands of trees.

Alternative D manages lotic and adjacent riparian and lentic habitats toward DPC to the benefit of beaver, muskrat, and mink. Alternative D's action to develop an additional 100 acres of surface water increases habitats for these types of wildlife and benefits them by improving floodplain connectivity and function. Livestock and wildlife tend to congregate at water sources, resulting in damage to critical riparian habitats. Fencing of streams on BLM-administered land is evaluated on a case-by-case basis under Alternative D.

Predatory Animals

Alternative D actions benefiting different vegetative types in the planning area are anticipated to benefit habitat generalists, such as predatory animals.

Small Game

Alternative D actions impacting forests, woodlands, riparian areas, and other habitat types utilized by small game are anticipated to benefit habitat generalists, such as the cottontail rabbit, and produce mixed results for more habitat-specific species, such as the snowshoe hare, red squirrel, fox squirrel, and gray squirrel.

Game Birds

The sharp-tailed grouse is the only game bird (except for the greater sage-grouse, discussed in the Special Status Species – Wildlife section) with specific management actions. Surface disturbance or occupancy is avoided within ¼ mile of sharp-tailed grouse leks under Alternative D. Buffer acreage protected for sharp-tailed grouse is the same under Alternative D. Sharp-tailed grouse, as well as Hungarian partridge and chukar, inhabit grasslands in the planning area and are anticipated to be impacted by actions affecting this vegetative type. Ring-necked pheasants, blue grouse, and wild turkey also are anticipated to be impacted by Alternative D actions, which impact other habitat types.

Migratory Game Birds

Alternative D actions pertaining to water and riparian and wetland habitats are anticipated to benefit migratory game birds. Alternative D manages lotic and adjacent riparian and lentic habitats toward DPC compared to PFC. Alternative D also constructs 100 acres of water reservoirs, improves floodplain connectivity and function, and restores incised streams and lentic habitats.

Nongame (Raptors)

Alternative D avoids surface disturbance within ½ mile of most raptor nests between February 15 and July 31; however, common or smaller species have ¼-mile buffers. Species with ¼-mile buffers include the red-tailed hawk, Swainson's hawk, American kestrel, osprey, great horned owl, long-eared owl, northern saw-whet owl, common barn owl, and western screech owl. Alternative D limits wind-energy development, thereby limiting potential collisions and electrocution of raptors. However, 461 raptor nests and 13 bald eagle roosts currently occur on BLM-administered land rated as outstanding/superb and fair/good/excellent. Without proper siting, Alternative D could adversely impact raptors. Alternative D also manages sagebrush, aspen, and other vegetative types toward DPC and restores and protects riparian areas. These actions are anticipated to benefit birds and small mammals comprising raptor prey in the planning area.

Nongame (Neotropical Migrants)

Alternative D actions pertaining to forest management; management of sagebrush, aspen, mountain shrub, lotic, and lentic habitats toward DPC; INPS control; habitat fragmentation; and creation and protection of water sources are anticipated to impact nongame neotropical migrants in the planning area.

Forest and Woodland Species – Alternative D does not include specific management actions aimed at managing forests and woodlands to benefit wildlife; rather, the goal is to achieve maximum wood growth and flow of wood products. Alternative D places increased importance on the value of aspen communities by managing toward DPC.

Mountain Shrub Species – The BLM places an increased importance on mountain shrub communities under Alternative D by managing these communities toward DPC compared to DFC.

Sagebrush and Desert Shrub Species – Species that utilize or depend on sagebrush habitats benefit from management actions for greater sage-grouse as described in the Special Status Species – Wildlife section. Because the breeding season of greater sage-grouse and neotropical migrants coincide, many species of neotropical migrants benefit from buffers around greater sage-grouse leks and nesting and early brood-rearing habitats. Alternative D protects the same size buffers around greater sage-grouse leks and the same-size buffers around nesting and early brood-rearing habitats, thereby resulting in similar benefits to sagebrush and desert shrub neotropical migrants.

Alternative D provides similar restrictions to minimize habitat loss and fragmentation in all habitat types, including sagebrush and desert shrubs. The areas disturbed and reclamation of disturbed areas are similar, thereby adversely impacting habitat quality in all habitat types, including sagebrush. Other than wind-energy, Alternative D is not expected to restrict activities that could result in habitat fragmentation and, other than salt cedar, is not expected to slow the spread of INPS in the planning area. Livestock grazing is similar under Alternative D.

Grassland Species – Under Alternative D, there are no specific management actions for neotropical migrants that utilize grassland. These species would be impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Alternative D does not manage to protect habitat fragmentation, which would result in adverse impacts to grassland habitats and grassland species.

Riparian and Wetland Species – Alternative D actions that protect, enhance, and restore water and riparian and wetland habitats are anticipated to benefit neotropical migrants that use riparian and wetlands. For example, Alternative D manages lotic and adjacent riparian and lentic habitats toward DPC compared to DFC. Alternative D also develops more (100) acres of surface water, is expected to increase habitat for neotropical migrants, improve floodplain connectivity and function on more acres, and restore more incised stream miles and lentic habitats.

Alternative D treats more acres of salt cedar in the planning area, thereby reducing the adverse impact of the spread of INPS on riparian habitat diversity. Although treatment of salt cedar results in improved breeding and migratory habitats for neotropical migrants, Alternative D leaves at least 850 acres of salt cedar, which would provide seed for further spread of INPS.

Nongame (Mammals)

Approximately 9,663 acres of identified “rock outcrops/badlands” on BLM-administered land could contain bat habitats. The areas include steep terrain and, because Alternative D does not prohibit surface-disturbing activities on slopes greater than 25 percent, adverse impacts to bat habitats could occur. Alternative D actively markets wind-energy development, which may adversely impact bats due to bat collisions with wind towers.

Nongame (Reptiles and Amphibians)

Although there are no specific management actions for reptiles and amphibians, these species are impacted by other biological resource management actions under Alternative D. The impacts of management actions on these habitat types are discussed throughout this section.

Based on all the factors described and the current challenges within the planning area, Alternative D is anticipated to have more beneficial and similar adverse impacts to 8 of the 11 wildlife categories in the

planning area. Alternative D is anticipated to have similar beneficial and adverse impacts to trophy game and nongame (mammals), while having more beneficial and less adverse impacts to nongame (raptors).

Alternative E (Proposed Casper RMP)

Potential impacts to wildlife categories are described in this section in relation to the intensity of allowable uses and management actions comprising Alternative E and in the context of the types of impacts described in Impacts Common to All Alternatives. Potential impacts to statutory wildlife categories from Alternative E are described relative to Alternative A.

Surface-disturbing Activities. Alternative E includes more restrictions regarding surface disturbance, but less compared to Alternative B. For example, Alternative E allows, but minimizes, surface occupancy (NSO) on highly erosive soils and prohibits surface disturbance on slopes greater than 25 percent without permission from the authorized officer. Alternative E is similar in that requirement of temporary protective surface treatment on disturbed areas is applied on a case-by-case basis. Moreover, Alternative E has less BLM-administered surface with high potential for water erosion and less BLM-administered surface with high potential for wind erosion subject to no or only minor restrictions on surface activities. Alternative E prohibits use of heavy equipment in all big game crucial winter range, except where human safety is at risk. Alternative E also rehabilitates all suppression-related damage as needed, but includes use of chemicals to control INPS when present. Alternative E also uses an integrated management technique approach to reduce fuels to protect high priority areas or resources including, but not limited to, wildlife habitats. Overall, the tactical constraints, fuel management approach, rehabilitation, and use of prescribed fire under Alternative E are anticipated to benefit wildlife habitats more than Alternative A.

Once surface disturbance occurs, reclamation requirements under Alternative E are anticipated to reduce adverse impacts to wildlife habitats. For example, Alternative E requires reclamation be completed in three growing seasons. In addition, Alternative E requires salvage and segregation of topsoil or alternative soil-handling methods, use of native species of vegetation, and use of certified weed-free seed for reclaiming disturbed areas.

OHV use under Alternative E is more restricted and, therefore, more beneficial to wildlife habitats. Alternative E closes and reclaims all existing roads and trails on BLM-administered surface that are in areas designated as highly erosive soils and not being utilized to meet public demand. The closure of roads and trails is anticipated to benefit wildlife habitats by reducing habitat fragmentation, erosion, and pollutant runoff coming from roads and trails.

Wildlife-disturbing Activities. Use of prescribed fire under Alternative E is anticipated to benefit wildlife habitats more than in Alternative A. For example, Alternative E uses prescribed burning to achieve measurable watershed level objectives for wildlife and other resource programs, reduce hazardous fuels, and reintroduce fire into fire-adapted ecosystems in the planning area. Alternative E develops wildland fire use plans; however, it allows natural ignitions within areas with wildland fire use plans to meet desired management objectives. Moreover, Alternative E focuses wildland fire use plans within aspen, juniper, and true mountain mahogany communities, which are anticipated to benefit wildlife.

No salt cedar would be targeted for eradication; however, Alternative E inventories and develops a treatment plan to reduce or eliminate salt cedar stands over the life of the plan. Alternative E also develops and implements a comprehensive management plan for controlling INPS in the planning area. Alternative E may require holding livestock for 72 hours prior to movement on or within public lands to control the spread of INPS on BLM-administered lands. The plan and specific actions to control INPS

identified for Alternative E are anticipated to slow the spread of INPS within the planning area and thereby benefit wildlife habitats.

Proactive Management Actions. Proactive management actions under Alternative E are anticipated to benefit wildlife because of management toward DPC under Alternative E compared to management toward PFC or DFC. Forest management under Alternative E focuses on maintaining or restoring the health of forest stands while providing forest products; Alternative E identifies snags to be left for wildlife. Alternative E also treats woodland encroachment in grassland, sagebrush, aspen, and other vegetative communities where determined to be detrimental to other resource values and uses. Treating encroachment of woodland species could benefit grassland, sagebrush, and shrubland wildlife species. Aquatic habitats also benefit more under Alternative E. For example, Alternative E constructs an additional 100 acres of surface water in the planning area.

Another proactive management action proposed by Alternative E is the annual prohibition of surface development from November 15 through April 30 on all big game crucial winter ranges (see Map 25). Exceptions could be granted by the BLM under Alternative E.

Alternative E proposes a proactive management action to avoid or minimize the adverse impacts from habitat fragmentation. The alternative protects wildlife habitats from fragmentation. The protected contiguous blocks of land also prohibit wind-energy development. Alternative E limits wind-energy development to power classes 4 through 7 (see Table 3-26). Minimizing the adverse impacts of habitat fragmentation is anticipated to benefit all wildlife categories described in this section.

Alternative E provides more protection to surface water from potential impacts associated with soil erosion and runoff from disturbed areas and from other actions. For example, Alternative E institutes a CSU restriction as described for Alternative B, except this restriction is applied to only Class 1 and 2 streams (refer to Glossary); remaining streams would be considered on a case-by-case basis. Alternative E also requires fencing all new and existing wells and reservoirs, as well as developed springs, to exclude livestock or wildlife, thereby avoiding degradation of these water sources. Alternative E also rehabilitates or redevelops all BLM-authorized well and spring developments producing 10 or more gallons per minute, regardless of whether issues arise, thereby benefiting water sources and associated wildlife habitats more than Alternative A. For developments less than 10 gallons per minute, the BLM considers rehabilitation on a case-by-case basis. Under Alternative E, these restrictions are anticipated to benefit water quality and wetland and riparian areas more than Alternative A.

Alternative E also protects or enhances riparian, wetland, and streamside habitats more than Alternative A. For example, Alternative E would, as necessary, use fencing, develop alternative water sources, manage livestock, place supplements, and adjust pasture boundaries and season of use to protect wetland, riparian areas, and streamsides. Management of runoff from roads and other impervious surfaces or disturbed areas is accomplished under Alternative E through requirement of an SWMP. The BLM could require an SWMP on all actions impacting more than 1 acre under Alternative E. This requirement is more restrictive and anticipated to benefit water quality and associated wildlife habitats more than Alternative A.

Alternative E maintains the existing Jackson Canyon ACEC for bald eagles, but also proposes to establish the Bates Hole MA to benefit greater sage-grouse and watershed values. The benefit of a Bates Holes MA is anticipated to extend to other sagebrush and grassland species beyond the greater sage-grouse. Alternative E designates an ACEC for black-tailed prairie dogs that also benefits other grassland wildlife species. Alternative E also maintains the North Platte River SRMA and establishes the South Bighorns/Red Wall MA, both of which are anticipated to benefit wildlife habitats. The establishment of MAs and designation of ACECs for special status and wildlife species are anticipated to add restrictions

on resource use and uses in these areas, thereby limiting human-disrupting activities and associated habitat loss, degradation, and fragmentation. Overall, the designations under Alternative E are anticipated to benefit wildlife more than in Alternative A.

Big Game

Alternative E reduces habitat loss and fragmentation due to restrictions on development, which lessens the amount of disturbed surface and protects large contiguous blocks of land from fragmentation. Moreover, Alternative E restricts wind-energy development and OHV use to the benefit of wildlife habitats. The addition of more surface water acres and the greater protection of existing water sources also are anticipated to enhance wildlife habitats to a greater extent under Alternative E. Alternative E restores and protects important riparian and wetland habitats more than Alternative A and manages different vegetation types (e.g., sagebrush, aspen, etc.) deemed important to wildlife toward DPC compared to management toward DFC. Alternative E also more effectively controls INPS.

Trophy Game

Alternative E prohibits bear baiting within 1 mile of all BLM recreational developments in the planning area. This restriction minimizes the potential for conflicts between humans and bears. Black bears also are affected by management actions in forest and woodland habitats.

Mountain lions generally utilize similar habitats as mule deer—their primary prey. Although there are no specific management actions for mountain lions in the alternatives, mountain lions are impacted by management actions for mule deer and big game habitats.

Furbearing Animals

No specific management actions for furbearing animals exist, but these species are impacted by other biological resource management actions. Badger, bobcat, and weasel are habitat generalists and, therefore, are impacted by a variety of actions in all habitat types. Impacts to various vegetation types can be found throughout this section.

Specific management actions in Alternative E are aimed at maintaining older forests and woodland stands to benefit wildlife. Management actions that promote old-growth characteristics benefit the American marten. Alternative E manages ponderosa pine stands for old growth (including snags) in Little Red Creek, Esterbrook, and Jackson Canyon. In other areas, the emphasis is on the sustainable flow of wood products. Alternative E places increased importance on the value of aspen communities by managing toward DPC.

Alternative E manages lotic and adjacent riparian and lentic habitats toward DPC to the benefit of beaver, muskrat, and mink. Alternative E's action to develop an additional 100 acres of surface water increases habitats for beaver, muskrat, and mink. These species also benefit by improved habitat and water quality, including improved floodplain connectivity and function.

To minimize damage to critical riparian habitats, Alternative E protects and enhances riparian and wetland management by managing livestock and grazing wildlife in these areas. Management actions could include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting pasture boundaries and season of use. These actions apply only to those streams on BLM-administered lands rated as nonfunctional or functional at-risk; however, these actions are anticipated to ultimately result in riparian systems with improved vegetation and structural diversity throughout the planning area, leading to an increase in habitats for beaver, muskrat, mink, and other wetland and riparian species.

Predatory Animals

Alternative E actions benefiting different vegetative types in the planning area are anticipated to benefit habitat generalists, such as predatory animals.

Small Game

Alternative E actions benefiting forests, woodlands, riparian areas, and other habitat types utilized by small game are anticipated to benefit habitat generalists, such as the cottontail rabbit, as well as more habitat-specific species, such as the snowshoe hare, red squirrel, fox squirrel, and gray squirrel.

Game Birds

The sharp-tailed grouse is the only game bird (except for greater sage-grouse, discussed in the Special Status Species – Wildlife section) with specific management actions. Sharp-tailed grouse buffer zones are the same under Alternative E. Sharp-tailed grouse, as well as Hungarian partridge and chukar, inhabit grassland on the planning area and are anticipated to be impacted by actions affecting this vegetative type. Ring-necked pheasants, blue grouse, and wild turkey also are anticipated to be impacted by Alternative E actions, which impact other habitat types.

Migratory Game Birds

Alternative E actions pertaining to water and riparian and wetland habitats are anticipated to benefit migratory game birds. Alternative E manages lotic and adjacent riparian and lentic habitats toward DPC compared to PFC. Alternative E also constructs 100 acres of water reservoirs, improves floodplain connectivity and function, and restores incised streams and lentic habitats.

Nongame (Raptors)

Under Alternative E, the BLM avoids surface disturbance within ½ mile of most raptor nests between February 1 and July 31; however, common or smaller species would have ¼-mile buffers. Species with ¼-mile buffers include the red-tailed hawk, Swainson's hawk, American kestrel, osprey, great horned owl, long-eared owl, northern saw-whet owl, common barn owl, and western screech owl. Alternative E restrictions around raptor nests are more extensive, thereby resulting in fewer direct impacts to nesting raptors. In addition, Alternative E limits wind-energy development compared to Alternative A, thereby limiting potential collisions and electrocution of raptors. However, 461 raptor nests and 13 bald eagle roosts currently occur on BLM-administered land rated as outstanding/superb and fair/good/excellent potential for wind energy. Without proper siting, Alternative E has the potential to adversely impact raptors species. Alternative E manages sagebrush, aspen, and other vegetative types toward DPC, restores and protects riparian areas, restricts livestock grazing, and increases control of INPS. These actions are anticipated to benefit birds and small mammals comprising raptor prey in the planning area.

Nongame (Neotropical Migrants)

Alternative E actions pertaining to forest management; management of sagebrush, aspen, mountain shrub, lotic, and lentic habitats toward DPC; INPS control; habitat fragmentation; and creation and protection of water sources are anticipated to benefit nongame neotropical migrants in the planning area.

Forest and Woodland Species – There are specific management actions in Alternative E aimed at managing forests and woodlands to benefit wildlife. For example, Alternative E emphasizes multiple use, which would result in a diversity of forests types and ages and ultimately result in a diverse bird community. Management actions that promote open, old-growth characteristics benefit many neotropical migrants. In addition, Alternative E manages ponderosa pine stands for old growth (including snags) in Little Red Creek, Esterbrook, and Jackson Canyon. In other areas, the emphasis is on the sustainable

flow of wood products. Clear-cuts could be up to 20 acres in size, which could increase impacts of habitat fragmentation for forest-interior species. Alternative E places increased importance on the value of aspen communities by managing toward DPC.

Mountain Shrub Species – The BLM places an increased importance on mountain shrub communities under Alternative E by managing these communities toward DPC compared to DFC.

Sagebrush and Desert Shrub Species – Species that utilize or depend on sagebrush habitats would benefit from management actions for greater sage-grouse, as discussed in the Special Status Species – Wildlife section. Because the breeding season of greater sage-grouse and neotropical migrants coincide, many species of neotropical migrants would benefit from buffers around greater sage-grouse leks and nesting and early brood-rearing habitats. Alternative E protects larger buffers around greater sage-grouse leks and the same-size buffers around nesting and early brood-rearing habitats, thereby benefiting sagebrush and desert shrub neotropical migrants.

Implementing Alternative E results in more careful planning in the extent and location of surface-disturbing activities. Instead of implementing vegetative treatments on a case-by-case basis, Alternative E emphasizes habitat and structural diversity and encourages active management to achieve specific objectives for wildlife habitats. In addition, the BLM manages all sagebrush habitats toward DPC. Reclamation from disturbance, including reseeding, is required within three growing seasons. Although surface disturbance results in short-term habitat loss and damage, the reclamation requirements of Alternative E help maintain long-term habitat quality across the planning area. Alternative E also seeks to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing a comprehensive weed management plan. Under Alternative E, the BLM would monitor grazing leases and adjust or convert as needed; changes would be consistent with rangeland health objectives. This monitoring includes the prevention of downward trends on all allotments. Impacts to sagebrush and desert shrub occur under Alternative E; however, the habitat fragmentation action of Alternative E also protects sagebrush and desert shrubs from habitat fragmentation.

Grassland Species – Although there are no specific management actions for neotropical migrants that utilize grassland, these species benefit by management actions under Alternative E that treat woodland encroachment into grassland habitats where it is detrimental to grassland species. These species are impacted by actions in grassland habitat, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Grassland habitats could be impacted by long-term surface disturbance on BLM-administered land under Alternative E; however, the habitat fragmentation action of Alternative E also protects grassland habitat from habitat fragmentation.

Riparian and Wetland Species – Although there are no specific management actions for neotropical migrants that use riparian and wetland habitats, these species benefit by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Alternative E manages toward PFC and identifies DPC for lotic and adjacent riparian and lentic habitats. An additional 100 acres of surface water is developed under Alternative E, which would increase habitat for neotropical migrants. These species also benefit by improved habitat and water quality. Alternative E improves floodplain connectivity and function on streams and would restore incised streams and lentic habitats. Alternative E inventories areas infested by salt cedar and develops a treatment plan for eradicating salt cedar over the life of the plan.

Livestock and wildlife tend to congregate at water sources and can, if unmanaged, result in damage to critical riparian habitats. Alternative E protects and enhances riparian and wetland management by managing livestock and grazing wildlife in these areas. Management actions could include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting pasture boundaries and season of use. These actions ultimately result

in a riparian system with increased vegetation and structural diversity, leading to an increase in abundance and diversity of neotropical migrants.

Nongame (Mammals)

Bats that use caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. There are 9,663 acres of identified "rock outcrops/badlands" on BLM-administered land that could contain potential bat habitats. These areas include steep terrain. Alternative E restricts most surface-disturbing activities on slopes greater than 25 percent; therefore, most cave habitats are expected to be protected. No specific management actions exist for abandoned mines. All bats could be adversely impacted by wind-energy facilities, as discussed for raptors.

Nongame (Reptiles and Amphibians)

Although there are no specific management actions for reptiles and amphibians, these species are impacted by other biological resource management actions under Alternative E. The impacts of management actions on these habitat types are discussed throughout this section.

Based on all the factors described and the current challenges within the planning area with the exception of establishing the proposed Wind River MA, Alternative E is anticipated to have more beneficial and similar adverse impacts to all of the 11 wildlife categories in the planning area.

4.4.6.3 Conclusion

Overall, Alternative B provides more measures to minimize habitat loss and fragmentation in the planning area compared to Alternative A. Alternative C includes similar measures to Alternative B, but allows more surface-disturbing activities. Alternatives A and E allow similar acres of surface disturbance, more than alternatives B and C; however, Alternative E is expected to have less potential adverse impact than Alternative A due to more restrictions. With the exception of limiting wind-energy development, Alternative D has few measures with which to control habitat loss and fragmentation. Moreover, Alternative D allows the most surface disturbance of any alternative, potentially resulting in substantial adverse impacts to wildlife resources.

Implementing Alternative B, followed by Alternative C, could result in more improvements to habitat quality, provide more measures to restrict activities that could damage sensitive soils and habitats, reserve more forage for big game on crucial winter range, and set aside more lands for new MAs with emphasis to benefit wildlife resources. Alternative A has minimal guidance to protect or improve habitat quality. In general, Alternative E has similar measures to protect and improve habitat quality as under Alternative C; however, under Alternative E, less land is set aside for new MAs. Alternatives A and D do not establish any new MAs. Alternative D does not restrict surface-disturbing activities in most sensitive areas and has few actions to improve habitat quality. Comprehensive INPS management plans provided in alternatives B, C, and E could result in long-term beneficial impacts to wildlife habitat quality. Lack of comprehensive management under alternatives A and D could increase spread of INPS across the planning area and continue to degrade wildlife habitats.

Alternative B provides the most protection for big game on crucial winter ranges from surface-disturbing activities and OHV use. Alternatives A, C, and E have similar protection from surface-disturbing activities, but Alternative C has more restrictions on OHV use during critical wildlife periods. Under Alternative D, establishing the proposed Wind River Basin MA removes discretionary wildlife stipulations from approximately 50 percent of the MA. Alternative E has some OHV restrictions on

crucial winter range. Based on the actions and uses identified, alternatives ranked in order of increasing potential adverse and decreasing beneficial impacts to the wildlife categories presented in this section are B, E, D, A, and C.

4.4.7 Special Status Species – Plants

Actions that could occur through implementing each alternative could affect special status plant species conservation and recovery. This section describes the impacts of each alternative on special status plants in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as beneficial or adverse with respect to special status plant species. See Map 27 for select special status plant species.

Allowable uses and management actions that contribute to the decline in abundance or distribution of special status plants are considered adverse. Conversely, beneficial impacts to special status plants consist of activities that protect habitat or reduce the risk of harm to these species in the planning area. An increase in special status plant numbers over time in response to an enhanced habitat or the increased viability of a species is considered a beneficial impact.

Direct impacts to special status plant species are defined, for this analysis, as actions resulting in damage to or loss of individual special status plants, fragmentation of habitat, loss of habitat quality, loss of pollinators, and loss of soil seed banks. Surface-disturbing activities, herbivory, trampling, fire, and herbicide application are considered the primary means by which direct impacts to special status plants could occur. Activities that create or increase competition between special status plants are also considered direct impacts. Plant collection and OHV use also could directly impact special status plant populations. Indirect impacts to special status plant species are defined as actions that aid or compromise the protection of special status plants. The loss or degradation of suitable habitat for special status plant species is considered a direct impact. Indirect impacts to potential habitats for special status plants also could occur when actions change the habitats in a way that makes them unsuitable for future colonization.

For the purpose of this analysis, short-term impacts to special status plant species include those activities that contribute to the decline in abundance or distribution of a species within 5 years of when the activity occurs. Long-term impacts to special status plants are those that require more than 5 years to manifest on the surface.

4.4.7.1 Methods and Assumptions

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

- Where resources overlap, management actions associated with protecting wildlife habitats and cultural resources directly benefit special status plant species.
- All surface-disturbing activities require reclamation according to the Casper Field Office's *Reclamation Monitoring Plan*. New oil and gas leases have stipulations (COAs) for protection of special status plant species (see Appendix I).
- The total amount of new surface disturbance allowed by 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.
- The existing provisions in place (e.g., presence/absence surveys conducted prior to proposed actions) to protect special status species are carried out and conditional monitoring is conducted (e.g., grazing and surface disturbance reclamation) to ensure special status species are not jeopardized.

- Management toward DPC is assumed to exceed the requirements of managing toward DFC.
- Establishing MAs that preclude or restrict development, including those not specifically aimed at conserving special status plant species, are assumed to benefit special status plant species where populations overlap with MA boundaries.
- Because not all locations of special status plant species in the planning area are known and because the locations of potential actions under the different alternatives also are not known, the analysis of potential impacts to special status plant species focuses on the threats and management challenges identified in Chapter 3.
- Assumptions described in the Special Status Species - Fish section were used in analyzing the impacts on the western prairie fringed orchid, which occurs along the Platte River System and may be impacted by water use in the planning area.
- Because the densities and locations of special status plant species in the planning area are not entirely known, impact analyses are based on the amount of vegetation and soil disturbed, the threats identified for special status plant species in Chapter 3, and the level of restrictions placed on BLM actions that could adversely impact special status plant species.
- Consultation with the USFWS and following conservation measures identified in the BA for all listed and sensitive species for the BLM's *Draft Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic EIS* are anticipated to mitigate most impacts to special status plant species.

4.4.7.2 Analysis of Alternatives

Allowable uses and management actions having the potential to impact special status plant species include all surface-disturbing activities, concentrated livestock and native ungulate grazing, OHV use, INPS, fire management, water-depleting activities with the North Platte Watershed, and proactive management actions.

As special status plant species are impacted by the alternatives, they can, in turn, impact resource uses. For example, actions designed to conserve special status plant species could limit livestock grazing, mineral development, fire management and ecology, vegetation treatments, OHV use, and control of INPS. The impacts of special status plant species on other resource topics (e.g., fire management and ecology, etc.) are not anticipated to be substantial; however, they are discussed under the appropriate impacted resources.

Impacts Common to All Alternatives

The types of impacts projected to occur to special status plant species as a result of the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Described below are potential types of impacts common to all alternatives.

Habitats for special status plants can be impacted by various surface-disturbing activities, such as energy and mineral exploration and development and the associated roads, ROW, and corridors. Other activities that may remove or trample vegetation and disturb soil, thus potentially adversely impacting habitats for special status plant species, include intensive recreational use, human collection, fire, unstructured recreation, and concentrated livestock and native ungulate grazing. Because none of the special status plants that may occur in the planning area depend on forest habitats, forest management and silviculture treatments are not expected to impact special status plant species. Surface disturbance also can indirectly impact special status plants by contributing to soil erosion, resulting in adverse impacts to watershed health. Erosion also contributes to the transport of INPS along the network of water courses within the

planning area. Soil compaction and erosion, alteration of hydrologic regimes, insecticide applications that may kill pollinators, modified fire-return intervals, and invasion of native habitats by INPS are potential indirect and long-term impacts to special status plant species.

Habitat is fragmented by activities such as construction of roads, trails, ROW, and corridors. Fragmentation adversely affects special status plants by increasing the amount of habitat edge (Knight et al. 2000), which leads to noxious weed proliferation and microclimate alterations through increased wind and solar exposure. Populations of special status plants frequently have a patchy distribution across the landscape; therefore, elimination of one or more populations can prevent gene flow among populations if residual populations are too far apart for sufficient cross-pollination. Natural surface road networks also contribute to a reduction in photosynthetic capacity in plants adjacent to roads due to dust deposits on leaf surfaces (Knight et al. 2000). These types of impacts are considered long-term because they generally persist for more than 5 years.

A portion of the surface disturbance that occurs under each alternative is reclaimed according to the Casper Field Office's *Reclamation Monitoring Plan.* However, not all impacts to special status plants from surface disturbance are offset by reclamation of disturbed lands because reclaimed lands often do not support the same plant community structure and composition as the habitat that was disturbed. Many special status plants are rare because of their association with a rare habitat or landscape feature. These plants might not reestablish on reclaimed lands if the unique habitat characteristics they require are no longer present. Moreover, INPS may establish on reclaimed lands and prevent full restoration of historical plant communities. These types of impacts are considered long-term because they generally persist for more than 5 years.

Grazing (both livestock and wildlife) may provide both adverse and beneficial impacts to special status plant species, depending on grazing intensity, timing/season of grazing, range conditions, and precipitation regimes. The Colorado butterfly plant is an example of a special status plant species that may benefit from grazing under certain conditions due to the removal of competing vegetative cover (Fertig 2000c). However, if grazing animals are not rotated or are concentrated in small areas during the plant's flowering season, grazing could adversely impact this species on some sites (Fertig 2000c). The Blowout penstemon is another special status plant species that may benefit from grazing under certain conditions by controlling competing vegetation. Grazing, particularly in sensitive riparian areas, can result in direct mortality to special status plants through trampling or herbivory and indirect impact due to soil compaction and erosion, changes in plant community composition and structure, and increased spreading of INPS (Fitch and Adams 1998). Inappropriate livestock grazing is a threat to Laramie columbine, western prairie fringed orchid, and Ute ladies'-tresses. Grazing has been considered a factor in the endangerment of 33 percent of all imperiled plant species in the United States (Wilcove et al. 1998).

Some management actions generally would benefit all special status plants. For example, management actions to control INPS may benefit special status plants by reducing competition. However, it is important to note that restoration of native habitats to pre-INPS densities and species composition should accompany INPS control for special status plant species to be enhanced by changed plant competition.

Other resource management actions that may indirectly benefit special status plant species include surface disturbance constraints to protect erosive soils, visual and cultural resources, MAs for natural and cultural resources, fish and wildlife, vegetation, and NHTs and Other Historic Trails. Where these constraints overlap with suitable habitat for special status plant species, benefits are anticipated for Porter's sagebrush, Nelson's milkvetch, and Laramie false sagebrush.

Activities in the planning area that deplete groundwater may adversely impact the Colorado butterfly plant, western prairie fringed orchid, and the Ute ladies'-tresses. These species inhabit or depend on

habitat associated with riparian and wetland areas, floodplains, and groundwater. For example, management actions under all alternatives could impact populations of the western prairie fringed orchid along the Platte River due to water depletions in the portion of the planning area that falls within the North Platte watershed. In the planning area, water depletions, though they occur hundreds of miles upstream, can affect population abundance and the availability of suitable habitats for federally listed birds, fish, and one plant in the Platte River System. The inundation or decline of wetland habitats due to flow regulation and reduced water availability can adversely impact wetland plants (National Research Council 2005). The management of the following primary resources and resource uses is anticipated to influence the quality and quantity of water in the Platte River watershed: minerals, livestock grazing, and fish and wildlife. See the Special Status Species – Fish section for a more detailed description of water depletion impacts in the North Platte watershed.

Alternative A

Surface-disturbing Activities. Surface-disturbing activities, such as oil and gas development, road construction, and other mechanized disturbance, could impact potential habitats for special status plants and undocumented populations. Such activities fragment habitats, which can isolate populations of special status plants. Long-term impacts such as habitat fragmentation and isolation of populations are difficult to mitigate; however, short-term impacts from surface disturbance are mitigated by reclamation. Reclamation of disturbed areas minimizes soil erosion and reduces opportunity for establishment of INPS which compete with special status plant species. However, despite reclamation, surface disturbance can have long-term impacts on some sensitive plant populations occurring on reclaimed lands through changes in plant community structure or encroachment of INPS. BLM actions under Alternative A are anticipated to impact 59,990 acres and 21,087 acres in the short- and long-term, respectively, in the planning area over the life of the plan. No specific constraints on resource management to minimize habitat fragmentation are identified for Alternative A.

Livestock and Native Ungulate Grazing. Approximately 6,016 acres currently are unavailable to livestock grazing in the planning area. Under Alternative A, livestock grazing is managed to prevent overgrazing and a downward trend on all leases with an emphasis on category I and M (see Glossary) grazing allotments. Approximately 10 percent of planning area grazing allotments are evaluated each year to determine whether they meet the standards for healthy rangelands. Management of livestock grazing in riparian and wetlands areas is managed on a case-by-case basis. Since livestock utilization levels and placement of water developments are managed on a case-by-case basis, some rare plant populations and habitats in areas with incomplete assessments could be impacted by heavy grazing and trampling; however, BLM uses appropriate regulatory and policy mechanisms to minimize or avoid adverse impacts.

The trend of continued improvement in rangeland productivity in the planning area is expected to continue under current management. Despite this upward trend, potential adverse impacts to special status plant species from livestock grazing include transport of INPS, soil erosion and compaction at livestock concentration areas, and removal of vegetation. These adverse impacts are not anticipated around known locations of special status plant species; however, direct and indirect adverse impacts could occur at unknown locations. Native ungulates are anticipated to have similar adverse impacts as livestock to special status plant species in areas where they concentrate, typically water sources.

INPS. Management for INPS could directly benefit special status plants by eliminating direct competition and maintaining habitat health and diversity. Competition from INPS is identified as a potential threat to the Colorado butterfly plant, western prairie fringed orchid, Laramie false sagebrush, and Ute ladies'-tresses. Under Alternative A, the spread of INPS is handled on a case-by-case basis and anticipated to provide some benefits to special status plants threatened by INPS. Alternative A does not

require livestock flushing before entering public lands or transferring between public lands to minimize transporting INPS in fecal material. Road construction under Alternative A contributes to transportation and dispersal of INPS seeds into special status plant habitats, which could have adverse impacts on special status plant habitats.

OHV Use. OHV use disturbs soils and removes vegetation, thus potentially impacting habitats for special status plants. Due to trampling, OHV use is identified as a threat to Laramie columbine, Nelson's milkvetch, and Laramie false sagebrush. OHV use is limited to existing roads and trails, but there is no coordinated planning to close new, unauthorized road and trails under Alternative A. In addition, Alternative A closes the smallest area to OHV use and includes the largest area limited to existing roads and trails for OHV use. The anticipated soil disturbance, vegetation removal, and transport of INPS under Alternative A is anticipated to indirectly and adversely impact unknown populations of special status plant species.

Fire Management and Ecology. Alternative A uses prescribed burning to manipulate vegetation in areas identified for treatment by the range, forestry, and wildlife programs. Special status plant species in the planning area are not anticipated to be adversely impacted by prescribed fire that mimics a natural fire regime. However, the lack of a natural fire regime or fire suppression are identified as potential threats to the Colorado butterfly plant, the blowout penstemon, and the western prairie fringed orchid. Intense wildland fire-suppression tactics are anticipated to be the most likely actions to adversely impact undocumented populations of special status plant species. Alternative A manages rehabilitation and stabilization following wildland fire on a case-by-case basis. In addition, Alternative A does not use an integrated management approach to reduce fuels and protect high priority areas or resource values. Alternative A does restrict use of heavy equipment in elk crucial winter range or to construct fire lines in areas containing wagon ruts.

Proactive Management Actions. Management of other resources could indirectly impact special status plants. Beneficial impacts to special status plants occur with the protection and conservation of land, for other resources overlap with locations of special status plant species. Current protection for special status wildlife species, such as greater sage-grouse, and cultural resources may benefit some special status plant habitats; however, the level of protection is unknown because the precise location of all special status plant species in the planning area is unavailable.

Under Alternative A, vegetation management is directed toward achieving DFC of plant communities on a case-by-case basis. Vegetation management toward DFC in the planning area is not specifically targeted at benefiting one of the nine special status plant species identified in Chapter 3.

Water depletions in portions of the planning area within the North Platte River watershed are summarized under each alternative in the Special Status Species – Fish section of this chapter. The number of wells and water developments projected under Alternative A are expected to cause depletions of approximately 79.4 acre-feet to the Platte River System and may adversely impact the western prairie fringed orchid along the Platte River. The Colorado butterfly plant and the Ute ladies'-tresses also may be adversely impacted by water depletions within the planning area as these species occur in floodplains, drainage bottoms, or riparian and wetland areas and depend on subirrigation or otherwise moist habitats. Because no water impoundments are developed for fish and wildlife, Alternative A results in the lowest amount of average annual water depletions of all alternatives and, thus, has the least potential to adversely impact downstream special status plant species.

Management actions that protect known populations of special status plants provide direct beneficial impacts. Under Alternative A, water developments and salt, mineral, and forage supplements are designed on a case-by-case basis to avoid known special status plant populations. Water developments,

mineral, and forage supplements attract animal concentrations and increase the potential of special status plants being trampled and grazed by livestock and wildlife.

Alternative B

Surface-disturbing Activities. Under Alternative B, approximately 39-percent less short-term and 45-percent less long-term disturbance are anticipated in the planning area from BLM actions compared to Alternative A. In addition to causing less disturbance, Alternative B reduces the potential for habitat fragmentation in the planning area by restricting mineral and renewable energy development within intact blocks of contiguous plant communities greater than 10,000 acres, depending on oil and gas potential and ownership. For example, Alternative B identifies 16 blocks comprising 413,552 acres of BLM-administered surface for protection from habitat fragmentation, compared to 0 acres under Alternative A. The restrictions on habitat fragmentation and fewer disturbed acres relative to Alternative A are anticipated to indirectly benefit special status plants by protecting potential habitats and minimizing spread of INPS and soil erosion.

Livestock and Native Ungulate Grazing. Alternative B generally allows livestock grazing over the same area identified under Alternative A; however, areas identified for the protection of specific resource values could be unavailable for Livestock grazing under Alternative B. In addition, Alternative B proposes to monitor all grazing allotments each year and manage livestock grazing to limit forage utilization to 40 percent of the current year's production. Alternative B provides the most aggressive approach to the management of BLM grazing lands, including riparian areas. More effective monitoring, management, and implementation of some grazing systems could, under certain conditions, potentially benefit the Colorado butterfly plant and other special status plants. Increased protection of riparian resources will benefit special status plants, such as Ute ladies'-tresses.

The trend of continued improvement in rangeland productivity in the planning area is expected to accelerate under Alternative B relative to Alternative A. The anticipated adverse impacts to special status plant species from current livestock grazing are not anticipated around known locations of special status plant species; however, due to stricter management of livestock grazing, direct and indirect adverse impacts to unknown locations of special status plants under Alternative B are expected to be less than under Alternative A.

INPS. Alternative B develops a comprehensive INPS management program consistent with Partners Against Weeds. This program provides a more coordinated effort to reduce INPS in habitats of special status plants and minimizes habitat degradation from the spread of INPS across the planning area. In addition, Alternative B requires a 72-hour flushing period for livestock before entering onto or within public lands to minimize transporting INPS. Road construction under Alternative B is projected to be less than under Alternative A and, therefore, is expected to lessen the transportation and dispersal of INPS seeds onto special status plant habitats.

OHV Use. Alternative B closes the largest area to OHV use and includes the smallest area limited to existing roads and trails for OHV use (see Table 2-1). The anticipated soil disturbance, vegetation removal, and transport of INPS under Alternative B are anticipated to produce the least indirect and adverse impacts to unknown populations of special status plant species compared to other alternatives.

Fire Management and Ecology. Alternative B uses prescribed burning on a broader landscape level than Alternative A and does not limit this tool for achieving objectives identified by the range, forestry, and wildlife programs. Alternative B manages rehabilitation wherever suppression-related damage occurs, including the use of chemicals to control INPS. In addition, Alternative B proposes to use an integrated management approach to reduce fuels and protect high-priority areas or resource values.

Alternative B restricts use of heavy equipment in a broader area than Alternative A, including areas of cultural resource sensitivity, riparian and wetland habitats, big game crucial winter range, greater sage-grouse leks, and areas of highly erosive soils.

Proactive Management Actions. Alternative B sets aside the most land of any alternative for new MAs that have management actions to benefit special status plant resources. This alternative provides the greatest opportunity of all alternatives to manage plant communities to maintain special status plant habitats.

Water depletions in portions of the planning area within the North Platte River watershed are anticipated to be the greatest (average water depletions of 2,014 acre-feet per year) under Alternative B. The proposed fish and wildlife reservoirs in Alternative B are expected to result in the highest amount of average annual water depletions of all alternatives and, thus, Alternative B has the highest potential to adversely impact the continued existence of the western prairie fringed orchid along the Platte River.

Alternative B provides maximum protection to known populations of special status plants. Water developments are not allowed within ¼ mile of special status plant populations, thereby affording special status plants some protection from direct trampling and grazing by livestock and wildlife due to water developments. The increased buffer compared to Alternative A aids in habitat protection and the potential expansion of the special status plant populations.

Alternative C

Surface-disturbing Activities. Under Alternative C, approximately 2 percent (58,689 acres) less short-term and 3 percent (20,358 acres) less long-term disturbance are anticipated in the planning area from BLM actions compared to Alternative A. In addition to causing less disturbance, Alternative C reduces the potential for habitat fragmentation in the planning area by setting aside blocks of land to protect from habitat fragmentation, similar to Alternative B. Alternative C identifies 8 blocks comprising 177,035 acres of BLM-administered surface containing big game crucial winter range or greater sage-grouse leks/habitat for protection. The restrictions on habitat fragmentation and fewer disturbed acres relative to Alternative A are anticipated to indirectly benefit special status plants by protecting potential habitat, and minimizing the spread of INPS and soil erosion. Adverse impacts from surface disturbance under Alternative C are anticipated to be less than under Alternative A.

Livestock and Native Ungulate Grazing. Alternative C generally allows livestock grazing over the same area identified under Alternative A and, similar to Alternative B, provides protection of specific resource values as needed. Under Alternative C, livestock grazing is managed to maintain a protective cover of vegetation and litter with emphasis on the condition of allotments with substantial acreage of highly erosive soils. The anticipated adverse impacts to special status plant species from livestock grazing are not expected around known locations of special status plant species; however, due to the requirement to target utilization on highly erosive soils, direct and indirect adverse impacts to unknown locations of special status plants under Alternative C are expected to be less than under Alternative A.

INPS. Alternative C develops a comprehensive INPS management program similar to Alternative B and could require a 72-hour flushing period for livestock before entering onto or within public lands to minimize transporting INPS. Road construction under Alternative C is projected to be less than under Alternative A and, therefore, is expected to lessen the transportation and dispersal of INPS seeds into special status plant habitats compared to Alternative A.

OHV Use. Alternative C closes approximately three times as many acres to OHV use and designates about the same number of acres as limited to existing roads and trails for OHV use as Alternative A. The anticipated soil disturbance, vegetation removal, and transport of INPS under Alternative C are

anticipated to produce less indirect and adverse impacts to unknown populations of special status plant species compared to Alternative A.

Fire Management and Ecology. Alternative C uses prescribed burning in a similar manner as Alternative B and includes management of rehabilitation wherever suppression-related damage occurs and control of INPS. Alternative C also proposes to use an integrated management approach to reduce fuels and protect high-priority areas or resource values similar to Alternative B. Use of heavy equipment for fire suppression under Alternative C is similar to Alternative B, except the former would not identify full protection areas.

Proactive Management Actions. Similar to Alternative B, buffers and restrictions for other resources will indirectly benefit habitats for special status plants. Compared to Alternative A, Alternative C sets aside more lands for new MAs that have management actions to benefit special status plant resources. Water quality on the planning area will be maintained or improved, which would also benefit downstream resources, including populations of western prairie fringed orchid.

Water depletions in portions of the planning area within the North Platte River watershed are anticipated to be the second highest (average water depletions of 1,054 acre-feet per year) under Alternative C. Alternative C has a greater adverse impact on surface water quantity and the western prairie fringed orchid along the Platte River than under Alternative A, but less than under Alternative B.

Maintenance of special status plant habitats through protection and vegetative treatments is greater than under Alternative A. The increased buffer (500 feet) compared to Alternative A aids in habitat protection and the potential expansion of special status plant populations.

Alternative D

Surface-disturbing Activities. Under Alternative D, approximately 6-percent (63,649 acres) more short-term and 5-percent (22,080 acres) more long-term disturbance are anticipated in the planning area from BLM actions compared to Alternative A. Similar to Alternative A, Alternative D does not reduce the potential for habitat fragmentation in the planning area by setting aside blocks of land to protect from habitat fragmentation. Adverse impacts from surface disturbance under Alternative D are anticipated to be greater than under Alternative A.

Livestock and Native Ungulate Grazing. Alternative D generally allows livestock grazing over the same area identified under Alternative A and, similar to Alternative B, provides protection of specific resource values as needed. The emphasis of livestock grazing management under Alternative D is similar to Alternative A. The trend of continued improvement in rangeland productivity in the planning area is expected to continue under Alternative D, similar to Alternative A. The anticipated adverse impacts to special status plant species from current livestock grazing are not expected around known locations of special status plant species; however, due to the requirement to target utilization on highly erosive soils, direct and indirect adverse impacts to unknown locations of special status plants under Alternative D are expected to be similar to Alternative A.

INPS. Alternative D does not develop a comprehensive INPS management program, nor does it require a 72-hour flushing period for livestock before entering onto or within public lands to minimize transporting INPS. Adverse impacts to special status plants from the spread of INPS are similar to Alternative A. Road construction under Alternative D is expected to be the most of any alternative and, therefore, is expected to contribute the most to the transportation and dispersal of INPS seeds into special status plant habitats. The lack of proactive INPS management under Alternative D could result in habitat degradation, a decline in habitat diversity, and adverse impacts to watershed health.

OHV Use. Alternative D closes a similar number of acres to OHV use and is limited to existing roads and trails as Alternative A. The anticipated soil disturbance, vegetation removal, and transport of INPS under Alternative D are expected to be similar to Alternative A.

Fire Management and Ecology. Alternative D uses prescribed burning in a similar manner as alternatives B and C. Alternative D also proposes to use an integrated management approach to reduce fuels and protect high-priority areas or resource values similar to Alternative B. Alternative D uses full protection strategies and tactics across the planning area, resulting in fewer adverse impacts to special status plants than Alternative A.

Proactive Management Actions. No new MAs are proposed under Alternative D. Actions to bring or maintain vegetation toward DPC occurs on approximately 25 percent of aspen, sagebrush, and mountain shrub communities, resulting in a greater potential for maintaining special status plant habitats relative to Alternative A.

Water depletions in portions of the planning area within the North Platte River watershed are anticipated to be 272 acre-feet per year under Alternative D. Adverse impacts to the western prairie fringed orchid resulting from projected water depletion occurs under Alternative D and are greater than those anticipated under Alternative A.

Water developments are not allowed within 300 feet of known populations of special status plants, thereby affording special status plants some protection from direct trampling and grazing by livestock and wildlife due to water development. The increased buffer (300 feet) compared to Alternative A provides some habitats protection, but minimal expansion of the special status plant populations.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. Under Alternative E, approximately 2-percent (61,274 acres) more short-term and 3-percent (21,672 acres) more long-term disturbance are anticipated in the planning area from BLM actions compared to Alternative A. Although projected surface disturbance is greater compared to Alternative A, the potential for habitat fragmentation in the planning area would be reduced under Alternative E by setting aside blocks of land to protect from habitat fragmentation. Alternative E identifies 8 blocks comprising 131,879 acres of BLM-administered surface, similar to Alternative C; however, all surface-disturbing activities within the 8 blocks are subject to a CSU restriction under Alternative E. The restrictions on habitat fragmentation relative to Alternative A are anticipated to indirectly benefit special status plants by protecting potential habitats and minimizing the spread of INPS. Adverse impacts from surface disturbance under Alternative E are anticipated to be less than under Alternative A.

Livestock and Native Ungulate Grazing. Alternative E generally allows livestock grazing over the same area identified under Alternative A and, similar to Alternative B, provides protection of specific resource values as needed. The trend of continued improvement in rangeland productivity in the planning area is expected to continue. The anticipated adverse impacts to special status plant species from current livestock grazing are not expected around known locations of special status plant species; however, due to the requirement to target utilization on highly erosive soils, direct and indirect adverse impacts to unknown locations of special status plants under Alternative E are expected to be less than under Alternative A.

INPS. Alternative E develops a comprehensive INPS management program similar to Alternative B and could require a 72-hour flushing period for livestock before entering onto or within public lands to minimize transporting INPS. Road construction under Alternative E is projected to be similar to

Alternative A and, therefore, is expected to have similar transport and dispersal of INPS seeds into special status plant habitats.

OHV Use. The anticipated soil disturbance, vegetation removal, and transport of INPS material under Alternative E are anticipated to produce less indirect and adverse impacts to unknown populations of special status plant species compared to Alternative A.

Fire Management and Ecology. Alternative E uses prescribed burning in a similar manner as Alternative B, except management is achieved at a watershed level. Alternative E proposes to use an integrated management approach to reduce fuels and protect high-priority areas or resource values similar to Alternative B, except Alternative E protects a broader area as opposed to focusing on sensitive wildlife habitats.

Proactive Management Actions. Similar to Alternative B, buffers and restrictions for other resources, such as soils, will indirectly benefit habitats for special status plants under Alternative E. Alternative E sets aside additional lands for new MAs having management actions to benefit special status plant resources. Riparian management benefits special status plants.

Water depletions in portions of the planning area within the North Platte River watershed are anticipated to be 270 acre-feet per year under Alternative E. Adverse impacts to the western prairie fringed orchid under alternatives D and E are similar and greater than under Alternative A, and less than under alternatives B and C.

Alternative E provides protection to known populations of special status plants. Salt and mineral placement and water developments are restricted within 500 feet of areas inhabited by special status plants.

4.4.7.3 Conclusion

Known populations of special status plant species have more protection from water developments and a higher potential to expand populations under Alternative A. Alternative E allows water developments in areas with special status plant populations, but only if an analysis determines there to be no adverse impacts to special status plants.

Comprehensive INPS management plans provided in alternatives B, C, and E are anticipated to result in similar long-term beneficial impacts to special status plant species. Lack of comprehensive management in alternatives A and D is expected to increase the spread of INPS across the planning area and continue to degrade native habitats, including habitats for special status plant species.

Fewer acres are subject to surface-disturbing activities and habitat fragmentation under Alternative B, followed by alternatives C and E. These alternatives also have more provisions to protect sensitive soils and habitats, such as riparian areas, and include more management restrictions that could benefit special status plant species. Based on acreage of surface disturbance and acres protected from habitat fragmentation, alternatives with the least to most potential adverse impacts to special status plant species are alternatives B, C, E, A, and D. Surface disturbance under alternatives A and D would impact similar acreage, and neither identifies land managed to avoid habitat fragmentation. Alternative D also has the highest potential to damage sensitive soils and habitats, potentially resulting in adverse impacts to special status plant species.

Special status plants potentially receive more indirect benefits from management for other resources, such as special status wildlife species and cultural resources, under alternatives B and C. Alternative B,

followed by alternatives C and E, set aside the most land for new MAs, which could indirectly benefit special status plants.

Alternative B potentially has the greatest impact on water quantity in the Platte River System downstream of the planning area, and potentially has the greatest adverse impact on the western prairie fringed orchid along the Platte River. Potential impacts to water quantity are lower under alternatives D, E, C, and A, with Alternative A resulting in the smallest projected water depletion in the North Platte River.

4.4.8 Special Status Species – Fish

Actions that could occur through implementing each alternative could impact Special Status Species – Fish. This section describes the impacts of each alternative on Special Status Species – Fish in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as beneficial or adverse.

No BLM sensitive or federally listed fish species are in the planning area; however, the federally endangered pallid sturgeon occurs in the Platte River downstream of the planning area and could be impacted by management activities in the part of the planning area comprising the North Platte watershed (see Map 5). In addition, 10 species are recognized by the WGFD as Status 1-3 (NSS1-3, see Glossary), including lake chub, flathead chub, hornyhead chub, black bullhead, common shiner, finescale dace, pearl dace, plains topminnow, plains minnow, and suckermouth minnow (Appendix E). Wyoming NSS1-3 are species that may be rare to common, with declining or vulnerable habitats. The impacts to Wyoming NSS1-3 species are similar to those described for Fish and Wildlife Resources – Fish. This section focuses on the potential impacts of each alternative on pallid sturgeon.

Adverse impacts to the pallid sturgeon could occur through depletion of water in the Platte River System, resulting from water use in a portion (i.e., North Platte watershed) of the planning area. Adverse impacts to the pallid sturgeon also could occur through degradation of water quality in the North Platte watershed. Activities in the North Platte watershed portion of the planning area that would measurably reduce the quantity or quality of water in downstream reaches of the Platte River are considered indirect adverse impacts. Water depletions are considered a long-term adverse impact because implementation of management actions projected to cause water depletion is anticipated to occur over the life of the plan. Degradation of water quality is considered a short-term adverse impact because individual surface-disturbing activities are anticipated to occur over a relatively short period of time (less than 5 years). No direct or beneficial impacts to the pallid sturgeon are anticipated as a result of the alternatives described in Chapter 2.

4.4.8.1 Methods and Assumptions

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

- Water consumption in the North Platte watershed may 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 within the North Platte watershed contributed to surface flows of the Platte River or its tributaries.
- For Platte River System species, the area evaluated includes the portion of the planning area drained by the North Platte River, as well as areas of the Platte River System downstream of the planning area.
- The number of projected oil and gas wells within the North Platte watershed vary by alternative and are estimated based on the potential for oil and gas development within the watershed.

- Based on assumptions for water use during well drilling, completion, and dust abatement, as well as for impoundment size and evaporation rates, each conventional oil and gas well uses approximately 2 acre-feet of water over the life of the plan.
- Produced water from CBNG drilling is assumed to have a negligible influence on surface water quantity and quality in the North Platte watershed.
- Management toward DPC is assumed to exceed the requirements of managing toward PFC.
- Because CBNG wells are air-drilled, drilling and completion of these wells do not result in depletion of water in the North Platte watershed (Bauer 2005).
- Most livestock water developments are implemented on I and M allotments (see Glossary). Approximately 46 percent of all I and M allotments in the planning area fall entirely or partially within the North Platte watershed.
- 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 [ft^2]) each, for a per-project surface area of 157 ft^2.
- Fish and wildlife impoundments each average approximately 5 acres in surface area.

4.4.8.2 Analysis of Alternatives

Allowable uses and management actions that could indirectly impact the pallid sturgeon include all surface-disturbing activities with potential to degrade water quality in the Platte River and water development actions able to deplete water quantity in the Platte River. The types of impacts projected to impact water quality and quantity in the North Platte watershed are anticipated to be common to all alternatives and, therefore, are discussed in the following section. The intensity of impacts to water quality and quantity are anticipated to vary by alternatives and are described in subsequent sections.

Impacts Common to All Alternatives

Reduced water flow in the Platte River can lead to adverse impacts on the ecosystems that support pallid sturgeon. Too little water at certain times of the year can limit the availability of forage fish to the pallid sturgeon (National Research Council 2005). Pallid sturgeon also may lose important migratory cues that are probably influenced by historically unregulated higher water flows in the spring of each year.

Water Quality. The potential to adversely impact water quality in the planning area is primarily a function of surface-disturbing activities and associated soil erosion, particularly on soils highly susceptible to water erosion. Actions removing vegetation and disturbing soil, thereby increasing the potential for offsite erosion and sediment delivery into the stream system, are primarily anticipated to be surface-disturbing activities. Appendix M provides data regarding surface disturbance acreage and RFAs related to development by alternative. Other actions, including concentration of livestock, fire management and ecology, OHV use, and reclamation of disturbed areas are anticipated to also remove or reduce vegetation and disturb soil, but are expected to have less potential to degrade water quality in the North Platte watershed.

Under all alternatives, sedimentation entering watersheds is minimized through implementing BMPs and developing and implementing an SWPPP and erosion and sediment control plans. In general, produced water from CBNG wells can result in higher volumes of water, as compared with conventional natural gas wells, and is relatively high quality in the planning area because it is derived from formations closer to recharge areas. Negligible adverse impacts to surface water quality from CBNG development are anticipated under any alternative after implementing BMPs and other mitigation measures. Please refer to

the Water section earlier in this chapter for more information about potential impacts to surface water quality.

Water Quantity. 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 the surface discharge of produced water from CBNG wells. The amount of water used for drilling and completion of wells, including water for dust abatement and other post-drilling activities, is relatively similar for most types of wells. 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 CBNG 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 is anticipated to be negligible compared to projected water depletions.

Projected development of water impoundments, springs, and wells for livestock, fish, and wildlife are anticipated to deplete water in the North Platte watershed. The number of impoundments, wells, and springs for livestock is the same under all alternatives. Table 4-10 summarizes the average annual depletion for each water-depleting action by alternative.

4.4.8.3 Conclusion

Alternative B has the least impact on water quality because it has the lowest levels of surface disturbance and the greatest protection for erodible soils among all the alternatives. According to projected surface disturbance (see Appendix M), alternatives A and D are anticipated to contribute the most sediment and the most runoff to surface water in the North Platte watershed and, therefore, have the most adverse impact on water quality.

Regarding water quantity, alternatives B and C have the greatest water depletion and, therefore, are likely to have the greatest adverse impact on the pallid sturgeon in the Platte River. As depicted in Table 4-10, these water depletions are heavily influenced by the Fish and Wildlife Water Impoundment evaporative loss. Anticipated adverse impacts to water quantity from Alternative A are anticipated to be the least (79 acre-feet), followed by Alternative E (270 acre-feet).

Table 4-10. BLM Actions and Potential Water Depletions in the North Platte Watershed During Implementation of the Casper Field Office Resource Management Plan

Alternative	Action[a]	Number	Average Annual Depletion (acre-feet)
A	Conventional Oil and Gas Drilling	279	28
	Livestock Water Impoundments[b]	12	51
	Livestock Water Wells and Springs	23	0
	Fish and Wildlife Water Impoundments[b]	0	0
	Total		**79**
B	Conventional Oil and Gas Drilling	34	3
	Livestock Water Impoundments[b]	12	51
	Livestock Water Wells and Springs	23	0
	Fish and Wildlife Water Impoundments[b]	92	1,960
	Total		**2,014**
C	Conventional Oil and Gas Drilling	234	23
	Livestock Water Impoundments[b]	12	51
	Livestock Water Wells and Springs	23	0
	Fish and Wildlife Water Impoundments[b]	46	980
	Total		**1,054**
D	Conventional Oil and Gas Drilling	285	29
	Livestock Water Impoundments[b]	12	51
	Livestock Water Wells and Springs	23	0
	Fish and Wildlife Water Impoundments[b]	9	192
	Total		**272**
E	Conventional Oil and Gas Drilling	268	27
	Livestock Water Impoundments[b]	12	51
	Livestock Water Wells and Springs	23	0
	Fish and Wildlife Water Impoundments[b]	9	192
	Total		**270**

[a]Due to the programmatic nature of RMP alternatives, key assumptions made for calculating projected water depletion in the North Platte watershed over the life of the RMP include the following:

(1) All wells, springs, and reservoirs projected for development over the life of the RMP are constructed and completed in year 1.

(2) Water depletions associated with conventional oil and gas drilling are calculated using an average depletion of 2 acre-feet per well occurring in the North Platte watershed by alternative. Oil and gas well numbers were derived from the RFD Scenario for Oil and Gas (BLM 2005c).

(3) Livestock wells and reservoirs projected for grazing allotment categories I and M (see Glossary) are included in water depletion calculations even when only a minor component of the allotment boundaries occurred in the North Platte watershed.

(4) Reservoir evaporative loss calculations are based on 45" annual pan evaporation, average pan coefficient of .70, and annual precipitation of 12.1" (based on a 30-year average of six recording stations) for the planning area.

(5) Potential water depletion for fire management is not included in calculations due to the nonpredictive nature of unplanned fire and the negligible water depletion associated with planned fire.

[b]Depletions associated with water impoundments are based on total acreage for each alternative.

4.4.9 Special Status Species – Wildlife

Actions that could occur through implementing each alternative could impact special status wildlife species. This section describes the impacts of each alternative on special status wildlife in terms of direct, indirect, short-term, and long-term impacts. Impacts also are described as beneficial or adverse to special status wildlife. Refer to maps 28 through 32 for special status wildlife species and maps 19 and 23 for vegetation.

Direct impacts to special status wildlife result from the direct loss of critical habitat or a key habitat feature, such as a nest site or lek area, or from the immediate loss of life. Special status wildlife also can be directly disturbed by human activities, potentially causing them to abandon a nest, lek, or home range. It has been widely documented that disturbance during sensitive periods (e.g., winter, nesting) leads to lower recruitment rates and higher mortalities, which adversely impact special status species wildlife.

Habitat loss and fragmentation are assumed to adversely impact special status wildlife. These conditions are described in more detail in the introductions to Biological Resources in this chapter and in Chapter 3. Habitat loss generally is a direct impact; i.e., the individual or population is immediately impacted. The impacts of habitat fragmentation, however, operate indirectly through mechanisms, such as population isolation (Saunders et al. 1991); edge impacts, such as increased nest predation and parasitism (Paton 1994; Faaborg et al. 1995); encroachment of INPS; and disruption of migration patterns.

Indirect impacts to special status wildlife 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 also could occur when specific actions change the habitat in a way that makes it unsuitable for future habitation.

Disturbance impacts could range from short-term displacement and shifts in activities to long-term abandonment of home range (Miller 1998; Yarmaloy et al. 1988; Connelly et al. 2000). For the purpose of this analysis, short-term impacts (up to 5 years) to special status wildlife are those activities that an individual or species respond to immediately, but does not impact the population viability of the species. Long-term impacts (more than 5 years) are those that cause an individual or species to permanently abandon an area or that impact the population viability and survival of the species.

4.4.9.1 Methods and Assumptions

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

- Impacts to special status wildlife species are based primarily on potential impacts to habitats managed by the BLM.
- Precise quantitative estimates of impacts generally are not possible because the exact locations of future actions are unknown, population data for species status wildlife species are often lacking, or habitat types impacted by surface-disturbing activities cannot be predicted.
- Actions impacting one species have similar impacts on other species using the same habitats or areas.
- The more acreage of habitat protected, the greater the benefit to the targeted species.
- Prohibiting all disturbing and disruptive activities in greater sage-grouse winter habitats is more beneficial to greater sage-grouse than avoiding these activities.

- Management of sagebrush habitats follows the BLM National Sage-Grouse Habitat Conservation Strategy. Using these guidelines, greater sage-grouse serve as an umbrella species for all sagebrush-dependent species.
- Prescribed fire is used to manage vegetative communities and can result in short-term adverse impacts with long-term beneficial impacts to wildlife and wildlife habitats.
- Management toward DPC is assumed to exceed the requirements of managing toward DFC.
- Measures to protect one species generally will result in long-term benefits to other species occurring within that habitat.
- Short- and long-term surface disturbance (see Appendix M) 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.
- Because of the migratory nature and relative mobility of some special status wildlife species (e.g., waterfowl, neotropical migrants, and raptors), these species are impacted by actions on non-BLM-administered land more so than other species. In the case of migratory species, impacts to winter and migration habitats could adversely impact the viability of some species. Winter and migration habitats are assumed to be at least as important to long-term viability of these species as breeding and nesting habitats.
- Interior least tern, Eskimo curlew, whooping crane, and piping plover occur along the Platte River in Nebraska, and could be impacted by management activities in the planning area. No direct impacts are expected to occur to habitats for these species as a result of activities in the planning area.
- The analysis of Platte River special status wildlife species focuses on changes in water quantity in the planning area as the primary indirect impact of resource management actions on Platte River species. Refer to the Special Status Species – Fish section for more details.

4.4.9.2 Analysis of Alternatives

The analysis of alternatives for special status wildlife species does not repeat the allowable uses and management actions proposed for each alternative and described in Chapter 2. Moreover, the types of impacts anticipated for special status wildlife species are similar in nature to the Impacts Common to All Alternatives described for Fish and Wildlife Resources – Wildlife; therefore, an extensive description of those impacts is not repeated in this section.

Impacts Common to All Alternatives

The types of impacts projected to occur to special status wildlife species as a result of the various alternatives are similar. Habitats are anticipated to be lost, degraded, reclaimed, protected, enhanced, and fragmented by management actions and allowable uses under all alternatives, although the intensity of impacts is anticipated to vary by alternative. Table 4-11 repeats Table 4-1's anticipated short- and long-term surface disturbance from BLM actions in the planning area over the life of the plan. RFAs contributing to this surface disturbance are identified in Appendix M.

Table 4-11. Reasonable Foreseeable Actions – Surface Disturbance (Acres) in the Casper Planning Area

Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Total Acres Short-Term Disturbance from BLM Actions	59,990	36,650	58,689	63,649	61,274
Total Acres Reclaimed from BLM Actions	38,903	25,085	38,331	41,569	39,602
Total Acres Long-Term Disturbance from BLM Actions	21,087	11,565	20,358	22,080	21,672

Source: Appendix M, Table M-1
BLM Bureau of Land Management

Surface-disturbing Activities. Because the precise location of surface-disturbing activities is unknown and because special status wildlife species utilize more than one vegetation type, impacts to special status wildlife from construction of well pads and roads, pits and reservoirs, pipelines and powerlines, mining, and vegetation treatments are anticipated to be a function of the amount, density, type, location, and frequency of short- and long-term disturbances. The timing and type of reclamation also is anticipated to impact special status wildlife species. Long-term surface disturbance acreage identified in Table 4-11 accounts for reclamation of some lands following short-term disturbance. Although reclamation restores habitat and thereby reduces long-term surface disturbance acreage, the location of permanent facilities (e.g., roads, well pads, etc.) adjacent to reclaimed areas can reduce the utility of reclaimed habitats. For example, the greater the density of permanent facilities in an area, the more the habitat is fragmented and the greater the adverse impact anticipated for wildlife. See the Fish and Wildlife Resources – Wildlife section for a more detailed description of surface-disturbing activities.

The bald eagle is a federally listed threatened species known to occur within the planning area. Currently, 5 bald eagle nests and 11 communal roosts have been documented within the planning area. Bald eagle habitats are described in detail in the Bald Eagle Habitat Management Plan (HMP) for the Platte River Resource Area and Jackson Canyon ACEC (BLM 1992a). As indicated in Chapter 2, Biological Resources, surface disturbance is prohibited within ½ to 1 mile of known or discovered bald eagle nests. In addition, NSO or development are allowed around bald eagle communal roosts. All bald eagle roosts are withdrawn from locatable mineral entry (BLM 1992a).

The Preble's meadow jumping mouse is a federally threatened species, so the USFWS has designated critical habitat in riparian areas in Converse and Platte counties. Under all alternatives, any management actions in critical habitat that could affect habitat for the Preble's meadow jumping mouse would be subject to Section 7 consultation with the USFWS. No measurable adverse impacts from the various alternatives' allowable uses and management actions have been identified for this species. Moreover, suitable habitat for this species primarily is found on private land in the eastern half of the planning area. However, actions resulting in the loss, degradation, or fragmentation of suitable riparian or wetland habitats could impact the Preble's meadow jumping mouse, including, but not limited to, surface-disturbing activities, livestock grazing, fire, OHV use, and INPS. Due to existing protection for wetlands and the limited distribution of this species to southeast Wyoming, no impacts to this species are anticipated from any alternatives.

Wildlife-disturbing Activities. These are authorized activities 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. Each of these activities is anticipated to occur under all alternatives and impact special status wildlife species. See the Fish and

Wildlife Resources – Wildlife section for a more detailed description of wildlife-disturbing activities. The precise location of wildlife-disturbing activities is not predictable at this level of analysis; therefore, these activities are evaluated during project-specific NEPA evaluations prior to project authorization.

Proactive Management Actions. Select management actions and allowable uses are anticipated to benefit special status wildlife species by promoting individual species and their habitats or by restricting activities of other resource programs (e.g., mining, livestock grazing, OHV use). Collectively, these actions are described in this section as proactive management actions and include managing vegetation communities and associated wildlife habitats; restricting certain types of development; establishing MAs; managing habitat fragmentation; and developing and protecting water source and associated habitats. See the Fish and Wildlife Resources – Wildlife section for a more detailed description of proactive management actions.

All alternatives provide some degree of protection to streams, wells, springs, or other water sources by prohibiting or managing surface disturbance within varying distances from the water sources. Those alternatives providing the greatest protection of water sources beneficial to wildlife are anticipated to have the greatest benefit to wildlife. Special status wildlife species that use water sources and riparian and wetland habitats within the planning area benefit from management actions common to all alternatives that promote the development and enhancement of water sources. Development of water sources for wildlife and livestock are anticipated to benefit the distribution and health of special status wildlife species within the planning area.

All alternatives continue to manage public lands within the Table Mountain (1,549 acres), Springer/Bump-Sullivan (593 acres), and Rawhide (200 acres) areas in accordance to WGFD WMA plans, which have specific goals to benefit waterfowl and riparian and wetland habitats. Transfer of these areas to the WGFD under some alternatives is not anticipated to have measurable differences in impacts to special status wildlife species across alternatives. No federally listed species are known to occur in these areas.

Impacts to special status wildlife species generally are described in this section in terms of anticipated surface disturbance, amount of habitat potentially protected from habitat fragmentation, amount of land protected by buffers around nests and leks, amount of water depletion to the Platte River System, and the potential adverse impacts from other resource program actions. Table 4-12 summarizes select conservation measures anticipated to offset some of the impacts to habitats. In addition, Tables 4-5 and 4-6 summarize acreage by alternatives of lands restricted, closed or administratively unavailable for mineral development. These restrictions are anticipated to benefit special status species wildlife in the area.

Alternative A

Game Birds (Greater Sage-Grouse)

Estimated short- and long-term surface disturbance from BLM actions in the planning area are anticipated to result in loss, degradation, and fragmentation of sagebrush habitat (Table 4-1). Specifically, mineral and energy development has been identified as a potential cause of declining greater sage-grouse populations (Wyoming Sage-Grouse Working Group 2003). Alternative A does not provide specific guidance or management actions for the prevention of habitat loss and fragmentation. For example, developing minerals and wind-energy facilities on BLM-administered land under Alternative A could result in long-term adverse impacts to greater sage-grouse by fragmenting sagebrush habitats. Alternative A does not include restrictions for the development of wind energy. Reclamation of surface disturbance would be handled on a case-by-case basis under Alternative A without specific requirements regarding completion timeframe, topsoil salvage, seeding, certified weed-free seed, or temporary protective surface

treatment requirements. For oil and gas activities, reclamation is completed according to the surface use plan. Overall, surface disturbance in sagebrush habitats under Alternative A is anticipated to adversely impact greater sage-grouse.

Alternative A manages wildland fire on a case-by-case basis for areas where a management-ignited prescribed fire are planned. In addition, prescribed burning is implemented to manipulate vegetation on areas identified for treatment in the range, forestry, and wildlife programs. Rehabilitation and stabilization following wildland fire are conducted on a case-by-case basis. Nelle et al. (2000) concluded that burning did not benefit greater sage-grouse nesting or brood-rearing habitats and adversely impacted nesting habitats due to the extensive time it takes for sagebrush canopy to recover. Because greater sage-grouse hens show fidelity for nesting areas, catastrophic wildland fires that remove large tracts of sagebrush could be detrimental to greater sage-grouse populations (Wyoming Sage-Grouse Working Group 2003). Holloran et al. (2005) recommend limiting prescribed fire that may adversely impact dense sagebrush stands with adequate herbaceous vegetation. Fire management and ecology under Alternative A does not promote a natural fire regime and uses full suppression tactics across the entire planning area. The potential for catastrophic fire damaging important greater sage-grouse habitats under Alternative A is anticipated to have an adverse impact on greater sage-grouse.

Currently, INPS management is handled primarily through the County Weed and Pest Program. However, in addition to the County Weed and Pest Program, livestock operators have formed five Coordinated Resource Management groups to manage weeds on more localized levels. Despite these efforts, the spread of INPS is anticipated to degrade sagebrush habitats in the long term. Although the extent of sagebrush habitat degradation from the spread of INPS and other weeds is unknown for the planning area, the potential for these species to substantially impact greater sage-grouse habitats in the future exists (Wyoming Sage-Grouse Working Group 2003). Therefore, the anticipated continued expansion and spread of INPS under Alternative A is expected to adversely impact greater sage-grouse and sagebrush habitats.

By altering habitat components necessary for greater sage-grouse habitats, livestock grazing can impact the suitability and extent of greater sage-grouse habitats in the planning area (Wyoming Sage-Grouse Working Group 2003). Holloran et al. (2005) suggest that annual livestock grazing in greater sage-grouse nesting habitats may adversely impact the next year's nesting success. Under Alternative A, the BLM continues to manage livestock to prevent improper grazing in all allotments. The BLM currently monitors rangeland health on approximately 10 percent of grazing allotments annually, with an emphasis on higher-priority allotments (i.e., I and M allotments, see Glossary). Monitoring is important to ensure grazing intensity and duration does not remove required herbaceous cover and litter important for maintaining greater sage-grouse habitats. Adams et al. (2004) identify grazing intensity and timing and duration of grazing as the most important factors in maintaining herbaceous cover for greater sage-grouse. Although rangeland productivity is improving within the planning area, the current focus of management and monitoring does not emphasize the protective cover of vegetation and litter required by greater sage-grouse. Therefore, management of livestock grazing under Alternative A is not anticipated to improve the quality or quantity of habitats for greater sage-grouse.

Under Alternative A, the BLM manages sagebrush habitats in the planning area to achieve DFC on a case-by-case basis. To minimize impacts to sagebrush habitats and greater sage-grouse, Alternative A requires avoidance of surface disturbance or occupancy within ¼ mile of occupied leks and avoidance of surface-disturbing and disruptive activities within 2 miles of occupied leks or in identified greater sage-grouse nesting and early brood-rearing habitats outside the 2-mile buffer. Table 4-12 identifies the acreage protected by these buffers. Braun (2002) indicates that adverse impacts to greater sage-grouse can occur within ¼- or ½-mile buffers and accordingly recommends no surface disturbance within 3 miles of occupied leks. To protect greater sage-grouse winter habitats, surface disturbance and disruptive

activities would be avoided from November 15 to March 14; however, greater sage-grouse winter habitats have not been delineated in the planning area. Current special designations within the planning area include the Jackson Canyon and Salt Creek Hazardous Area ACECs. No special designations or other MAs emphasizing the greater sage-grouse currently exist under Alternative A.

Table 4-12. Summary of Select Conservation Measures and Potential Habitat Impacts for Special Status Species – Wildlife

Actions Affecting SSS-Wildlife	Acreage Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Buffer Acres Around Raptor Nests	Total Area	82,938-157,220	82,940-270,914	82,940-270,913	82,940-257,625	82,940-257,625
	BLM-Administered Surface	82,938-123,622	64,572-213,876	64,572-213,875	64,572-204,177	64,572-204,177
Greater Sage-Grouse Leks Protective Buffers	BLM-Administered Surface	7,572	40,897	14,959	7,572	26,068
	BLM-Administered Minerals	17,474	89,210	31,561	17,474	51,841
Greater Sage-Grouse Nesting and Early Brood-Rearing Habitat Buffers	BLM-Administered Surface	345,533	788,774	400,445	345,533	435,981
	BLM-Administered Minerals	794,600	1,940,880	891,383	794,600	960,342
Acres Managed for Potential Black-footed Ferret Reintroduction	BLM-Administered Surface	N/A	145,641	145,641	CBC	CBC
Acres Protected from Habitat Fragmentation	Total Area	0	660,498	279,305	0	192,545
	BLM-Administered Surface	0	413,552	177,035	0	131,879
	BLM-Administered Minerals	0	580,007	238,724	0	168,386
Acres Protected from Habitat Fragmentation by Vegetation Types						
Agricultural Lands (Altered by Human)	Total Area	0	3	3	0	0
	BLM-Administered Surface	0	0	0	0	0
Desert Shrublands (Including Greasewood)	Total Area	0	137,327	18,252	0	5,115
	BLM-Administered Surface	0	83,675	9,652	0	2,902
Forests and Woodlands	Total Area	0	56,435	33,583	0	23,616
	BLM-Administered Surface	0	40,221	25,944	0	18,996
Grassland	Total Area	0	175,000	85,552	0	64,302
	BLM-Administered Surface	0	109,692	52,589	0	40,032
Mountain Shrubland	Total Area	0	37,495	37,610	0	32,325
	BLM-Administered Surface	0	27,318	27,350	0	23,380
Riparian	Total Area	0	9,701	3,234	0	2,104
	BLM-Administered Surface	0	3,086	115	0	107
Rock Outcrops/Badlands	Total Area	0	3,087	3,095	0	2,001
	BLM-Administered Surface	0	2,962	2,967	0	1,952

Table 4-12. Summary of Select Conservation Measures and Potential Habitat Impacts for Special Status Species – Wildlife *(Continued)*

Actions Affecting SSS-Wildlife	Acreage Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Sagebrush	Total Area	0	241,450	97,976	0	63,082
	BLM-Administered Surface	0	146,598	58,418	0	44,510
Acres Managed toward DFC or DPC for Aspen	BLM-Administered Surface	DFC 2,822	DPC 2,822	DPC 1,411	DPC 706	DPC 2,822
Acres Managed toward DFC or DPC for Sagebrush	BLM-Administered Surface	DFC 630,183	DPC 630,183	DPC 315,902	DPC 157,546	DPC 630,183
Acres Managed toward DFC or DPC for Mountain Shrub	BLM-Administered Surface	DFC 46,779	DPC 46,779	DPC 23,390	DPC 11,695	DPC 46,779
Acres of Salt Cedar Eradication	BLM-Administered Surface	N/A	1,700	1,275	850	Inventory and develop a Plan
Livestock Movement from INPS Infested Areas	BLM-Administered Surface	0	72 hours	72 hours	0	72 hours
Acreage Managed for DPC: Miles of Lotic/Acres of Lentic Habitats	BLM-Administered Surface	PFC 350 /10,000	DPC 350 /10,000	DPC 175 /5,000	DPC 88 /2,500	DPC 350 /10,000
Incised Stream Miles/Lentic Habitat Restored	BLM-Administered Surface	N/A	108/90	75/47	33/43	33/43
Acres of Proposed Surface Water for Fish and Wildlife	BLM-Administered Surface	1,500	2,500	2,000	1,600	1,600
Stream Miles of Improved Floodplain Connectivity	BLM-Administered Surface	N/A	350	108	75	75

BLM Bureau of Land Management
CBC case-by-case
DFC Desired Future Condition
DPC Desired Plant Community
N/A Not Applicable
INPS invasive, nonnative plant species
PFC Proper Functioning Condition
SSS Special Status Species (Wildlife)

Alternative A restrictions on surface disturbance or occupancy and disruptive activities around occupied greater sage-grouse leks are anticipated to provide some benefit to greater sage-grouse during sensitive periods; however, these restrictions may be insufficient to maintain or improve greater sage-grouse populations over the long term. In the long term, projected surface-disturbing and disruptive activities; management of fire, INPS, and livestock grazing; and existing proactive management actions under Alternative A may adversely impact greater sage-grouse in the planning area.

Migratory Game Birds (Waterfowl)

Measurable impacts from surface-disturbing activities are not anticipated for migratory game birds (waterfowl) under Alternative A. Wildlife-disturbing activities, such as fire management, OHV use, and livestock grazing activities sometimes occur in or near water, wetland, and riparian area habitats favored by waterfowl and, therefore, may adversely impact this category of special status wildlife species, particularly during sensitive periods (e.g., nesting). For example, livestock and wildlife tend to congregate at water sources, resulting in trampling of nests and vegetation and soil compaction around wetland and riparian areas. Under Alternative A, fencing of streams on BLM-administered land to exclude livestock and wildlife are evaluated on a case-by-case basis.

The spread of INPS is anticipated to degrade migratory game bird habitats in the planning area by displacing native vegetation, increasing soil erosion, and diminishing overall habitat quality. Through

removal of vegetation, disturbance of soil, drought, and other factors (see the INPS section earlier in this chapter), INPS are anticipated to continue spreading in wetland and riparian areas in the planning area. Unabated, the continued spread of INPS is anticipated to degrade suitable habitats and may adversely impact migratory game birds.

No management actions are identified specifically for migratory game birds under Alternative A; however, these special status wildlife species are anticipated to be impacted (beneficially and adversely) by management actions and allowable uses included for other resources and resource uses. For example, under Alternative A, the BLM manages lotic and adjacent riparian habitats and lentic habitats toward PFC. The BLM does not construct any new fish and wildlife reservoirs, improve any stream floodplain connectivity, or restore incised streams under Alternative A. However, the BLM continues to manage an estimated 1,500 acres of water sources beneficial to waterfowl and to opportunistically pursue new water sources under Alternative A. The continued spread of INPS in the planning area could degrade these habitats.

Management of riparian habitats toward PFC and continued management of 1,500 acres of water sources within the planning area are anticipated to maintain current riparian and wetland habitats and migratory game bird conditions within the planning area. However, in the long term, the continued spread of INPS in the planning area is expected to degrade water, riparian, and wetland habitats and, therefore, may adversely impact migratory game birds in the planning area.

Nongame (Raptors)

Nongame raptors are anticipated to be impacted by surface-disturbing activities resulting from mineral development, fire management, INPS, OHV use, livestock grazing, and management actions for biological resources under Alternative A. The late winter, spring, and early summer periods, when courtship, nest construction, incubation, and early brooding periods occur, are considered more sensitive to disturbance because adult nongame raptors are more prone to abandon nests at these times (USFWS 2002a). Constructing road, powerlines, and other development facilities can contribute to loss and fragmentation of raptor habitats and ultimately impact diversity and abundance of raptor populations (USFWS 2002a).

Surface disturbance will have localized adverse impacts on raptor prey species by temporarily and permanently disturbing habitats for small mammals and birds. Under Alternative A, surface disturbance impacts to raptors are minimized by designated buffer zones around raptor nests. Development infrastructure will also impact raptors. For example utility poles can provide perching and nesting structures for raptors, but can also result in mortality to raptors through collision and electrocution (APLIC and USFWS 2005). Under Alternative A, the BLM determines the size of buffer zones around raptor (excluding bald eagles) nests on a case-by-case basis from February 1 through July 31, although buffers would typically be ¼- to ½-mile wide. Including bald eagle nests, the BLM protects 82,938 to 123,622 acres surrounding raptor nests under Alternative A.

Wind-energy facilities can be a source of mortality for raptors if raptors collide with wind tower blades. High mortality could result if wind towers are placed along a migration path or within nesting territories. Raptors, other birds, and bats sometimes collide with tall wind energy and utility infrastructures, including guy wires used for stabilization. Wind-energy facilities also could result in habitat loss and fragmentation, as well as human disturbance from construction and maintenance activities. Alternative A does not contain specific restrictions for developing wind energy or preventing habitat fragmentation in the planning area.

Bald eagles can be adversely impacted by disturbance or habitat changes at important winter roosts; however, Alternative A establishes NSO buffers around all bald eagle roosts. Within the Jackson Canyon ACEC, silvicultural practices continue to be implemented to achieve healthy-aged and structured stands for the benefit of bald eagle roosting. However, these stands would be removed from the commercial base. These management activities are expected to benefit the bald eagle by maintaining important roost sites.

Special status raptors are impacted by wildlife-disturbing activities that contribute to habitat loss, fragmentation, and degradation. Such actions include, but are not limited to, INPS control, OHV use, and livestock grazing. For example, the anticipated continued spread of INPS in the planning area is expected to degrade habitats for raptors and their prey over the long term. Fire is a useful tool for managing wildlife habitat; however, fire management under Alternative A is not specifically targeted to benefit raptors. Although improper livestock grazing can adversely impact habitats of raptors and their prey, Alternative A is anticipated to continue the upward trend of improving rangeland productivity and, therefore, not adversely impact raptors. Because special status raptors use a variety of habitats, general habitat impacts to raptors are similar to those discussed elsewhere in this section and in the vegetation sections and Fish and Wildlife Resources – Wildlife section. In the long term, the continued spread of INPS in the planning area, combined with the loss and fragmentation of raptor habitats by wind energy, mineral development, and associated infrastructure, are expected to degrade habitats important to raptors and their prey and, thus, may adversely impact these species over the life of the plan.

Nongame (Neotropical Migrants)

Many neotropical migrants breed and nest on BLM-administered lands and winter in the tropics (BLM 1992c). Although impacts to these species on their winter habitat are not subject to BLM management, impacts to breeding and nesting habitats from surface-disturbing activities, INPS control, fire management and ecology, and management actions for biological resources on BLM-administered lands are anticipated for neotropical migrants. Surface disturbance is anticipated to have localized adverse impacts to breeding and nesting habitats for neotropical migrants. Habitat impacts from surface disturbance may include temporary and permanent loss of breeding and nesting habitats due primarily to mineral development. Fragmentation and degradation of habitats for neotropical migrants also are anticipated from surface-disturbing activities and associated development. For example, neotropical migrants are expected to be adversely impacted by wind-energy facilities, as discussed for special status raptors.

Because of the diverse and numerous species within the neotropical migrant category, additional impact analysis organizes these species into the following habitat guilds:

- Forest and Woodland Species – Lewis's woodpecker
- Sagebrush and Shrubland Species – Brewer's sparrow, loggerhead shrike, sage sparrow, and sage thrasher
- Grassland Species – Baird's sparrow, long-billed curlew, and mountain plover
- Riparian and Wetland Species – yellow-billed cuckoo, willow flycatcher, white-faced ibis, trumpeter swan, American white pelican, black-crowned night heron, snowy egret, Caspian tern, Forster's tern, black tern, and Franklin's gull
- Platte River Species – Eskimo curlew, interior least tern, piping plover, and whooping crane

Forest and Woodland Species – The Lewis's woodpecker is the only special status neotropical migrant in this category. This species inhabits open ponderosa pine, juniper woodlands, and aspen communities, but

can also be found in cottonwood riparian habitats (see analysis for riparian and wetland species). Under Alternative A, forests are managed primarily for forest products and stand vigor. Bock et al. (1992) identified the Lewis's woodpecker as a species that responds positively to livestock grazing. In addition, Alternative A manages aspen and other woodland stands in the planning area to achieve DFC. In the long-term, actions and allowable uses implemented under Alternative A are not expected to adversely impact populations of forest and woodland neotropical migrants.

Sagebrush and Shrubland Species – Similar to greater sage-grouse, Brewer's sparrow, sage sparrow, and sage thrasher depend on sagebrush habitats. These species may use other shrubland types, particularly during the nonbreeding season. The loggerhead shrike uses more of a diversity of shrubland types, including sagebrush. Therefore, measures to protect greater sage-grouse as discussed under Game Birds (greater sage-grouse) would benefit all sagebrush and shrubland species. Adverse impacts to sagebrush habitats, as discussed for greater sage-grouse, adversely impact these species. On the other hand, sagebrush and shrubland species may benefit from management actions in mountain shrub communities. For example, Alternative A manages mountain shrub communities to achieve DFC. In the long term, actions and allowable uses implemented under Alternative A are expected to benefit forest and woodland neotropical migrants within buffer areas established for greater sage-grouse.

Grassland Species – Under Alternative A, there are no specific management actions for special status neotropical migrants that utilize grassland. These species would be impacted by actions in grassland habitats, such as surface-disturbing activities, INPS control, fire management, OHV use, and livestock and wildlife grazing. Under Alternative A, short- and long-term surface disturbance to grassland habitats on BLM-administered land in the planning area is expected. Another grassland species, mountain plover, is often found in association with prairie dog towns because they tend to prefer nesting areas with sparse vegetation cover. The long-billed curlew also nests in areas with sparse vegetation. Therefore, these species would also be impacted by management actions for black-tailed and white-tailed prairie dogs (see Nongame [Mammals] section).

Riparian and Wetland Species – Although there are no specific management actions for special status neotropical migrants that use riparian and wetlands, these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Riparian and wetland areas also provide late brood-rearing habitats for greater sage-grouse; breeding and migratory stopover habitats for sensitive songbirds, waterbirds, shorebirds, and waterfowl; and breeding, foraging, and wintering habitat for bald eagles. Management and potential impacts to riparian and wetland species under Alternative A are anticipated to be similar to those described for migratory game birds (waterfowl).

Platte River Species – Potential impacts to Platte River species would primarily result from water-depleting actions in the North Platte watershed. See the Special Status Species – Fish section for more discussion of water depletion and its impacts to Platte River species. Because Platte River species depend on Platte River habitats and because historical water depletions have impacted these species, projected water depletions from BLM actions in the North Platte watershed may adversely impact the Eskimo curlew, interior least tern, piping plover, and whooping crane.

Nongame (Mammals)

Impacts from surface-disturbing activities, INPS, fire management and ecology, and management actions for biological resources are anticipated for special status nongame mammals. Surface disturbance is anticipated to have localized adverse impacts to special status nongame mammal habitats including temporary and permanent loss of habitats. Fragmentation and degradation of habitat for special status nongame mammals also is anticipated from surface-disturbing activities and associated development.

It is important to note that some special status nongame mammal species, especially bats, may use more than one habitat type. However, because of the diverse and numerous species within the special status nongame mammal category, the impact analysis organizes these species into the following habitat guilds:

- Forest and Woodland Species – spotted bat, eastern red bat, hoary bat, and silver-haired bat
- Sagebrush and Shrubland Species – white-tailed prairie dog, big brown bat, pallid bat, olive-backed pocket mouse, silky pocket mouse, hispid pocket mouse, prairie vole, sagebrush vole, and plains pocket gopher
- Grassland Species – black-tailed prairie dog, black-footed ferret, and plains harvest mouse
- Riparian and Wetland Species – Preble's meadow jumping mouse
- Cave Species – Townsend's big-eared bat, long-eared myotis, fringed myotis, western small-footed myotis, little brown myotis, and long-legged myotis

Forest and Woodland Species – These species use forests, woodlands, and habitat edges for foraging and typically roost in snags and crevices under tree bark. No specific management actions for bats for any alternatives exist, nor have bat habitats been delineated in the planning area. In general, forest and woodland special status nongame mammal species occupy similar habitats as forest and woodlands special status nongame neotropical migrants and, thus, impacts to the two groups may be similar. Potential impacts from forest management and fire are anticipated to be the primary cause of impacts to forest and woodland species. Forest management under Alternative A focuses on timber management and stand vigor. In the long term, these actions are not expected to adversely impact populations of special status nongame mammals occupying forests and woodlands in the planning area.

Sagebrush and Shrubland Species – Similar to greater sage-grouse, special status nongame mammals in this category depend on sagebrush habitats or other shrubland types. Therefore, measures to protect greater sage-grouse as discussed under Game Birds (greater sage-grouse) are anticipated to benefit all sagebrush and shrubland species. Likewise, adverse impacts to sagebrush habitats, as discussed for greater sage-grouse, also would adversely impact these species. Sagebrush and shrubland mammal species also may benefit from management actions in mountain shrub communities. Under Alternative A, the BLM manages 46,779 acres of mountain shrub communities toward DFC. In the long-term, actions implemented under Alternative A are expected to benefit special status nongame mammals occupying sagebrush habitats within designated greater sage-grouse lek habitat buffers.

Grassland Species – These species are impacted by actions in grassland habitat, such as surface-disturbing activities, reclamation, INPS control, and livestock grazing. Under Alternative A, short- and long-term surface disturbance is expected for grassland habitats on BLM-administered land in the planning area. Seglund et al. (2004) suggest that livestock grazing has adversely impacted the range of the white-tailed prairie dog. Prairie dog control (i.e., poisoning or other APHIS-approved control methods) are allowed only when an adjacent landowner submits a written request and only where the distance to private land is less than ½ mile. Reductions in prairie dog populations may affect other grassland species associated with prairie dog towns, including mountain plover, burrowing owl, swift fox, and black-footed ferret. Because most suitable habitats for prairie dogs are located on private and state land in the planning area, measurable adverse impacts to prairie dog populations are not anticipated by BLM actions under Alternative A.

Riparian and Wetland Species – The Preble's meadow jumping mouse is the only species in this category. Management actions potentially impacting this species or its designated critical habitat are described in the Impacts Common to All Alternatives section.

Cave Species – Bats that use caves for roosting, maternity colonies, or hibernation could be impacted by surface-disturbing activities near caves, cliffs, or other rock features. Caves, cliffs, and rock outcrops are often found in steep terrain; the BLM limits surface-disturbing activities on slopes greater than 25 percent under Alternative A. Therefore, most cave habitats are expected to be protected under Alternative A; however, all special status bats could be adversely impacted by wind-energy facilities, as discussed for special status raptors.

Nongame (Amphibians)

The northern leopard frog is the only special status amphibian in the planning area. This species uses riparian and wetland habitats; therefore, impacts to the northern leopard frog are similar to those described for special status waterfowl using riparian and wetland habitats.

Alternative B

Game Birds (Greater Sage-Grouse)

Under Alternative B, estimated short- and long-term surface disturbances from BLM actions in the planning area are anticipated to result in less loss, degradation, and fragmentation of sagebrush habitats than under Alternative A. In addition, Alternative B includes specific management actions for protection from habitat fragmentation (including sagebrush habitats) on BLM-administered surface and federal mineral estate. Oil and gas and wind-energy development are precluded in areas protected from habitat fragmentation under Alternative B. Developing wind-energy facilities on BLM-administered land is restricted to outstanding/superb power classes (see Table 3-26) under Alternative B, thereby reducing the potential to fragmenting sagebrush habitats (Table 4-12). Two known greater sage-grouse leks occur on BLM-administered land in areas rated as outstanding/superb wind-energy power classes (see Table 3-26).

Reclamation of surface disturbance under Alternative B includes requirements for completion within one growing season; topsoil salvage and segregation; seeding with native, certified weed-free native species' seed; and temporary protective surface treatment. Although surface disturbance results in short-term habitat loss and damage, the reclamation requirements of Alternative B help maintain long-term habitat quality in all habitat types, including sagebrush. Overall, because surface disturbance and habitat loss, degradation, and fragmentation are less under Alternative B than under Alternative A, the associated adverse impacts to greater sage-grouse habitats also are expected to be less.

Alternative B restores a natural fire regime in the planning area and uses prescribed fire to achieve measurable landscape-level objectives. In addition, Alternative B does not allow heavy equipment around leks, thereby minimizing impacts to habitat quality. Use of a natural fire regime in fire-adapted ecosystems and reduction in fuel loads in the planning area may reduce the potential for catastrophic fire, potentially impacting greater sage-grouse nesting habitats adversely. Therefore, Alternative B is anticipated to benefit greater sage-grouse.

Alternative B seeks to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing comprehensive weed management plans throughout the planning area. In addition, livestock could be held for 72 hours prior to moving onto and within public lands to control the spread of INPS. These management actions are anticipated to control the spread of INPS more effectively compared to Alternative A. Greater control of INPS under Alternative B is anticipated to protect sagebrush habitats and, therefore, benefit greater sage-grouse more than under Alternative A.

OHV use under Alternative B is more restrictive compared to Alternative A and the most restrictive compared to other Action Alternatives (see Appendix M). Restrictions to OHV use under Alternative B

are anticipated to result in fewer potential impacts (wildlife disturbing) to the greater sage-grouse compared to Alternative A.

Under Alternative B, the BLM monitors all grazing allotments annually. In addition, Alternative B limits forage utilization to 40 percent of current growing-season production. The restrictions to forage utilization and complete monitoring of all allotments under Alternative B are anticipated to benefit greater sage-grouse by increasing the quantity and quality of herbaceous plant species.

Under Alternative B, the BLM manages the sagebrush habitats it administers to achieve DPC. To minimize impacts to sagebrush habitats and greater sage-grouse, Alternative B requires greater avoidance of surface disturbance or occupancy to protect associated nesting and early brood-rearing habitats compared to Alternative A. Specifically, Alternative B requires larger buffers around leks (½-mile NSO restriction) and nesting and early brood-rearing habitats (4-mile TLS) on BLM-administered surface and federal mineral estate compared to Alternative A. The larger buffer is similar to the recommendations by Braun (2002). Alternative B protects greater sage-grouse winter habitats during similar timeframes as Alternative A; however, Alternative B implements an additional goal within the Bates Hole and Fish Creek/Willow Creek areas to avoid surface disturbance in sagebrush stands that provide winter habitats, particularly those areas with greater than 20 percent canopy cover. Alternative B establishes the Bates Hole MA with an emphasis on greater sage-grouse and watershed values. Within the boundaries of the Bates Hole MA, the protective buffers for lek (¾-mile NSO restriction) and greater sage grouse nesting (4-mile NSO restriction) are even more restrictive than those areas outside the MA boundary.

In the long term, the larger protective buffers restricting surface disturbance or occupancy around greater sage-grouse leks, combined with the proactive management actions establishing the Bates Hole MA, are anticipated to protect sagebrush habitats. Under Alternative B, these restrictions and proactive management actions could benefit greater sage-grouse to a greater extent than under Alternative A.

Migratory Game Birds (Waterfowl)

Measurable impacts from surface-disturbing activities, fire management, OHV use, INPS control, and livestock grazing activities under Alternative B are anticipated to adversely impact migratory game birds the least of all alternatives. Under Alternative B, all existing wells and multiuse reservoirs are fenced on BLM-administered land. Moreover, Alternative B requires a CSU restriction from 500 feet to ¼ mile of all perennial streams, wetlands, riparian areas, and water bodies. Alternative B also institutes a comprehensive management approach for controlling INPS and targets eradication of 1,700 acres of salt cedar, a species often occurring in wetland and riparian areas. Overall, Alternative B's restrictions and proactive management actions are anticipated to protect and enhance water, wetland, and riparian habitats to the waterfowls' benefit.

Alternative B continues to manage the Table Mountain, Springer/Bump-Sullivan, and Rawhide areas in accordance to WGFD WMA plans; however, a protective withdrawal would be established under Alternative B segregating 2,201 acres from operation of the public land laws, including mining laws. Alternative B manages the same amount of riparian as Alternative A, but under DPC instead of PFC. Alternative B also constructs the most new fish habitats and wildlife reservoirs (1,000 acres), improves floodplain connectivity along the 350 stream miles, and restores 108 miles of incised streams. The withdrawals, new reservoirs, habitat restoration, and management toward DPC are anticipated to protect, enhance, and restore waterfowl habitats and, thus, benefit waterfowl more than under Alternative A.

Nongame (Raptors)

Surface-disturbing activities, fire management, INPS control, OHV use, livestock grazing, and management actions for biological resources are anticipated to impact raptors less under Alternative B

than under Alternative A. Compared to Alternative A, restrictions around raptor nests are more extensive in time and area under Alternative B; therefore, resulting in fewer direct impacts to nesting raptors. Buffers around all raptor nests would be ½-mile wide, except restrictions around ferruginous hawk nests would apply within 1 mile. Including bald eagle nests (see Impacts Common to All Alternatives), Alternative B protects more BLM-administered surface surrounding raptor nests compared to Alternative A.

The development of wind-energy facilities on BLM-administered land is restricted to outstanding/superb power classes (see Table 3-26) under Alternative B, thereby reducing the potential to fragment sagebrush habitats compared to Alternative A. Approximately 21 raptor nests and 4 bald eagle roosts occur on BLM-administered land rated as outstanding/superb power classes. Overall, the restrictions to wind-energy development, surface-disturbing activities, fire suppression, livestock grazing, OHV use, and INPS control under Alternative B are anticipated to protect more raptor habitats compared to Alternative A.

Alternative B is anticipated to continue the trend of improving rangeland productivity and slowing the spread of INPS more than Alternative A. These actions and increased restrictions on OHV use in the planning area are anticipated to protect and enhance more raptor habitats compared to Alternative A.

Nongame (Neotropical Migrants)

Under Alternative B, short- and long-term surface disturbances are anticipated to be less; therefore, associated adverse impacts to breeding and nesting habitats for neotropical migrants are anticipated to be less compared to Alternative A. Impacts to neotropical migrants from wind-energy development also are anticipated to be less under Alternative B than under Alternative A, due to limiting wind-energy development to outstanding/superb power classes (see Table 3-26).

Because of the diverse and numerous species within the neotropical migrant category, the impact analysis organizes these species into the following habitat guilds.

Forest and Woodland Species – Compared to Alternative A, specific management actions under Alternative B are aimed at maintaining open forest and woodlands stands to benefit wildlife. Management actions that promote open, old-growth characteristics benefit the Lewis's woodpecker. For example, ponderosa pine stands are managed for old growth (including snags) in Little Red Creek, Esterbrook, and Jackson Canyon under Alternative B. Relative to Alternative A, Alternative B places increased importance on the value of aspen communities by managing these communities toward DPC.

Sagebrush and Shrubland Species – Measures to protect and reduce potentially adverse impacts to greater sage-grouse, as discussed under Game Birds (greater sage-grouse), benefit special status sagebrush and shrubland species. Sagebrush and shrubland species also may benefit from management actions in mountain shrub communities. Relative to Alternative A, Alternative B places an increased importance on mountain shrub communities by managing toward DPC.

Grassland Species – Although no specific management actions are identified under Alternative B for special status neotropical migrants utilizing grasslands, these species benefit by management actions treating woodland encroachment into grassland habitats where it is detrimental to grassland species. Grassland special status neotropical migrant species are impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Under Alternative B, less grassland habitat is expected to be impacted by BLM actions compared to Alternative A. Moreover, management actions under Alternative B are anticipated to protect more grassland and other vegetation types from habitat fragmentation compared to Alternative A. The mountain plover and

long-billed curlew nest in areas with sparse vegetation and are anticipated to be impacted by management actions for black-tailed and white-tailed prairie dogs (see Nongame [Mammals]).

Riparian and Wetland Species – Although no specific management actions for special status neotropical migrants utilizing riparian and wetlands are identified under Alternative B, these species are expected to be impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Riparian and wetland areas provide late brood-rearing habitats for greater sage-grouse; breeding and migratory stopover habitats for sensitive songbirds, waterbirds, shorebirds, and waterfowl; and breeding, foraging, and wintering habitats for bald eagles. Management and potential impacts to riparian and wetland species under Alternative B are anticipated to be similar to those described for migratory game birds (waterfowl) but less than under Alternative A.

Under Alternative B, managing livestock grazing and wetland and riparian areas could include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting to pasture boundaries and season of use. Furthermore, Alternative B does not allow surface-disturbing activities and heavy equipment on wet soils. These actions would ultimately result in a riparian system with increased vegetation and structural diversity, leading to an increase in abundance and diversity of neotropical migrants.

Platte River Species – Construction of reservoirs, pits, springs, and wells are anticipated to deplete the most water annually under Alternative B compared to other alternatives. See the Special Status Species – Fish, Table 4-10, for Platte River depletion calculations. Because Platte River species depend on Platte River habitats and because historical water depletions have impacted these species, projected water depletions from BLM actions in the North Platte watershed may adversely impact the Eskimo curlew, interior least tern, piping plover, and whooping crane.

Overall, the management of habitats toward DPC, restrictions on wind-energy development, less surface disturbance, and managing INPS control, OHV use, and livestock grazing under Alternative B are anticipated to protect and enhance more habitats and, thus, benefit special status neotropical migrants within the planning area more than Alternative A. Conversely, potential adverse impacts to the Platte River species downstream of the planning area are anticipated to be the most under Alternative B, primarily due to the highest predicted annual average water depletion.

Nongame (Mammals)

Impacts from surface-disturbing activities, INPS control, fire management and ecology, OHV use, livestock grazing, and management actions for biological resources under Alternative B are anticipated to be less for special status nongame mammals compared to Alternative A.

Forest and Woodland Species – In general, forest and woodland special status nongame mammal species occupy similar habitats as forest and woodland special status nongame neotropical migrants and, thus, impacts to the two groups may be similar. Forest management under Alternative B emphasizes watershed stability, wildlife habitats, and recreation, and would try to maximize opportunities to improve forest diversity, species vitality, and genetic diversity. Compared to Alternative A, forest management under Alternative B is anticipated to protect and enhance more forest and woodland habitats to benefit special status nongame mammals.

Sagebrush and Shrubland Species – Sagebrush and shrubland special status nongame mammal species are anticipated to benefit from management actions in sagebrush and mountain shrub communities. Alternative B manages more sagebrush and more mountain shrub communities toward DPC than Alternative A, thereby providing a greater benefit to special status nongame mammals compared to

Alternative A. Potential impacts to white-tailed prairie dogs are similar to those for black-tailed prairie dogs described under Grassland Species, below.

Grassland Species – Similar to Alternative A, grassland species are impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, fire management, and livestock and wildlife grazing. However, under Alternative B, less grassland habitats are impacted by short- and long-term surface disturbances compared to Alternative A. Less surface disturbance and less habitat fragmentation under Alternative B are anticipated to benefit special status nongame mammal species more than under Alternative A.

Alternative B designates a black-tailed prairie dog ACEC on approximately 22,937 acres (3,103 and 14,846 acres, respectively, on BLM-administered surface and federal mineral estate). The goal of this ACEC is to ensure a long-term, self-sustaining population of prairie dogs in the planning area. Furthermore, under Alternative B, shooting prairie dogs is not permitted on all public surface lands within the planning area. Prairie dog control is not allowed, except for human health and safety reasons. Alternative B manages 145,641 acres of public land for potential reintroduction of black-footed ferrets, which would also benefit other special status grassland species. The associated potential increases in prairie dog populations under Alternative B are anticipated to benefit species associated with prairie dog towns, including mountain plover, burrowing owl, swift fox, and black-footed ferret, more so than under Alternative A.

Riparian and Wetland Species – The Preble's meadow jumping mouse is the only species in this category. Management actions that could affect this species or designated critical habitat for this species are described in the Impacts Common to All Alternatives section.

Cave Species – Bats using caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. Caves, cliffs, and rock outcrops are often found in steep terrain; the BLM limits surface-disturbing activities on slopes greater than 25 percent under Alternative B. Therefore, most cave habitats are expected to be protected under Alternative B; however, all special status bats could be adversely impacted by wind-energy facilities, as discussed for special status raptors.

Nongame (Amphibians)

Potential impacts to the northern leopard frog are commensurate with impacts to riparian and wetland habitats. The impacts under Alternative B are anticipated to be similar to those described for special status neotropical migrants that use riparian and wetland habitats and less than under Alternative A.

Alternative C

Game Birds (Greater Sage-Grouse)

Estimated short- and long-term surface disturbances from BLM actions under Alternative C are approximately 3- and 4-percent less, respectively, compared to Alternative A (Table 4-11). Disturbance to sagebrush habitats is also anticipated to be less compared to Alternative A. To avoid or minimize the impacts of habitat fragmentation, Alternative C protects 8 blocks of land from habitat fragmentation, substantially more than Alternative A (Table 4-12). Developing wind-energy facilities on BLM-administered surface would be allowed on outstanding/superb and good/excellent power classes (see Table 3-26) under Alternative C, on less acreage than under Alternative A, however. Nineteen greater sage-grouse leks are known to occur on BLM-administered land designated within these power classes. Greater sage-grouse lek and nesting and earlybrood-rearing buffers apply.

Reclamation requirements under Alternative C are more restrictive than Alternative A, including a three growing-season timeframe, limited topsoil salvage, certified weed-free seeding, and temporary protective surface treatment requirements. Overall, because surface disturbance and habitat loss, degradation, and fragmentation are less under Alternative C compared to Alternative A, the associated adverse impacts to greater sage-grouse also are expected to be less.

Alternative C restores a natural fire regime to fire-adapted ecosystems in the planning area and utilizes prescribed fire to achieve measurable landscape-level objectives. In addition, Alternative C does not allow heavy equipment around leks, thereby minimizing impacts to habitat quality. Embracing a natural fire regime in fire-adapted ecosystems and managing fuel loads under Alternative C are anticipated to lower the risk of catastrophic fire, which could adversely impact greater sage-grouse nesting habitats more than under Alternative A.

Alternative C seeks to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing a comprehensive weed management plan. In addition, the BLM's authorized officer could require a 72-hour holding period for livestock prior to movement onto or within public lands under Alternative C. Developing and implementing a weed management plan is anticipated to slow the spread of INPS in the planning area, thereby benefiting greater sage-grouse habitats to a greater extent than Alternative A.

OHV use under Alternative C is more restrictive compared to Alternative A. Restrictions to OHV use under Alternative C are anticipated to result in fewer potential impacts (human disturbance and habitat degradation) to greater sage-grouse compared to Alternative A.

Under Alternative C, the BLM manages livestock grazing to maintain a protective cover of vegetation and litter with emphasis on the condition of allotments with substantial acreage of highly erosive soils and high priority allotments (categories I and M, see Glossary). Additional litter in sagebrush habitats under Alternative C is expected to provide greater benefits to greater sage-grouse compared to Alternative A.

Under Alternative C, the BLM manages 315,902 acres of sagebrush habitats toward DPC and the same acreage toward DFC, thereby improving sagebrush habitats compared to Alternative A. Alternative C protects lek habitats more compared to Alternative A, but less than Alternative B. Alternative C protects the same amount of nesting and early brood-rearing habitats on BLM-administered surface and federal mineral estate as Alternative A. Similar to Alternative A, greater sage-grouse winter habitats are protected from surface disturbance and disruptive activities from November 15 to March 14. However, Alternative C avoids surface disturbance in sagebrush stands in the Bates Hole and Fish Creek/Willow Creek areas that provide winter habitats, particularly those areas with greater than 20-percent canopy cover. No additional special designations or other MAs are established under Alternative C for greater sage-grouse.

Restrictions on surface disturbance or occupancy proposed by Alternative C are anticipated to benefit greater sage-grouse during the sensitive nesting and wintering periods and in sensitive habitats, such as leks. Under Alternative C, less proposed surface disturbance, more protected lek buffer acreage, more acreage protected from habitat fragmentation, and generally more restrictive management actions regarding surface disturbance, reclamation, and resource uses within the planning area are expected to have less adverse and more beneficial impacts to greater sage-grouse compared to Alternative A.

Migratory Game Birds (Waterfowl)

Impacts from surface-disturbing activities, OHV use, INPS control, and livestock grazing activities could adversely impact special status waterfowl less under Alternative C than under Alternative A. Under Alternative C, all existing wells and multiuse reservoirs constructed after 1995 are fenced on BLM-

administered land. Moreover, Alternative C requires a CSU restriction from 500 feet to ¼ mile of all Class 1 (see Glossary), perennial streams, wetlands, riparian areas, and water bodies. Alternative C identifies more salt cedar acres for eradication compared to Alternative A. Salt cedar often occurs in wetland and riparian areas used by special status waterfowl. Overall, Alternative C's restrictions and proactive management actions could protect and enhance water, wetland, and riparian habitats to the benefit of special status waterfowl to a greater extent compared to Alternative A.

Alternative C continues the Table Mountain, Springer/Bump-Sullivan, and Rawhide HMPs as described for Alternative A; however, these lands are disposed to the WGFD within 5 years. Alternative C manages more lotic and adjacent riparian habitats and more lentic habitats toward DPC compared to Alternative A. Alternative C also constructs more new fish and wildlife reservoirs, improves floodplain connectivity on more stream miles, and restores more miles of incised streams compared to Alternative A. The new reservoirs, habitat restoration, and management toward DPC under Alternative C are all anticipated to protect, enhance, and restore waterfowl habitats and, thus, benefit special status waterfowl more than under Alternative A.

Nongame (Raptors)

Surface-disturbing activities, fire management, INPS control, OHV use, livestock grazing, and management actions for biological resources are anticipated to impact special status raptors less under Alternative C than under Alternative A. Compared to Alternative A, restrictions around raptor nests would be more extensive, thereby benefiting nesting special status raptors more under Alternative C.

The development of wind-energy facilities on BLM-administered land is restricted to outstanding/superb and good/excellent power classes (see Table 3-26) under Alternative C, thereby reducing the potential of fragmenting sagebrush habitats compared to Alternative A. Approximately 461 raptor nests and 13 bald eagle roosts are known to occur on BLM-administered land within the power classes open to wind-energy development under Alternative C. Without proper siting, Alternative C could adversely impact special status raptors species similar to Alternative A. The restrictions to surface-disturbing activities, fire suppression, livestock grazing, OHV use, and INPS control under Alternative C are anticipated to protect more special status raptor habitats compared to Alternative A.

All bald eagle roosts are protected by buffers, as discussed under Impacts Common to All Alternatives. To further protect bald eagle roosts, no heavy equipment and no tree cutting is allowed around roosts during fire suppression under Alternative C. In the Jackson Canyon ACEC, forest-management activities and prescribed burning are allowed to meet bald eagle management objectives, but would be limited to existing roads and trails and not occur during the roosting period under Alternative C.

Alternative C is anticipated to continue the upward trend of improving rangeland productivity, slow the spread of INPS, and increase restrictions on OHV use in the planning area more so than compared to Alternative A. These actions could protect and enhance more special status raptor habitats under Alternative C compared to Alternative A.

Nongame (Neotropical Migrants)

Under Alternative C, short- and long-term surface disturbances are anticipated to be less; therefore, associated adverse impacts to breeding and nesting habitats for special status neotropical migrants are anticipated to be less compared to Alternative A. Because wind-energy development is limited compared to Alternative A, impacts to special status neotropical migrants from wind-energy development under Alternative C are anticipated to be less.

Because of the diverse and numerous species within the neotropical migrant category, the impact analysis organizes these species into the following habitat guilds.

Forest and Woodland Species – Under Alternative C, no specific management actions aimed at maintaining open forest and woodlands stands to benefit wildlife; rather, the goal is to maintain sustainable flow of wood products. Selected wildlife snags are retained in Little Red Creek, Jackson Canyon, and Esterbrook. Relative to Alternative A, Alternative C places increased importance on the value of aspen communities by managing aspen toward DPC. Overall, there are few management actions that would specifically benefit the Lewis's woodpecker.

Sagebrush and Shrubland Species – Measures to protect and reduce potential adverse impacts to greater sage-grouse, as discussed under Game Birds (greater sage-grouse), will benefit all sagebrush and shrubland species. Sagebrush and shrubland species also may benefit from management actions in mountain shrub communities. Relative to Alternative A, Alternative C places an increased importance on mountain shrub communities by managing toward DPC.

Grassland Species – Although no specific management actions for special status neotropical migrants that utilize grasslands are identified under Alternative C, these species are expected to benefit by management actions that treat woodland encroachment into grassland habitats where it is detrimental to grassland species. Grassland special status neotropical migrant species are expected to be impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock grazing. Alternative C impacts less and protects more grassland habitats from fragmentation compared to Alternative A. The mountain plover is often found in association with prairie dog towns. The mountain plover tends to prefer nesting areas with sparse vegetation cover. The long-billed curlew also nests in areas with sparse vegetation. Therefore, these species are also impacted by management actions for black-tailed and white-tailed prairie dogs (discussed under Nongame [Mammals]) under Alternative C.

Riparian and Wetland Species – Although no specific management actions for special status neotropical migrants utilizing riparian areas and wetlands are identified under Alternative C, these species are expected to be impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Compared to Alternative A, Alternative C manages more lotic and adjacent riparian habitat and lentic habitat toward DPC; develops more reservoirs of surface water, possibly increasing habitats for special status neotropical migrants; improves more habitat and water quality; improves floodplain connectivity and function on more miles of stream; and restores more miles of incised streams. Management of and potential impacts to riparian and wetland species under Alternative C are anticipated to benefit migratory game birds (waterfowl) more than under Alternative A.

Under Alternative C, management of livestock grazing could include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting to pasture boundaries and season of use. These actions apply only to streams on BLM-administered lands rated as nonfunctional or functional at-risk. Furthermore, Alternative C does not allow surface-disturbing activities and heavy equipment on wet soils. These actions are anticipated to ultimately result in a riparian system with improved vegetation and structural diversity, leading to a potential increase in abundance and diversity of special status neotropical migrants.

Platte River Species – Construction of reservoirs, pits, springs, and wells are anticipated to deplete approximately 1,054 acre-feet of water annually under Alternative C, more than under Alternative A. See the Special Status Species – Fish, Table 4-10, for Platte River depletion calculations. Because Platte River species depend on Platte River habitat and because historical water depletions have impacted these species, projected water depletions from BLM actions in the North Platte watershed may adversely impact the Eskimo curlew, interior least tern, piping plover, and whooping crane.

Overall, the management of habitats toward DPC, less surface disturbance, and management of INPS, OHV use, and livestock grazing under Alternative C are anticipated to protect and enhance more habitats and, thus, benefit special status neotropical migrants within the planning area more compared to Alternative A. Conversely, potential impacts to the Platte River neotropical migrants, downstream of the planning area, are anticipated to be higher under Alternative C compared to Alternative A, primarily due to higher predicted annual average water depletion.

Nongame (Mammals)

Impacts from surface-disturbing activities, INPS control, fire management and ecology, OHV use, livestock grazing, and management actions for biological resources are anticipated to be less under Alternative C for special status nongame mammals compared to Alternative A, but more than predicted under Alternative B.

Forest and Woodland Species – In general, forest and woodland special status nongame mammal species occupy similar habitats as forest and woodland special status nongame neotropical migrants and, thus, impacts to the two groups are anticipated to be similar. Forest management under Alternative C emphasizes a sustainable flow of wood products. Management of aspen communities toward DPC under Alternative C is expected to benefit special status nongame mammals occupying this habitat more so than compared to Alternative A; otherwise, anticipated impacts and benefits to forest and woodland nongame mammal species are expected to be similar to Alternative A.

Sagebrush and Shrubland Species – Sagebrush and shrubland special status mammal species are anticipated to benefit from management actions in sagebrush and mountain shrub communities. Alternative C manages more sagebrush and mountain shrub communities toward DPC compared to Alternative A, thereby providing a greater benefit to nongame mammals compared to Alternative A. Potential impacts to white-tailed prairie dogs are similar to those for black-tailed prairie dogs described under Grassland Species, below.

Grassland Species – Similar to Alternative A, grassland species are impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, fire, and livestock and wildlife grazing. Alternative C disturbs a similar amount of grassland habitats compared to Alternative A; however, habitat fragmentation is less under Alternative C compared to Alternative A. Less surface disturbance and less habitat fragmentation under Alternative C are anticipated to benefit special status grassland species more than Alternative A.

Alternative C designates a black-tailed prairie dog ACEC, similar to and the same size as described for Alternative B. Under Alternative C, prairie dogs could be shot on public surface lands, beginning after pups have weaned (approximately July 1) and ending October 31. Prairie dog control is not allowed except for human health and safety reasons. Therefore, designation of a black-tailed prairie dog ACEC and the potential for an increase in prairie dog populations due to these actions would benefit species associated with prairie dog towns, including mountain plover, burrowing owl, swift fox, and black-footed ferret more than Alternative A. Under Alternative C, the BLM manages 145,641 acres of public land for potential reintroduction of black-footed ferrets, which would also benefit other special status grassland species.

Riparian and Wetland Species – The Preble's meadow jumping mouse is the only species in this category. Management actions potentially impacting this species or its critical habitats are described in the Impacts Common to All Alternatives section.

Cave Species – Bats using caves for roosting, maternity colonies, or hibernation could be impacted by surface-disturbing activities near caves, cliffs, or other rock features. Approximately 9,663 acres of

identified "rock outcrops/badlands" exist on BLM-administered land, which could contain potential bat habitats. Caves, cliffs, and rock outcrops are often found in relatively steep terrain. Under Alternative C, the BLM limits surface-disturbing activities on slopes greater than 25 percent. Therefore, cave habitats are expected to be protected. Potential adverse impacts to special status bats from wind-energy facilities are anticipated to be less under Alternative C than under Alternative A.

Nongame (Amphibians)

The northern leopard frog is the only special status amphibian in the planning area. This species uses riparian and wetland habitats; therefore, impacts to the northern leopard frog are similar to those described for special status neotropical migrants that use riparian and wetland habitats and less compared to Alternative A.

Alternative D

Game Birds (Greater Sage-Grouse)

Estimated short- and long-term surface disturbances and disturbance to sagebrush habitats from BLM actions in the planning area under Alternative D are the highest of all alternatives (Table 4-11 and Table 4-12). Similar to Alternative A, Alternative D does not propose to avoid or minimize the impacts of habitat fragmentation by protecting blocks of contiguous native habitats. The area open to development of wind-energy facilities is less under Alternative D than under Alternative A; however, Alternative D encourages wind-energy development.

Reclamation requirements under Alternative D are similar to Alternative A, including no temporary protective surface treatment, no topsoil segregation, and no certified weed-free seeding; however, a five growing-season timeframe is required under Alternative D.

Alternative D uses full suppression strategies across the entire planning area and, therefore, is expected to contribute to fuel loading and increase the potential for catastrophic fire in sagebrush. In addition, full suppression tactics across the planning area are anticipated to increase the spread of INPS. Together, these actions are anticipated to adversely impact habitats used by greater sage-grouse in the long term.

Similar to Alternative A, Alternative D does not seek to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing a comprehensive weed management plan. Likewise, Alternative D does not require a 72-hour holding period for livestock prior to movement onto or within public lands. Similar to Alternative A, the spread of INPS under Alternative D is expected to continue, as is the degradation of habitats that INPS invade, including sagebrush.

OHV use under Alternative D is similar to Alternative A. The lack of restrictions to OHV use under Alternative D are anticipated to result in similar potential impacts (i.e., human disturbance and habitat degradation) to greater sage-grouse as under Alternative A.

Under Alternative D, no additional restrictions are placed on livestock grazing in the planning area. Although rangeland productivity is improving in the planning area, Alternative D may not provide sufficient litter and monitoring to ensure a similar improvement in greater sage-grouse nesting habitats. Therefore, livestock grazing under Alternative D is anticipated to have similar impacts to greater sage-grouse habitats as those described for Alternative A.

Under Alternative D, the BLM manages 157,546 acres of sagebrush habitats to achieve DPC; remaining sagebrush habitats are managed toward DFC. Management of sagebrush toward DPC requirements is assumed to provide greater benefits to greater sage-grouse compared to DFC management under

Alternative A. Alternative D protects the same buffer acreage for greater sage-grouse leks and early brood-rearing habitats as Alternative A. Greater sage-grouse winter habitats are protected similar to the way they are in Alternative A. No additional special designations or MAs occur under Alternative D for greater sage-grouse.

Alternative D results in similar surface disturbance, protected lek buffer acreage, no acreage protected from habitat fragmentation, and generally similar restrictive management actions regarding surface disturbance, reclamation, and resource uses as described for Alternative A. Overall, because surface disturbance and habitat loss, degradation, and fragmentation are similar to Alternative A, impacts to greater sage-grouse also are expected to be similar to Alternative A.

Migratory Game Birds (Waterfowl)

Measurable impacts from surface-disturbing activities, fire management, OHV use, INPS control, and livestock grazing activities under Alternative D are anticipated to adversely impact waterfowl to a similar extent as that compared to Alternative A. Under Alternative D, all new wells and multiuse reservoirs constructed after 1995 are fenced on BLM-administered land. Moreover, Alternative D requires an NSO restriction within 500 feet of perennial streams, wetlands, riparian areas, and water bodies and a CSU restriction from 500 feet to ¼ mile. Alternative D identifies more salt cedar acres for eradication compared to Alternative A. Overall, Alternative D's restrictions and proactive management actions are anticipated to protect and enhance water, wetland, and riparian habitat to a greater benefit for special status waterfowl than Alternative A.

Alternative D continues the Table Mountain, Springer/Bump-Sullivan, and Rawhide HMPs, as described for Alternative A; however, these lands would be disposed to the WGFD within 5 years. Alternative D manages more miles of lotic and adjacent riparian habitats and more acres of lentic habitat toward DPC compared to Alternative A. Alternative D constructs more new fish and wildlife reservoirs, improves floodplain connectivity on more stream miles, and restores more miles of incised streams compared to Alternative A. The new reservoirs, habitat restoration, and management toward DPC are all anticipated to protect, enhance, and restore special status waterfowl habitat and, thus, benefit special status waterfowl more compared to Alternative A.

Nongame (Raptors)

Surface-disturbing activities, fire management, INPS control, OHV use, livestock grazing, and management actions for biological resources are anticipated to impact special status raptors to a similar extent compared to Alternative A. Restrictions around raptor nests are more extensive under Alternative D, therefore benefiting nesting special status raptors more than under Alternative A.

The development of wind-energy facilities on all BLM-administered land is encouraged under Alternative D, but restricted to power classes 4 through 7 (see Table 3-26) and acreage as described for Alternative C. Without proper siting, Alternative D could adversely impact special status raptors similar to Alternative A. Because acreage is restricted, adverse impacts are expected to be less under Alternative D compared to Alternative A. The area open to wind-energy development under Alternative D is more than alternatives C and E due to the lack of protection for habitat fragmentation, but less than under Alternative A.

All bald eagle roosts are protected by buffers as discussed under Impacts Common to All Alternatives. Full fire-suppression tactics are used across the planning area under Alternative D and are expected to adversely impact bald eagle roost areas more than under Alternative A. In the Jackson Canyon ACEC, prescribed burning is allowed to meet bald eagle management objectives. Forest management activities

are allowed to meet bald eagle management objectives. Overall, impacts of these actions to bald eagles are anticipated to be similar to Alternative A.

Alternative D is anticipated to protect more raptor habitats through buffers, thereby providing greater benefit to special status raptors compared to Alternative A; however, management actions for INPS control, OHV use, and fire management under Alternative D are anticipated to result in similar special status raptor habitat quality impacts as under Alternative A.

Nongame (Neotropical Migrants)

Under Alternative D, short- and long-term surface disturbances are anticipated to be similar to Alternative A; therefore, associated adverse impacts to breeding and nesting habitats for neotropical migrants are anticipated to be similar to Alternative A. Wind-energy development is encouraged under Alternative D in power classes 4 through 7 (see Table 3-26); however, the area open to wind-energy development is less compared to Alternative A. Alternative D does not identify contiguous blocks of habitats for protection from habitat fragmentation, similar to Alternative A. Potential impacts to special status neotropical migrants from habitat fragmentation under Alternative D are, therefore, anticipated to be similar to Alternative A.

Because of the diverse and numerous species within the special status neotropical migrant category, the impact analysis organizes these species into the following habitat guilds.

Forest and Woodland Species – Under Alternative D, no specific management actions aimed at maintaining open forest and woodlands stand to benefit wildlife; rather, the goal is to achieve maximum wood growth and flow of wood products. Relative to Alternative A, Alternative D places increased importance on the value of aspen communities by managing toward DPC. Overall, forest management under Alternative D could adversely impact the Lewis's woodpecker by maintaining younger and denser stands of trees.

Sagebrush and Shrubland Species – Measures to protect and reduce potential adverse impacts to greater sage-grouse, as discussed under Game Birds (greater sage-grouse), benefit all sagebrush and shrubland species. Sagebrush and shrubland species also may benefit from management actions in mountain shrub communities. Alternative D places an increased importance on mountain shrub communities relative to Alternative A by managing toward DPC.

Grassland Species – Under Alternative D, no specific management actions for special status neotropical migrants that utilize grassland exist. These species would be impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Under Alternative D, short- and long-term surface disturbances in grassland habitats is similar compared to Alternative A. Also similar to Alternative A, Alternative D does not manage to protect habitat fragmentation, which could adversely impact grassland habitats and special status grassland species. The mountain plover is often found in association with prairie dog towns. The mountain plover tends to prefer nesting areas with only sparse vegetation cover. The long-billed curlew also nests in areas with sparse vegetation. Therefore, these species could also be impacted by management actions for black-tailed and white-tailed prairie dogs (described under Nongame [Mammals]).

Riparian and Wetland Species – Although no specific management actions for special status neotropical migrants using riparian and wetland habitats are identified under Alternative D, these species are expected to benefit from other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. Under Alternative D, the BLM manages more lotic and adjacent riparian habitats and lentic habitats toward DPC, develops more fish and wildlife reservoirs, improves floodplain connectivity on more miles of stream, and restores more miles of incised streams compared to Alternative

A. Therefore, potential impacts to riparian and wetland species under Alternative D are anticipated to be less compared to Alternative A for special status migratory game birds (waterfowl).

Livestock and wildlife tend to congregate at water sources, resulting in damage to riparian habitats. Similar to Alternative A, fencing of streams on BLM-administered land is evaluated on a case-by-case basis under Alternative D.

Platte River Species – Construction of reservoirs, pits, springs, and wells are anticipated to deplete approximately 272 acre-feet of water annually under Alternative D, more than under Alternative A. See the Special Status Species – Fish section for more discussion of water depletion and impacts to Platte River species. Alternative C is anticipated to produce approximately 69 CBNG wells within the North Platte watershed; however, the contribution of produced water from these wells is expected to be negligible compared to projected water depletions. Because Platte River species depend on Platte River habitats and because historical water depletions have impacted these species, projected water depletions from BLM actions in the North Platte watershed may adversely impact the Eskimo curlew, interior least tern, piping plover, and whooping crane.

Overall, the management of habitats toward DPC, the amount of surface disturbance, the management of INPS, OHV use, and livestock grazing under Alternative D are anticipated to result in similar impacts to habitats for special status Platte River species as under Alternative A. Conversely, potential impacts to the Platte River species downstream of the planning area are anticipated to be higher under Alternative D than under Alternative A, primarily due to higher predicted annual average water depletion.

Nongame (Mammals)

Impacts from surface-disturbing activities, INPS control, fire management and ecology, OHV use, livestock grazing, and management actions for biological resources are anticipated to be similar under Alternative D for special status nongame mammals as under Alternative A.

Forest and Woodland Species – In general, forest and woodland special status nongame mammal species occupy similar habitats as forest and woodland special status nongame neotropical migrants and, thus, impacts to the two groups are anticipated to be similar. Forest management under Alternative D emphasizes a maximum wood growth and flow of wood products. Compared to Alternative A, forest management under Alternative D is anticipated to result in similar impacts to special status nongame mammals.

Sagebrush and Shrubland Species – Alternative D manages more sagebrush and more mountain shrub communities toward DPC compared to Alternative A, thereby providing greater benefit to special status nongame mammals compared to Alternative A. Potential impacts to white-tailed prairie dogs are similar to those for black-tailed prairie dogs described under Grassland Species, below.

Grassland Species – Similar to Alternative A, these species are impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, fire, and livestock and wildlife grazing. Alternative D impacts a similar amount of grassland habitats compared to Alternative A. The amount of habitat fragmentation expected under Alternative D is similar under Alternative A. Similar surface disturbance and no protection from habitat fragmentation under Alternative D are anticipated to result in similar impacts to grassland special status nongame mammal species as under Alternative A.

Under Alternative D, a black-tailed prairie dog ACEC is not designated. Restrictions on shooting prairie dogs are the same as under Alternative A. Prairie dog control is allowed only when an adjacent landowner submits a written request and where the distance to private land is less than ½ mile. Reductions in prairie dog populations may affect other grassland species associated with prairie dog

towns, including the mountain plover, burrowing owl, swift fox, and the black-footed ferret. No specific management for potential reintroduction of black-footed ferrets is included under Alternative D, resulting in no additional benefits to the ferret or other special status grassland species.

Riparian and Wetland Species – The Preble's meadow jumping mouse is the only species in this category. Management actions potentially impacting this species or its critical habitat are described in the Impacts Common to All Alternatives section.

Cave Species – Bats that using caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. Approximately 9,663 acres of identified "rock outcrops/badlands" exist on BLM-administered land, potentially containing bat habitats. Caves, cliffs, and rock outcrops are often found in relatively steep terrain. Under Alternative D, no restrictions to surface-disturbing activities on slopes greater than 25 percent are implemented and, thus, Alternative D provides a greater potential to adversely impact cave habitats compared to Alternative A. Because less area is open to development, potential adverse impacts to special status bats from wind-energy facilities are anticipated to be less under Alternative D than under Alternative A.

Nongame (Amphibians)

The northern leopard frog is the only special status amphibian in the planning area. This species uses riparian and wetland habitats; therefore, impacts to the northern leopard frog are similar under Alternative D to those described for neotropical migrants that use riparian and wetland habitats and similar to Alternative A.

Alternative E (Proposed Casper RMP)

Game Birds (Greater Sage-Grouse)

Short- and long-term surface disturbances, including impacts to sagebrush, anticipated under Alternative E are expected to be similar to Alternative A (Tables 4-11 and 4-12). However, Alternative E proposes to avoid or minimize the impacts of habitat fragmentation by protecting 8 blocks of contiguous native habitats (including sagebrush) compared to 0 blocks under Alternative A. The development of wind-energy facilities is restricted to outstanding/superb and good/excellent power classes (see Table 3-26) under Alternative E compared to no restriction under Alternative A.

Reclamation requirements under Alternative E are more stringent than under Alternative A, including a temporary protective surface treatment on a case-by-case basis, limited topsoil salvage, a requirement for certified weed-free seeding, and a three growing-season timeframe for completing reclamation.

Alternative E restores a natural fire regime to fire-adapted ecosystems in the planning area and uses prescribed fire to achieve measurable watershed-level objectives. The anticipated reduction in fuel loads under Alternative E is anticipated to reduce the potential for catastrophic fire, which could benefit greater sage-grouse nesting habitats. Alternative E also minimizes fire suppression activities around greater sage-grouse leks, thereby minimizing adverse impacts compared to Alternative A.

Alternative E seeks to minimize adverse impacts to sagebrush and other habitats from the spread of INPS by implementing a comprehensive weed management plan for the entire planning area. In addition, the BLM's authorized officer could require a 72-hour holding period for livestock prior to movement onto public lands under Alternative E. Developing and implementing a weed management plan is anticipated to slow the spread of INPS in the planning area, thereby benefiting greater sage-grouse habitats more than Alternative A.

OHV use under Alternative E is more restrictive than under Alternative A. Restrictions to OHV use under Alternative E are anticipated to result in fewer potential impacts (human disturbance and habitat degradation) to greater sage-grouse compared to Alternative A.

Alternative E manages livestock grazing to maintain a protective cover of vegetation and litter with emphasis on the condition of allotments with substantial acreage of highly erosive soils and high-priority allotments (categories I and M, see Glossary). The emphasis on litter in grazing allotments under Alternative E is expected to benefit greater sage-grouse more than Alternative A.

Under Alternative E, the BLM manages 630,183 acres of sagebrush habitats to achieve DPC. Management of sagebrush toward DPC requirements is assumed to provide greater benefits to greater sage-grouse than managing toward DFC as under Alternative A. Alternative E protects more lek habitats compared to Alternative A. Alternative E also protects more nesting and early brood-rearing habitats on BLM-administered surface and federal mineral estate compared to Alternative A. Similar to Alternative A, greater sage-grouse winter habitats are protected from surface disturbance and disruptive activities from November 15 to March 14; however, Alternative E restrictions also apply to greater sage-grouse habitats in the Bates Hole and Fish Creek/Willow Creek areas. No additional special designations or MAs are established under Alternative E for greater sage-grouse.

Restrictions on surface disturbance or occupancy proposed by Alternative E are anticipated to benefit greater sage-grouse during their sensitive nesting and wintering periods and in sensitive habitats, such as leks. Less proposed surface disturbance, more protected lek buffer acreage, more acreage protected from habitat fragmentation, and generally more restrictive management actions regarding surface disturbance, reclamation, and resource uses within the planning area under Alternative E are expected to have less adverse and more beneficial impacts to greater sage-grouse compared to Alternative A.

Migratory Game Birds (Waterfowl)

Measurable impacts from surface-disturbing activities, fire management, OHV use, INPS control, and livestock grazing activities are anticipated to adversely impact special status waterfowl less under Alternative E than under Alternative A. Under Alternative E, all new and existing wells and springs are fenced. Fencing of multiuse reservoirs are considered on a case-by-case basis on BLM-administered land. Alternative E requires a CSU restriction within ¼ mile of all Class 1 perennial streams, wetlands, riparian areas, and water bodies, and considers all other streams on a case-by-case basis. Alternative E develops a plan to reduce or eliminate all salt cedar acres in the planning area over the life of the plan, an improvement to habitats compared to Alternative A. Overall, Alternative E's restrictions and proactive management actions are anticipated to protect and enhance water, wetland, and riparian habitats to the benefit of special status waterfowl to a greater extent compared to Alternative A.

Alternative E continues the Table Mountain, Springer/Bump-Sullivan, and Rawhide HMPs as described for Alternative A; however, these lands would be disposed to the WGFD within 5 years. Alternative E manages more miles of lotic and adjacent riparian habitats and more acres of lentic habitats toward DPC compared to Alternative A. Alternative E also constructs more new fish and wildlife reservoirs, improves floodplain connectivity on more stream miles, and restores more miles of incised streams compared to Alternative A. The new reservoirs, habitat restoration, and management toward DPC are all anticipated to protect, enhance, and restore special status waterfowl habitats and, thus, benefit special status waterfowl more than Alternative A.

Nongame (Raptors)

Surface-disturbing activities, fire management, INPS control, OHV use, livestock grazing, and management actions for biological resources are anticipated to impact special status raptors less and

benefit special status raptor habitats more under Alternative E compared to Alternative A. Restrictions around special status raptor nests are more extensive under Alternative E; therefore, benefiting nesting special status raptors more compared to Alternative A.

Developing wind-energy facilities on BLM-administered land are encouraged, but restricted to power classes 4 through 7 (see Table 3-26) under Alternative E, thereby reducing the potential for fragmenting habitats compared to Alternative A. Without proper siting, Alternative E has the potential to adversely impact special status raptor species similar to Alternative A. Restrictions to surface-disturbing activities, amount of surface disturbance, fire suppression, livestock grazing, OHV use, and INPS management under Alternative E are anticipated to impact special status raptors less and benefit special status raptor habitats more compared to Alternative A. In addition, restrictions on wind-energy development under Alternative E are anticipated to benefit special status raptors more than Alternative A.

All bald eagle roosts are protected by buffers, as discussed under Impacts Common to All Alternatives. Fire management under Alternative E is similar to Alternative B and prohibits felling of trees within 200 yards of bald eagle roots during suppression. In the Jackson Canyon ACEC, forest management activities and prescribed burning are similar to Alternative A relative to bald eagle management objectives.

Alternative E is anticipated to maintain the upward trend of improving rangeland productivity for the short term. Developing a plan for eradicating salt cedar under Alternative E is expected to control INPS more effectively compared to Alternative A. Overall, there is more effective INPS control, more buffer area protection around raptor nests, and less area open to wind-energy development under Alternative E, thereby providing greater benefit to special status raptors compared to Alternative A.

Nongame (Neotropical Migrants)

Short- and long-term surface disturbances are anticipated to be less under Alternative E compared to Alternative A; therefore, associated adverse impacts to breeding and nesting habitats for special status neotropical migrants are anticipated to be less. Since wind-energy development is limited under Alternative E, impacts to special status neotropical migrants from wind-energy development are anticipated to be less than Alternative A.

Because of the diverse and numerous species within the neotropical migrant category, the impact analysis organizes these species into the following habitat guilds.

Forest and Woodland Species – Compared to Alternative A, there are specific management actions under Alternative E aimed at maintaining open forest and woodland stands to benefit wildlife. Management actions that promote open, old-growth characteristics benefit the Lewis's woodpecker. Alternative E manages ponderosa pine stands for old growth (including snags) in Little Red Creek, Esterbrook, and Jackson Canyon. In other areas, the emphasis is on the sustainable flow of wood products. Relative to Alternative A, Alternative E places increased importance on the value of aspen communities by managing aspen toward DPC.

Sagebrush and Shrubland Species – Measures to protect and reduce potential adverse impacts to greater sage-grouse, as discussed under Game Birds (greater sage-grouse), benefit all sagebrush and shrubland species. Sagebrush and shrubland species also may benefit from management actions in mountain shrub communities. Relative to Alternative A, Alternative E places an increased importance on mountain shrub communities by managing toward DPC.

Grassland Species – Although no specific management actions for special status neotropical migrants that utilize grasslands were identified for Alternative E, these species are expected to benefit from actions that treat woodland encroachment into grassland habitats where it is detrimental to grassland species.

Grassland special status neotropical migrant species are impacted by actions in grassland habitat, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Alternative E is expected to disturb more grassland habitats compared to Alternative A; however, Alternative E is also expected to protect more grassland habitat from habitats fragmentation compared to Alternative A. The mountain plover is often found in association with prairie dog towns. The mountain plover tends to prefer nesting areas with only sparse vegetation cover. The long-billed curlew also nests in areas with sparse vegetation. Therefore, these species also are impacted by management actions for black-tailed and white-tailed prairie dogs (discussed under Nongame [Mammals]).

Riparian and Wetland Species – Although no specific management actions for special status neotropical migrants using riparian and wetland habitats are identified under Alternative E, these species are expected to benefit from other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats. For example, Alternative E manages more lotic and adjacent riparian habitats and more lentic habitats toward PFC, develops more fish and wildlife reservoirs, improves floodplain connectivity and function on more miles of stream, and restores more miles of incised streams compared to Alternative A.

Livestock and wildlife tend to congregate at water sources, resulting in damage to critical riparian habitats. Alternative E protects and enhances riparian and wetland management by managing livestock and grazing wildlife in these areas. Management actions could include fencing, developing alternative water supplies for livestock, herding, placing feed and mineral supplements away from water sources, and adjusting to pasture boundaries and season of use. Furthermore, Alternative E does not allow surface-disturbing activities and heavy equipment on wet soils. These actions are expected to ultimately result in a riparian system with increased vegetation and structural diversity, leading to a potential increase in abundance and diversity of special status neotropical migrants.

Platte River Species – Construction of reservoirs, pits, springs, and wells are anticipated to deplete approximately 270 acre-feet of water annually under Alternative E, more than under Alternative A. See the Special Status Species – Fish section for more discussion of water depletion and impacts to Platte River species. Alternative E is anticipated to produce approximately 106 CBNG wells within the North Platte watershed; however, the contribution of produced water from these wells is expected to be negligible compared to projected water depletions. Because Platte River species depend on Platte River habitats and because historical water depletions have impacted these species, projected water depletions from BLM actions in the North Platte watershed may adversely impact the Eskimo curlew, interior least tern, piping plover, and whooping crane.

Overall, managing habitats toward DPC, less surface disturbance, and managing INPS, OHV use, and livestock grazing under Alternative E are anticipated to protect and enhance more habitats and, thus, benefit special status neotropical migrants within the planning area more than Alternative A. Conversely, potential impacts to the Platte River species, downstream of the planning area, are anticipated to be more under Alternative E than under Alternative A, primarily due to higher predicted annual average water depletion.

Nongame (Mammals)

Impacts from surface-disturbing activities, spread of INPS, fire management and ecology, OHV use, livestock grazing, and management actions for biological resources are anticipated to be less for special status nongame mammals under Alternative E compared to Alternative A.

Forest and Woodland Species – In general, forest and woodland special status nongame mammal species occupy similar habitats as forest and woodland special status nongame neotropical migrants and, thus,

impacts to the two groups are anticipated to be similar. Forest management under Alternative E emphasizes a sustainable flow of wood products, while also managing for multiple use. Compared to Alternative A, forest management under Alternative E is anticipated to result in fewer impacts to special status nongame mammals.

Sagebrush and Shrubland Species – Sagebrush and shrubland special status mammal species are anticipated to benefit from management actions in sagebrush and mountain shrub communities. Alternative E manages more sagebrush and more mountain shrub communities toward DPC compared to Alternative A, thereby providing more benefit to special status nongame mammals compared to Alternative A. Potential impacts to white-tailed prairie dogs are similar to those for black-tailed prairie dogs discussed under Grassland Species, below.

Grassland Species – These species would be impacted by actions in grassland habitats, such as surface-disturbing activities, reclamation, INPS control, and livestock and wildlife grazing. Alternative E disturbs a similar amount of acres of grassland habitats compared to Alternative A; however, Alternative E reduces habitat fragmentation compared to Alternative A. Less surface disturbance and less habitat fragmentation under Alternative E are anticipated to benefit special status nongame mammal species more than under Alternative A.

Under Alternative E, a black-tailed prairie dog ACEC is not designated. Under Alternative E, according to WGFD hunting regulations, there are no restrictions on shooting prairie dogs. Prairie dog control is allowed only when an adjacent landowner submits a written request and where the distance to private land is less than ½ mile. Reductions in prairie dog populations may affect other grassland species associated with prairie dog towns, including the mountain plover, burrowing owl, swift fox, and the black-footed ferret. No specific management for potential reintroduction of black-footed ferrets are in Alternative E, resulting in no additional benefits to the ferret or other special status grassland species.

Riparian and Wetland Species – The Preble's meadow jumping mouse is the only species in this category. Management actions potentially impacting this species or its critical habitats are described in the Impacts Common to All Alternatives section.

Cave Species – Bats using caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. Approximately 9,663 acres of identified "rock outcrops/badlands" are on BLM-administered land that could contain potential bat habitats. Caves, cliffs, and rock outcrops are often found in relatively steep terrain. Under Alternative E, the BLM would restrict surface-disturbing activities on slopes greater than 25 percent; therefore, cave habitats are expected to be protected. Because of restrictions on wind-energy development, potential adverse impacts to special status bats from wind-energy facilities are anticipated to be less under Alternative E than under Alternative A.

Nongame (Amphibians)

The northern leopard frog is the only special status amphibian in the planning area. This species uses riparian and wetland habitats; therefore, impacts to the northern leopard frog under Alternative E are similar to those described for special status neotropical migrants using riparian and wetland habitats and less compared to Alternative A.

4.4.9.3 Conclusion

Based on the projected disturbance and proposed actions summarized in Appendix M, Tables 4-11 and 4-12, and the impacts described in this section, the following conclusions are made.

Alternative B disturbs the least area both short and long term compared to other alternatives. Short- and long-term surface disturbances to BLM-administered land and to vegetation types for the other alternatives are projected to be similar and substantively more than Alternative B.

Alternatives B, C, and E protect blocks of contiguous native habitats from habitat fragmentation. Alternative B proposes to protect the most habitat followed by alternatives C and E. Alternatives A and D do not propose to protect habitats from habitat fragmentation.

Alternatives B and E are anticipated to protect the largest area for greater sage-grouse leks, nesting and early brood-rearing habitats, and winter habitats. Alternatives A, C, and D protect similar, but less acreage. Other sagebrush-dependent species (e.g., Brewer's sparrow, sage sparrow, and sage thrasher) are anticipated to benefit from protective management actions for greater sage-grouse.

Alternatives B and C protect the largest area around natural raptor nests and artificial nesting structures. Alternatives D and E protect similar, but less area. Alternative A does not provide buffers for artificial nesting structures, and, therefore, protects the smallest amount of land for raptor nests.

The potential to adversely impact the Platte River species downstream of the planning area is greatest under alternatives B and C because these alternatives result in the highest annual water depletions to the Platte River System. Alternative A is projected to have the smallest annual water depletion to the Platte River System. Alternatives D and E are projected to deplete more water to the Platte River System than Alternative A, but less than alternatives B and C.

For other special status species, there are no specific management actions that directly address their protection or conservation. Therefore, adverse or beneficial impacts to special status species' habitats provided a more meaningful comparison of impacts among alternatives. Alternative B provides the greatest beneficial impacts to special status wildlife habitats by imposing the most restrictions to minimize habitat disturbance, loss, fragmentation, and degradation, and by including the most proactive actions to restore and enhance habitats. Alternatives D and A have the greatest adverse impacts to wildlife habitats and, therefore, the fewest beneficial impacts for special status wildlife. Alternatives C and E generally provide intermediate levels of benefits. In the long term, the overall potential impact of alternatives to special status wildlife species in order of ascending adverse and descending beneficial impacts are B, C, E, A, and D.

4.5 Heritage and Visual Resources

The heritage and visual resources section describes the potential impacts to cultural, paleontological, and visual resources with respect to each alternative. Within each resource, the methods and assumptions, analysis of alternatives, and a conclusion are provided.

4.5.1 Cultural Resources

Cultural resources are fragile, nonrenewable evidence of past human history and heritage on the landscape. They are public resources entrusted to the BLM for protection and interpretation, providing a context for present-day land use decisions. Actions that could occur through implementing each alternative could impact cultural resources in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as being beneficial or adverse. Historic trails are analyzed in detail in the NHTs and Other Historic Trails section in this chapter and Native American concerns are identified in this section and in the Tribal Treaty Rights section. Refer to Map 33 for cultural resources (Volume 2).

Direct impacts to cultural resources from RMP alternatives typically result from actions that disturb the soil or physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to resource significance; introduce visual or audible elements out of character with the property or alter its setting; or result in neglect of the resource to the extent that it deteriorates or is destroyed. For example, surface-disturbing activities are considered an adverse direct impact because the resource is nonrenewable; once it has been disturbed, the potential for collecting or preserving meaningful data is lost. For the purposes of this analysis, actions resulting in data collection and preservation of cultural resources could be considered beneficial impacts, but, in fact, are neutral or nonadverse impacts, as the actions merely maintain the status quo. A truly beneficial impact to cultural resources enhances values, such as construction of interpretive signs. Indirect impacts to cultural resources result from project-induced increases or decreases in activity in the planning area. For example, constructing a recreational facility may increase visitor use, but could result in indirect impacts to previously undisturbed cultural resources.

As a practical matter, there is little difference between short- and long-term impacts from surface disturbance. Once a disturbance occurs to a cultural resource, the alteration is permanent. Restoration occasionally can be done in some cases, and stabilization can halt additional deterioration, but once a portion of a site is damaged, it can rarely be repaired. The duration of a disturbing element or activity can be considered as short-term or long-term. A pipeline construction corridor is a short-term disturbance, as normal reclamation ultimately stabilizes the soil. A disturbance continuing beyond 5 years is considered long-term.

For all agency undertakings with the potential to adversely impact historic properties (i.e., cultural resources that are eligible for, or listed in, the National Register of Historic Places [NRHP]), the BLM complies with Section 106 of the National Historic Preservation Act (NHPA). Section 106 compliance typically includes a cultural resources inventory and evaluation of any resources found. If historic properties are present, the BLM consults with the State Historic Preservation Office (SHPO), interested Native American tribes, and other interested parties in developing mitigation measures for adversely affected properties. Under all alternatives, the BLM continues its obligation to conduct government-to-government consultation with interested tribes regarding the sensitive resources of the planning area.

Impacts to Native American traditional resources or sacred sites are identified in consultation with the impacted tribes. The Eastern Shoshone Tribe indicated that the setting of sacred sites, including solitude, peace and quiet, and the view of the surrounding area, are important to maintaining the quality of the

resource. Alterations to these characteristics can adversely impact traditional use of the area. While temporary disturbances, such as construction activities, are not identified as a major concern of the Eastern Shoshone Tribe, long-term increases in noise, changes in the visual setting and smells, as well as increases in motion and activity, all have the potential to detract from the tribe's setting. Other tribes may, in the future, make known similar or additional concerns that may impact sites in which they have a heritage interest. In addition, physical impacts to traditional or sacred sites and limitations on tribal access can impact traditional use.

The BLM initiated contact with the following tribes, listed alphabetically below, to identify potential impacts of the alternatives to sites of cultural concern on BLM lands.

- Blackfeet Nation
- Cheyenne River Sioux Tribe
- Confederated Salish and Kootenai Tribe
- Crow Tribe
- Eastern Shoshone Tribe
- Kiowa Tribe of Oklahoma
- Lower Brule Sioux Tribe
- Nez Perce Tribe
- Northern Arapaho Tribe
- Northern Cheyenne Tribe
- Oglala Lakota Tribe
- Rosebud Sioux Tribe
- Shoshone-Bannock Tribe
- Ute Tribe

4.5.1.1 Methods and Assumptions

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

- Cultural resources will continue to be found throughout the planning area.
- All surface-disturbing activities could adversely impact cultural resources.
- Natural and prescribed fire could damage rock art sites and sites composed of combustible materials.
- Protection for all cultural resources will occur according to federal laws and BLM regulations and agreements, regardless of whether the resources are specifically identified in the RMP.
- Adverse impacts to cultural resources from surface-disturbing activities occur primarily at the time the initial surface disturbance occurs. Therefore, the projected numbers for short-term surface disturbance are used to quantify impacts to cultural resources.
- The intensity of surface disturbance by alternative, as identified in Appendix M, equates to levels of development and, in turn, increased access to public lands.

4.5.1.2 Analysis of Alternatives

As cultural resources are impacted by management actions under each alternative, actions for cultural resources can, in turn, impact other resources. For example, constraints placed on surface disturbance on or around specific cultural sites may impact desired actions under another resource. The impacts of cultural resources on other resource topics (e.g., physical, biological, fire management and ecology, etc.) are discussed under the appropriate impacted resources.

Impacts Common to All Alternatives

The types of impacts projected to occur to cultural resources as a result of the various alternatives are similar; however, the intensity of the impacts is anticipated to vary. Therefore, impacts to cultural resources from surface-disturbing activities, such as minerals development, ROW, facilities development, OHV use, recreational, fire management, and proactive cultural resource management actions are

described under individual alternatives. Essentially, any activity that creates or has the potential to create surface disturbance, regardless of the resource program to which it may be associated, can cause potential impacts to cultural resources.

Under all alternatives, all eligible sites or sites listed in the NRHP within the 1,633-acre Notches Dome Archeological District (48NA368) are subject to an NSO restriction. An onsite Class III inventory prior to implementing any surface development proposals would be required. Similarly, NSO would be permitted on the Spanish Diggings prehistoric quarry (48PL48). These management actions result in a beneficial impact to cultural resources. For all alternatives, management of fish and wildlife resources could have an indirect beneficial impact on cultural resources if improving fisheries and other habitat enhance the availability of traditional resources. The situation is similar for soils management, in which reducing erosion and limiting erosion of highly erosive soils help preserve archeological sites. Managing natural and prescribed fire can directly and adversely impact cultural resources by direct disturbance from suppression, thermal effects on rock art panels, or burning sites composed of combustible materials, such as wickiups, corrals, or historic sites. Indirect impacts would derive from new exposures of cultural materials, making them available for illicit collection or disruption by erosion. Positive impacts can be seen, in that previously covered sites are exposed and made available for recording.

Alternative A

Surface-disturbing Activities. Under Alternative A, surface-disturbing activities by resources identified in Appendix M could impact cultural resources. Under Alternative A, the projected short-term surface disturbance (59,990) from BLM actions results in the third highest disturbance acreage, following alternatives E and D, respectively (refer to Table 4-1). The net potential adverse impact to cultural resources is limited, however, because compliance with Section 106 of the NHPA requires that some type of mitigation be applied to historic properties prior to any disturbance. The relative amount of surface disturbance projected for each alternative defines the level of potential to impact cultural resources.

The impacts to cultural resources from surface-disturbing activities under Alternative A are anticipated to be commensurate with the intensity of RFAs shown in Appendix M. Moreover, the impacts to cultural resources from surface disturbance projected for Alternative A are anticipated to be primarily adverse. However, normal compliance with Section 106 of the NHPA prior to the approval of an action serves to moderate the amount of actual disturbance to cultural resources. In those cases in which an accommodation cannot be made, consultation between the BLM and the SHPO takes place to develop and implement a treatment plan to mitigate adverse impacts to historic properties. While this often results in data recovery, planned excavation, detailed recording and mapping, Historic American Buildings Survey/Historic American Engineering Record documentation, or interpretation are among the variety of techniques that can be used for mitigation, depending on the type of site and the nature of the potential adverse impacts.

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 cultural resources. For example, under Alternative A, surface-disturbing activities are reviewed on a case-by-case basis and NSO would be allowed on slopes greater than 25 percent without permission of the authorized officer. One TCP, Cedar Ridge (identified by the Eastern Shoshone tribe), is known to occur in the planning area. Sensitive values at Cedar Ridge are protected on a case-by-case basis. These management actions result in beneficial impacts to cultural resources; however, fewer restrictions on surface-disturbing activities are provided for under Alternative A as compared to alternatives B, C, and E. Therefore, additional protection for cultural resources under Alternative A is less than all other alternatives, except Alternative D.

Land Disposal and Acquisition. Disposal of BLM-administered surface land can result in both beneficial and adverse impacts to cultural resources. The results of the survey required under Section 106 of the NHPA causes a beneficial impact to cultural resources because it generates data that promotes further understanding of cultural resources in the planning area. However, if historic properties are identified during the inventory, it could result in an adverse impact, because once in private ownership, there are no protective measures for cultural resources. Land-tenure adjustment is classed as an adverse impact (in terms of Section 106) for that reason. Historic properties need to be mitigated by application of a treatment plan developed through consultation between the BLM and the SHPO. In other words, cultural resource issues have to be resolved prior to any changes in land ownership. Under Alternative A, 103,725 acres of BLM-administered surface are identified for disposal by sale. This is the lowest acreage identified for disposal under all the alternatives. Acquisition of lands within the planning area could result in a beneficial impact to cultural resources in that additional sites may be obtained in the newly acquired lands.

Access. General development (e.g., recreational facilities and mineral development) and OHV use can provide access to remote cultural resource locations leading to adverse impacts related to traffic, vandalism, and erosion.

For the purpose of this analysis, development activities are anticipated to be similar in intensity to the surface disturbance acres identified in Table 4-1. Based on this assumption, the third highest amount of development and increase in access occurs under Alternative A and results in an indirect adverse impact to cultural resources. Because adverse impacts to historic properties must be mitigated prior to authorizing an action, the degree of adverse impact is lessened.

Increased visitor use through OHV use and improved access can have both beneficial and adverse impacts on cultural resources. For example, archeological sites are protected when there are access restrictions, but may be exposed to vandalism or other impacts if multiple uses increase, including exploration for extractive resources (e.g., mining) or an increase in recreational opportunities. However, lack of access also can adversely impact the use of traditional cultural resources.

OHV use on public lands, under all alternatives, indirectly impacts cultural resources. The impacts of OHV use are primarily anticipated to be adverse, indirect, and to occur in the areas limited to existing roads and trails for OHV use. Alternative A projects the largest area (1,311,715 acres) as limited to existing roads and trails for OHV use (Table 2-1). Although OHV use is currently restricted in some areas, and use is limited to existing and limited to designated roads and trails, new trails are constantly being created and become part of the "existing designation." The Oregon and Bozeman trails are closed to OHV use, which would result in beneficial impacts to cultural resources (see the National Historic Trails and Other Historic Trails section in this chapter).

Proactive Cultural Resource Management Actions. Under Alternative A, an NSO restriction is in place for cultural sites within the 1,633-acre Notches Dome Archeological District that may be or have been nominated to the NRHP. In addition, within the Notches Dome Archeological District, Class III inventories are required prior to authorization of surface-development proposals. These proactive cultural resource management actions result in beneficial impacts to cultural resources within the Notches Dome Archeological District.

Other proactive cultural resource management actions include NSO restrictions on sites 48NA227, 48NA940, and 48NA84. This management action results in a beneficial impact to the identified cultural resources.

Under Alternative A, cultural resource inventories and site evaluations are in direct response to specific land use proposals in accordance with Section 106 of the NHPA. Additional inventory is carried out when resources permit to comply with Section 110 of the NHPA. While these actions benefit cultural resources, they are the minimum required by law. No additional protective measures are identified under Alternative A for Pine Ridge.

Alternative B

Surface-disturbing Activities. Under Alternative B, the projected short-term disturbance acreage (36,650 acres) from BLM actions is the lowest of any alternative (refer to Table 4-1). As in Alternative A, the net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to cultural resources from surface-disturbing activities under Alternative B are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative B is anticipated to be less than Alternative A and the least relative to all other alternatives.

Relative to Alternative A and other alternatives, Alternative B incorporates the most restrictions on surface-disturbing activities. Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative B provide additional protection for cultural resources. For example, under Alternative B, NSO is allowed on highly erosive soils or on slopes greater than 25 percent and in the Cedar Ridge TCP with a CSU restriction in the periphery as defined in Table 2-3. These types of management actions result in beneficial impacts to cultural resources.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface land under Alternative B are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative B, 109,210 acres of BLM-administered surface are identified for disposal by sale. Approximately 5-percent more than proposed under Alternative A. Disposal of BLM-administered surface results in both a beneficial and adverse impact to cultural resources as described in Alternative A.

Access. The indirect adverse impacts of access from development and OHV use under Alternative B are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative B proposes the least amount of development of any alternative (as represented by surface disturbance numbers in Table 4-1) and provides the smallest area (909,651 acres) for OHV use limited to existing roads and trails, a 31-percent decrease from Alternative A (1,311,715 acres). These management actions result in indirect adverse impacts to cultural resources, but less adverse impacts than under Alternative A.

Proactive Cultural Resource Management Actions. Proactive cultural resource management actions for the 1,633-acre Notches Dome Archeological District under Alternative B are the same as those identified under Alternative A. For sites 48NA227, 48NA940, and 48NA84, Alternative B offers additional protection compared to Alternative A by including an NSO restriction not only on the site, but also within a 300-foot buffer around each site. This management action results in beneficial impacts to the identified cultural resources.

Under Alternative B, cultural resource inventories and site evaluations are the same as those identified under Alternative A, except that Class III block surveys are conducted on leases, oil and gas units, oil and gas fields, and similar large-scale development areas. This management action results in a beneficial impact to cultural resources.

The minimum cultural resource block inventory size for Pine Ridge under Alternative B is 40 acres. Linear inventories will cover a minimum of 100 feet on either side of the centerline. This action results in a beneficial impact to cultural resources. No similar action is identified for Pine Ridge in Alternative A. More area is inventoried for cultural resources under Alternative B than under Alternative A.

Alternative C

Surface-disturbing Activities. Under Alternative C, the projected short-term disturbance acreage (58,689 acres) from BLM actions results in the fourth highest disturbance acreage following alternatives E, D, and A, respectively (refer to Table 4-1). Again, the net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to cultural resources from surface-disturbing activities under Alternative C are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative C is anticipated to be less than under Alternative A.

Restrictions on surface-disturbing activities to protect other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative C provide additional protection for cultural resources. For example, under Alternative C, surface disturbance on highly erosive soils are minimized to the extent practicable and NSO is allowed on slopes greater than 25 percent with highly erosive soils. In addition, NSO is allowed in the Cedar Ridge TCP and a CSU restriction in the TCP's periphery, as defined in Table 2-3. These types of management actions result in beneficial impacts to cultural resources.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface under Alternative C are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative C, 241,364 acres of BLM-administered surface are identified for disposal by sale, approximately 233-percent more than proposed under Alternative A (103,725 acres). Disposal of BLM-administered surface results in both beneficial and adverse impacts to cultural resources, as described in Alternative A.

Access. The indirect adverse impacts of access from development and OHV use under Alternative C are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative C proposes a decrease in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1) and Alternative C designates the fourth highest acreage (along with Alternative E) to OHV use limited to existing roads and trails (1,162,113 acres), an 11-percent decrease from Alternative A (1,311,715 acres). These management actions would result in indirect adverse impacts to cultural resources. The impacts are similar in intensity to those identified in Alternative A.

Proactive Cultural Resource Management Actions. Proactive cultural resource management actions for the 1,633-acre Notches Dome Archeological District under Alternative C are the same as those identified under Alternative A. For sites 48NA227, 48NA940, and 48NA84, Alternative C offers additional protection compared to Alternative A by maintaining the NSO restriction within the site boundaries and adding a CSU restriction on public lands within 300 feet of each site. This management action results in beneficial impacts to the identified cultural resources.

Under Alternative C, cultural resource inventories are conducted on the area of potential impact plus a buffer zone of at least 300 feet. Inventory boundaries are identified on a project-by-project basis. This management action would result in beneficial impacts to cultural resources.

The minimum cultural resource block inventory size for Pine Ridge under Alternative C is 40 acres. Linear inventories will cover a minimum of 100 feet on either side of the centerline. This management action results in beneficial impacts to cultural resources. No similar action is identified for Pine Ridge in Alternative A. More area is inventoried for cultural resources under Alternative C than under Alternative A.

Alternative D

Surface-disturbing Activities. Under Alternative D, the projected short-term disturbance acreage (63,649 acres) from BLM actions results in the greatest acreage of all the alternatives (refer to Table 4-1). The net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to cultural resources from surface-disturbing activities under Alternative D are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative D is anticipated to be more than under Alternative A.

Fewer restrictions on surface-disturbing activities for protecting other resources (e.g., soil, water, biological resources, special designations, and other MAs) are provided under Alternative D; therefore, additional protection for cultural resources under Alternative D is less than all other alternatives. For example, under Alternative D, surface disturbance on highly erosive soils and slopes greater than 25 percent is allowed, and surface-disturbing activities on the Cedar Ridge TCP are subject to a CSU restriction with no additional protection for the periphery. These types of management actions result in beneficial impacts to cultural resources; however, they are less beneficial than under any other alternative.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface under Alternative D are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative D, 224,834 acres of BLM-administered surface are identified for disposal by sale. Approximately 217-percent more than proposed under Alternative A (103,725 acres). The impacts of land-tenure adjustment will be much like those described in Alternative A, although with less acreage.

Access. The indirect adverse impacts of access from development and OHV use under Alternative D are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative D proposes an increase in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1) and the highest level of development of all alternatives. Alternative D designates the second highest acreage to OHV use limited to existing roads and trails (1,292,630 acres), a 1-percent decrease from Alternative A (1,311,715 acres). These actions result in indirect adverse impacts to cultural resources. The adverse impacts under Alternative D are greater than those identified under Alternative A, as well as all other alternatives.

Proactive Cultural Resource Management Actions. Proactive cultural resource management actions for the 1,633-acre Notches Dome Archeological District under Alternative D are the same as those identified under Alternative A. Likewise, proactive cultural resource management actions under Alternative D for sites 48NA227, 48NA940, and 48NA84 are the same as those identified under Alternative A.

Under Alternative D, cultural resource inventories are conducted on the area of potential impact plus a buffer zone of at least 100 feet. Inventory boundaries are identified on a project-by-project basis. This management action results in a beneficial impact to cultural resources. No additional protective measures

are identified under Alternative D for Pine Ridge. Slightly more area is inventoried for cultural resources under Alternative D than in Alternative A.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. Under Alternative E, the projected short-term disturbance acreage (61,274 acres) from BLM actions results in the second highest disturbance acreage following Alternative D (refer to Table 4-1). As in all other alternatives, the net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to cultural resources from surface-disturbing activities under Alternative E are anticipated to be adverse, as is the case for all alternatives and commensurate with the locations and intensity of RFAs as shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative E are anticipated to be more than under Alternative A. The net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative E provide additional protection for cultural resources. Under this alternative, surface disturbance on highly erosive soils is minimized to the extent practicable and NSO would be allowed in the Cedar Ridge TCP. These types of management actions result in beneficial impacts to cultural resources.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface under Alternative E are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative E, 224,834 acres of BLM-administered surface are identified for disposal by sale, approximately 216-percent more than proposed under Alternative A (103,725 acres). Disposal of BLM-administered surface results in both a beneficial and adverse impact to cultural resources, as described in Alternative A. Unlike Alternative A, under Alternative E, the BLM would actively seek to acquire lands with sensitive cultural resource values, resulting in a beneficial impact to cultural resources.

Access. The indirect adverse impacts of access from development and OHV use under Alternative E are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative E proposes an increase in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1) and Alternative E designates the third highest acreage (along with Alternative D) to OHV use limited to existing roads and trails (1,162,244), an 11-percent decrease from Alternative A (1,311,715). These actions result in an indirect adverse impact to cultural resources; however, the impacts under Alternative E are similar in intensity to those identified under Alternative A.

Proactive Cultural Resource Management Actions. Proactive cultural resource management actions for the 1,633-acre Notches Dome Archeological District under Alternative E are the same as those identified under Alternative A. For sites 48NA227, 48NA940, 48NA84, Alternative E offers additional protection compared to Alternative A by maintaining an NSO restriction within the site boundaries and adding a CSU restriction on public lands within 300 feet of each site.

Under Alternative E, cultural resource inventories are conducted on the area of potential impact plus a buffer zone of at least 100 feet. Inventory boundaries are identified on a project-by-project basis. This management action results in a beneficial impact to cultural resources.

The minimum cultural resource block inventory size for Pine Ridge under Alternative E is 40 acres. Linear inventories will cover a minimum of 100 feet on either side of the surface disturbance. This

management action results in beneficial impacts to cultural resources. No similar action is identified for Pine Ridge in Alternative A. More area is inventoried for cultural resources under Alternative E than under Alternative A.

4.5.1.3 Conclusion

Allowable uses and management actions described in this section for the various alternatives are used to determine the potential impacts to cultural resources. Meaningful differences in surface-disturbing activities, land-tenure adjustments, access, and proactive management actions form the basis for the following conclusion. Impacts to cultural resources from the alternatives are anticipated to be similar in type, but different in intensity. Whereas proactive cultural resource management actions result in beneficial impacts across all alternatives, overall potential impacts to cultural resources under Alternative D are anticipated to be the most adverse. Potential impacts under Alternative B are anticipated to be the least adverse. Potential adverse impacts to cultural resources under alternatives C and E are anticipated to be similar in intensity and slightly less than Alternative A. Under all alternatives, the BLM continues its obligation to conduct government-to-government consultation 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. Conflicts between cultural resources and other resource uses not covered by the RMP will be resolved by the Wyoming State Protocol Agreement and provisions in the NHPA.

4.5.2 Paleontological Resources

Much of the land managed by the BLM comprises badlands topography or exposed bedrock, resulting in a higher potential for the discovery of fossil localities than on most private lands. Direct impacts to paleontological resources from RMP alternatives typically result from actions that physically alter, damage, or destroy fossils or their contexts. For example, any type of surface disturbance in an area containing fossil resources could have a direct impact by disturbing important paleontological values. These actions also may have an indirect impact by providing greater access to the area, which can bring increased vandalism, removal of materials, and inadvertent damage that could impact fossils or their contexts. Conversely, actions that result in data collection and preservation or establishment of paleontological resources can be considered beneficial impacts. Impacts from the designation of the Alcova Fossil Area as an ACEC or MA, respectively, are addressed in the Special Designations and Other MAs section of this chapter. See Map 34 for paleontological resources.

4.5.2.1 Methods and Assumptions

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

- Scientifically important fossils will continue to be found within the planning area.
- Adverse impacts to paleontological resources occur from physical damage or destruction of fossils, from loss of related scientific data, and from transfer from public ownership.
- Adverse impacts to paleontological resources from surface-disturbing activities occur primarily at the time the initial surface disturbance occurs. Therefore, it is valid to use the projected numbers for short-term surface disturbance to quantify impacts to paleontological resources. Erosion resulting from long-term surface disturbance also can adversely impact paleontological resources, but not to the extent of short-term surface disturbance.
- Development activities over the life of the plan are anticipated to be similar in intensity to the surface disturbance acres identified in Table 4-1.

4.5.2.2 Analysis of Alternatives

Allowable uses and management actions that could impact paleontological resources include all surface-disturbing activities, changes in ownership, visitor accessibility, OHV use, and proactive paleontological resource management actions.

Impacts Common to All Alternatives

The types of impacts projected to occur to paleontological resources as a result of the alternatives are similar; however, the intensity of impacts is anticipated to vary. Therefore, impacts to paleontological resources from surface-disturbing activities, changes in ownership, visitor accessibility, OHV use, and proactive paleontological resource management actions are described under individual alternatives.

Alternative A

Surface-disturbing Activities. Under Alternative A, surface-disturbing activities by resources identified in Appendix M could impact paleontological resources. Under Alternative A, the projected short-term surface disturbance (59,990 acres) from BLM actions results in the third highest disturbance acreage following alternatives E and D, respectively (refer to Table 4-1).

The intensity of impacts to paleontological resources from surface-disturbing activities under Alternative A is anticipated to be similar to the RFAs shown in Appendix M. Moreover, the impacts to paleontological resources from surface disturbance projected for Alternative A are anticipated to be primarily adverse. However, mitigation of adverse impacts often results in data collection and (or) preservation of paleontological resources, which could result in a small beneficial impact.

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. For example, under Alternative A, no surface use is allowed on slopes greater than 25 percent without permission of the authorized officer. This and other management actions of this type result in beneficial impacts to paleontological resources because they limit the potential for disturbance. However, fewer restrictions on surface-disturbing activities are provided for under Alternative A as compared to alternatives B, C, and E. Therefore, additional protection for paleontological resources under Alternative A is less than the protection for all other alternatives, except Alternative D.

Land Disposal and Acquisition. Disposal of public surface containing known or previously undocumented paleontological resources results in an adverse impact to paleontological resources due to the loss to the public of public fossils and the lack of protective measures for paleontological resources when under private ownership. Under Alternative A, 103,725 acres of public surface are identified for disposal. This is the lowest acreage identified for disposal under all alternatives. Likewise, any acquisition of lands within the planning area that contains paleontological resources results in a beneficial impact to paleontological resources due to the protective measures offered under federal ownership and the gain of public fossils.

Access. General development (e.g., recreational facilities and mineral development) and OHV use result in increased access to public lands and, therefore, adverse impacts to remote paleontological resources occur. For example, paleontological localities are protected when there are access restrictions, but may be exposed to vandalism and erosion with increased access.

For the purpose of this analysis, development activities are anticipated to be similar in intensity to the surface disturbance acres identified in Table 4-1. Based on this assumption, it is anticipated that the third

highest amount of development and increase in access will occur under Alternative A and result in an indirect adverse impact to paleontological resources.

OHV use on public lands under all alternatives indirectly impacts paleontological resources. The impacts of OHV use are primarily anticipated to be adverse, indirect, and occur in the areas limited to existing roads and trails for OHV use. However, the existing OHV park (187 acres) contains important paleontological resources. Direct impacts from OHV use may be occurring. Indirect impacts from accelerated erosion and degradation due to exposure also may be impacting the site. The site is presently being researched and monitored to determine if OHV use is causing adverse impacts above the level of natural degradation. Although use is limited to existing roads and trails, new trails are constantly being created and become part of the "existing designation" throughout the planning area. For this reason, increased access to remote locations under this OHV designation is more likely to occur. Alternative A identifies the largest area (1,311,715 acres) for OHV use limited to existing roads and trails (Table 2-1).

Proactive Paleontological Resource Management Actions. Under Alternative A, current management practices continue. Existing management (permits, goal to acquire lands with high paleontological values, and requirements to assess and mitigate adverse impacts) result in beneficial impacts to paleontological resources. However, management actions under Alternative A generally are less protective than those under alternatives B, C, D, and E.

Alternative B

Surface-disturbing Activities. The impacts to paleontological resources from surface-disturbing activities under Alternative B are anticipated to be adverse and similar in type to Alternative A (as identified in Appendix M). However, the intensity of adverse impacts to paleontological resources from surface-disturbing activities under Alternative B is anticipated to be less than under Alternative A. Under Alternative B, the projected short-term disturbance acreage from BLM actions is the lowest of any alternative (refer to Table 4-1).

Relative to Alternative A and other alternatives, Alternative B incorporates the most restrictions on surface-disturbing activities. Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative B provide additional protection for paleontological resources. For example, under Alternative B, no surface use is allowed on slopes greater than 25 percent. This and other similar management actions result in beneficial impacts to paleontological resources because they limit disturbance to paleontological resources.

Land Disposal and Acquisition. The types of impacts expected to occur from disposal of public surface under Alternative B are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative B, 109,210 acres of public surface are identified for disposal; approximately 5-percent more than proposed under Alternative A. Disposal of public surface results in an adverse impact to paleontological resources and acquisition results in a beneficial impact, as described in Alternative A.

Access. The types of impacts anticipated to occur from development and OHV use under Alternative B are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative B proposes the least amount of development by alternative (as represented by surface disturbance numbers in Table 4-1) and provides the smallest area (909,651 acres) for OHV use limited to existing roads and trails; a 31-percent decrease from Alternative A (1,311,715 acres). These actions result in an indirect adverse impact to paleontological resources, but less of an adverse impact than in Alternative A. Alternative B increases the size of the existing OHV park from 187 to 242 acres. If the

additional acres include important paleontological resources, a proportionate increase in possible adverse impacts is expected.

Proactive Paleontological Resource Management Actions. Under Alternative B, no new interpretive facilities are constructed; additional stipulations on permits are considered on a case-by-case basis; the BLM proactively identifies and designates areas of high paleontological values and applies NSO restrictions, as needed; retains public surface with important paleontological values; requires on-the-ground surveys prior to approval of surface-disturbing activity or land disposal; and requires monitoring during disturbance on Class 3, 4, and 5 formations. These proactive management actions result in a beneficial impact to paleontological resources. The proactive management actions under Alternative B are more protective than those identified under Alternative A, and the most protective of all alternatives.

Alternative C

Surface-disturbing Activities. The impacts to paleontological resources from surface-disturbing activities under Alternative C are anticipated to be adverse and similar in type to Alternative A (as identified in Appendix M). However, the intensity of adverse impacts to paleontological resources from surface-disturbing activities under Alternative C is anticipated to be less than under Alternative A. Under Alternative C, the projected short-term disturbance acreage from BLM actions would result in the fourth highest disturbance acreage following alternatives D, E, and A, respectively (refer to Table 4-1).

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative C provide additional protection for paleontological resources. For example, under Alternative C, no surface use is allowed on slopes greater than 25 percent with highly erosive soils. This and other management actions of this type result in a beneficial impact to paleontological resources because they limit disturbance to paleontological resources.

Land Disposal and Acquisition. The types of impacts expected to occur from disposal of public surface under Alternative C are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative C, 241,364 acres of public surface are identified for disposal, which is approximately 233-percent more than proposed under Alternative A (103,725 acres). Disposal of public surface results in an adverse impact to paleontological resources and acquisition results in a beneficial impact, as described in Alternative A.

Access. The type of impacts anticipated to occur from development and OHV use under Alternative C are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative C proposes a decrease in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1) and Alternative C designates the third highest acreage (along with Alternative E) to OHV use limited to existing roads and trails (1,162,113 acres), an 11-percent decrease from Alternative A (1,311,715 acres). Under Alternative C, the existing OHV park increases from 187 acres to 285 acres. This may increase the adverse impacts, depending on whether the expansion area includes additional paleontological resources.

Proactive Paleontological Resource Management Actions. Under Alternative C, interpretive facilities are constructed, additional stipulations are added to permits on a case-by-case basis, public surface with scientifically important paleontological values is retained, and on-the-ground surveys prior to approval of surface-disturbing activity or land disposal are required, as is monitoring during disturbance on Class 4 and 5 formations. These proactive management actions would result in a beneficial impact to paleontological resources. The proactive management actions under Alternative C are more protective than those identified under Alternative A, but less protective than under Alternative B.

Alternative D

Surface-disturbing Activities. The impacts to paleontological resources from surface-disturbing activities under Alternative D are anticipated to be adverse and similar in type to Alternative A (as identified in Appendix M). However, the intensity of adverse impacts to paleontological resources from surface-disturbing activities under Alternative D are anticipated to be more than under Alternative A. Under Alternative D, the projected short-term disturbance acreage from BLM actions result in the highest disturbance acreage of all the alternatives (refer to Table 4-1).

Fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) are provided under Alternative D; therefore, additional protection for paleontological resources under Alternative D are less than all other alternatives. For example, under Alternative D, surface disturbance on slopes greater than 25 percent is allowed. Under Alternative D, this management action results in an adverse impact to paleontological resources because it opens more BLM land to surface-disturbing activities. Compared to Alternative A, Alternative D is less protective of paleontological resources.

Land Disposal and Acquisition. The types of impacts expected to occur from disposal of public surface under Alternative D are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative D, 224,834 acres of public surface are identified for disposal; approximately 217-percent more than proposed under Alternative A (103,725 acres). Disposal of public surface results in an adverse impact and acquisition results in a beneficial impact to paleontological resources, as described in Alternative A.

Access. The types of impacts anticipated to occur from development and OHV use under Alternative D are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative D proposes an increase in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1) and the highest level of development of all alternatives. Alternative D designates the second highest acreage to OHV use limited to existing roads and trails (1,292,630 acres), a 1-percent decrease from Alternative A (1,311,715 acres). Alternative D, similar to Alternative C, includes expanding the existing OHV park from 187 acres to 285 acres. This may increase the adverse impacts, depending on whether the expansion area includes additional paleontological resources.

Proactive Paleontological Resource Management Actions. Under Alternative D, interpretive facilities are constructed, permits will include standard stipulations, public surface with scientifically important paleontological values are retained, surveys are required prior to approval of surface-disturbing activity or land disposal, and monitoring is required during disturbance of Class 4 and 5 formations. These proactive management actions result in a beneficial impact to paleontological resources. The proactive management actions under Alternative D are more protective than those identified under Alternative A, but less protective than under alternatives B, C, and E.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. The impacts to paleontological resources from surface-disturbing activities under Alternative E are anticipated to be adverse and similar in type to Alternative A (as identified in Appendix M). However, the intensity of adverse impacts to paleontological resources from surface-disturbing activities under Alternative E are anticipated to be more than under Alternative A. Under Alternative E, the projected short-term disturbance acreage from BLM actions results in the second highest disturbance acreage following Alternative D (refer to Table 4-1).

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative E provide additional

protection for paleontological resources. For example, under Alternative E, no surface use is allowed on slopes greater than 25 percent without permission of the authorized officer and an NSO restriction is in place on slopes greater than 25 percent in the South Bighorns. These types of management actions result in beneficial impacts to paleontological resources because they limit disturbance to paleontological resources.

Land Disposal and Acquisition. The types of impacts expected to occur from disposal of public surface under Alternative E are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative E, 224,834 acres of public surface are identified for disposal; approximately 217-percent more than proposed under Alternative A (103,725 acres). Disposal of public surface results in an adverse impact and acquisition results in a beneficial impact to paleontological resources, as described in Alternative A.

Access. The types of impacts anticipated to occur from development and OHV use under Alternative E are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative E proposes an increase in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1), and Alternative E designates the third highest acreage (along with Alternative C) to OHV use limited to existing roads and trails (1,162,244 acres), an 11-percent decrease from Alternative A (1,311,715 acres). Alternative E includes expanding the existing OHV park by 98 acres from the existing situation discussed in Alternative A to 285 acres. This may increase the adverse impacts, depending on whether the expansion area includes additional paleontological resources.

Proactive Paleontological Resource Management Actions. Under Alternative E, interpretive facilities are constructed, additional stipulations are added to permits on a case-by-case basis, public surfaces with scientifically important paleontological values are retained, on-the-ground surveys prior to approval of surface-disturbing activity or land disposal are required, as is monitoring during disturbance on Class 3 formations. These proactive management actions result in a beneficial impact to paleontological resources. The proactive management actions under Alternative E are more protective than those identified under Alternative A, but less protective than under Alternative B.

4.5.2.3 Conclusion

Meaningful differences in surface-disturbing activities, disposal and acquisition, access, and proactive management form the basis for the following conclusion. Impacts to paleontological resources from the alternatives are anticipated to be similar in type, but differ in intensity. Proactive paleontological resource management actions result in beneficial impacts across all alternatives. Potential impacts to paleontological resources under Alternative D are anticipated to be the most adverse, whereas potential impacts from Alternative B are anticipated to be the least adverse. Potential adverse impacts to paleontological resources from alternatives C and E are anticipated to be similar in intensity and slightly less than Alternative A.

4.5.3 Visual Resources

This section describes the anticipated impacts of each alternative on VRM in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as beneficial or adverse with respect to visual resources.

Anything that draws the viewer's attention and contrasts with the basic elements (form, line, color, or texture) of a given landscape, impacts the viewer's perceptions, creating impact to the visual resources. Changes from any source that introduces intrusive elements into the existing landscape could impact visual resources. Direct impacts resulting from on-the-ground activities may be either adverse or beneficial. Adverse impacts include the addition of visual intrusions, such as roads and facilities, or the

removal of natural materials (i.e., soil, vegetation). Beneficial impacts are normally a direct result of post-disturbance reclamation efforts. Indirect impacts relate to the management of other resource values, in which specific actions may limit, as well as increase, the effectiveness of the VRM program. Actions that occur on lands not administered by the BLM (regardless of ownership) can impact the visual resources of the adjacent public lands. Maps 35 through 39 identify VRM by alternative.

4.5.3.1 Methods and Assumptions

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

- Future development and other land use activities described under each alternative are compared to recommended VRM classes and the existing visual conditions to determine potential impacts.
- To adequately describe potential impacts of each alternative in the context of the capacity for differing landscapes to absorb visual intrusions, actions potentially impacting visual resources were divided into general categories: high profile developments, low-profile or short-term projects, and resource management prescriptions.

4.5.3.2 Analysis of Alternatives

Allowable uses and management actions that could impact visual resources primarily include surface development and vegetation management. As visual resources are impacted by the alternatives, VRM can, in turn, impact other resources. The impacts of VRM on other resource topics (i.e., physical, biological, etc.) are discussed under the appropriate impacted resources.

Impacts Common to All Alternatives

The types of impacts projected to occur to visual resources as a result of the various alternatives are similar. However, the intensity of impacts is anticipated to vary by alternative; therefore, impacts to visual resources from surface development and vegetation management actions are described under individual alternatives.

An impact to the visual quality of the landscape occurs when a management activity creates noticeable surface disturbance that contrasts with form, line, color, or texture in the landscape. Typical management activities include vegetation management, range-improvement projects, or more intensive activities, such as oil and gas development and mining. Most oil and gas development is expected to occur in the Wind River and Powder River basins. Coal mining operations would most likely occur in northeastern portions of Converse County (Powder River Basin). Mining activities such as coal mining or limestone quarrying, which are large in scale relative to the landscapes in which they occur, create dominant long-term adverse visual impacts. Even when such activities meet the established VRM objectives, they should be mitigated, where possible.

Small-scale, dispersed development (range improvements, etc.) have a lesser impact due to the ability to fit these facilities into natural landscapes. Visual resources in areas with a high potential for oil and gas development are likely to be more heavily impacted through the long term.

Alternative A

Visual Resource Management. Current VRM classes for the planning area were established during the Platte River Resource Area Oil and Gas Environment Assessment. Under current management, the majority of public land surface of the planning area is classified as VRM Class IV (953,543 acres), VRM Class III (210,258 acres), and VRM Class II (109,827 acres). The remaining public land surface acreage was former Class V (2,074-plus acres) or was unclassified (85,875 acres). Current visual resource classes

do not accurately reflect the visual quality of the planning area, nor do they account for existing land use, development, and other changes within the planning area.

Surface Development. Current management allows for large-scale disturbances, high-profile intrusions, and concentrated development. As a result, high-profile and concentrated development of nonrenewable resources is expected to continue in both the Wind River and Powder River basins under current management. Coal development outside the CDPAs is not addressed in Alternative A.

Vegetation Management. Short-term impacts associated with forest management include changes in the natural line, color, form, and texture of harvest areas, as well as the introduction of new visual intrusions, such as haul roads. These impacts are anticipated to adversely impact visual quality; however, long-term impacts diminish as forests regenerate.

Other forms of vegetation management under Alternative A are applied to varying plant communities in a limited fashion. The use of prescribed burns and wildland fire suppression could create adverse impacts to visual resources. Rehabilitation after burns is determined on a case-by-case basis. Fuel-reduction methods, such as mechanical, chemical, or biological vegetation treatments and the use of mosaic burn patterns, minimize impacts to visual resources.

Under Alternative A, adverse impacts to visual resources resulting from mechanical, chemical, or biological vegetation treatments are anticipated to be short-term. Long-term impacts from vegetation treatments will most likely be beneficial to visual resources. Alternative A allows for the greatest amount of visual degradation of the public lands in the Casper Field Office because it has the largest acreage managed under the Class IV objective.

Alternative B

Visual Resource Management. In this alternative, proposed VRM Classes for BLM-managed surface are as follows: 408,576 acres as Class II; 415,458 acres as Class III; and 537,543 acres as Class IV.

Surface Development. Relative to current management, large-scale disturbances, high-profile intrusions, and concentrated development are limited under Alternative B. For example, wind-energy development in the planning area is restricted to areas classified as power classes 6 and 7 (see Table 3-26).

Alternative B proposes the greatest acreage in Class II and the least acreage in Class IV of all the alternatives. Accordingly, it provides the greatest positive long-term impact to visual resources. Where projects were developed in Class II areas, a higher standard for mitigation of visual impacts is required. As a result, scenic quality is better protected.

Class II areas are considered ROW avoidance areas and do not allow cross-country placement of ROW facilities. In addition, the Oregon Trail Road ROW Corridor, Segment A, is replaced for the protection of this historic landscape. The new corridor is to be located along an existing pipeline route. These restrictions minimize adverse impacts to natural landscapes within areas containing sensitive resource values.

Vegetation Management. Vegetation management prescriptions under Alternative B further promote age and species diversity among differing plant communities with an emphasis on mountain shrub, sagebrush, and forest communities. In addition, habitat fragmentation management actions limit and (or) restrict development in areas with low development potential for coal and oil and gas resources, with public surface ownership greater than 50 percent, and contiguous native vegetation blocks of greater than 10,000 acres. This restriction benefits VRM relative to Alternative A. Rehabilitation efforts following

fire reduce impacts to areas impacted by suppression efforts. The long-term impacts to visual resources from management activities are anticipated to be beneficial.

Overall, Alternative B affords more protection to visual resources and results in fewer adverse impacts to visual resources than Alternative A. In addition, Alternative B considers existing conditions throughout the planning area and, therefore, increases the potential to achieve visual resource goals.

Alternative C

Visual Resource Management. Similar to Alternative B, this alternative proposes fewer acres of BLM-administered surface for VRM Class II and more for VRM Class III and IV. The acreage are as follows: (Class II, 367,151 acres; Class III, 433,799 acres; and Class IV, 560,627 acres). Isolated 40-acre parcels contiguous to USFS property are managed to meet USFS visual objectives for those areas.

Surface Development. Relative to current management, large-scale disturbances, high-profile intrusions, and concentrated development are somewhat restricted under Alternative C. For example, wind-energy development in the planning area is restricted to areas designated as power classes 3, 4, 5, 6, and 7 (see Table 3-26). Under Alternative C, coal development is limited to the existing CDPA and impacts to VRM are confined to that area. However, the remainder of the planning area has fewer restrictions on surface development than Alternative B, which allows for more visual intrusions and an increased contrast compared to Alternative B, but less than Alternative A. This alternative protects scenic quality better than Alternative A, less than Alternative B, and the same as Alternative E.

Alternative C is slightly less restrictive than Alternative B, but more restrictive than Alternative A. In addition, Alternative C has less acreage of expected long-term surface disturbance compared to Alternative A.

Restrictions on the types of facilities that could be placed in utility corridors are lifted, with the exception of the Oregon Trail Road ROW Corridor, Segment A. Restrictions along this corridor increase. Visual intrusions within important landscapes are limited; however, more adverse impacts to visual resources occur across the planning area.

Vegetation Management. Vegetation management under Alternative C is similar to the description under Alternative B, but realized on a smaller scale as the area managed is smaller. The management to limit habitat fragmentation still represents a beneficial impact to VRM compared to Alternative A. Alternative C allows clear-cuts up to 20 acres, with meandering boundaries, which has a greater impact on visual resources than the 5-acre clear-cuts under alternatives A and B. Priority on limited suppression tactics are employed to reduce the potential disturbance from heavy equipment use. Visual impacts resulting from both wildland and prescription fires are expected to be slightly less than those under alternatives A and B.

Overall, Alternative C affords more protection to visual resources and results in less adverse impacts to visual resources relative to Alternative A.

Alternative D

Visual Resource Management. Alternative D proposes fewer acres of BLM-managed surface in Class II than alternatives B and C, but more than Alternative A. Similarly, a larger portion of total surface acreage would be in Classes III and IV. (Class II, 205,542 acres; Class III, 548,780 acres; and Class IV, 607,255 acres).

Surface Development. Relative to current management, large-scale disturbances, high-profile intrusions, and concentrated development are expected to continue under Alternative D. For example, wind-energy development in the planning area is not restricted to areas designated as particular power classes (see Table 3-26). In addition, Alternative D allows for the most extensive resource development. As a result, except for Alternative A, this alternative provides less protection for the visual values of BLM-administered lands than the other alternatives. Scenic quality is adversely impacted more and mitigation efforts are held to lower standards for much of the area.

This alternative poses the least restrictive management strategy in regard to preserving NHTs and Other Historic Trails, ROW, renewable energy facilities, and temporary projects that exceed contrast levels for the given VRM classes. Alternative D has the fewest surface-development restrictions and the greatest potential for long-term surface disturbance (22,080 acres) from BLM actions compared to all other alternatives.

Vegetation Management. Under Alternative D, the impacts of mechanical, chemical, and biological vegetation treatments, excluding forest harvest and fire management, are similar to those under Alternative B. Clear-cutting could have greater impacts on visual resources compared to Alternative A because there are no restrictions on the size or shape of the cuts. Alternative D results in the greatest adverse impacts to visual resources from both large and small-scale projects. In addition, Alternative D has the greatest probability of the alternatives to exceed allowable visual impacts in Class II and III areas for the planning area.

Alternative E (Proposed Casper RMP)

Visual Resource Management. Alternative E is a compromise between Alternative D and existing management shown in Alternative A (maps 35, 38, and 39). It proposes the same acreage for the three VRM Classes as Alternative C. (Class II, 367,151 acres; Class III, 433,799 acres; and Class IV, 560,627 acres).

Surface Disturbance and Development. Relative to current management, large-scale disturbances, high-profile intrusions, and concentrated development are somewhat restricted under Alternative E. For example, wind-energy development in the planning area is restricted to areas designated as power classes 3, 4, 5, 6, and 7 (see Table 3-26). Visual impacts from wind energy are greater than under Alternative B and less than under Alternative D.

The impacts to visual resources are anticipated to be commensurate with development activities. Potential adverse impacts to visual resources from ROW facilities are similar to those anticipated under Alternative C.

Vegetation Management. Under Alternative E, the impacts of mechanical, chemical, and biological vegetative treatments are similar to those described under Alternative C. Under Alternative E, habitat fragmentation management is slightly less beneficial than under Alternative C, as the acreage protected is smaller, but still provides greater beneficial impact to VRM than under Alternative A.

Overall, Alternative E affords more protection to visual resources and results in less adverse impacts to visual resources relative to Alternative A.

4.5.3.3 Conclusion

With much of the BLM-administered surface and federal mineral estate ownership located within VRM Class IV areas, minimal restrictions on mineral development for protection of visual resources are anticipated under all alternatives. Alternatives B, C, and D are anticipated to limit the potential impact to

visual resources. Under Alternative A, the direct impact to the visual setting associated with surface disturbance and facility development continues throughout the planning area and has the potential to impact areas that are highly valued by the public, such as cultural sites, historic trails, and recreational areas, to a greater degree than all other alternatives. This conclusion is based on the outdated inventory under Alternative A.

Overall, Alternative B produces the least adverse impacts to VRM because other management actions under this alternative are restricted to certain geographic areas, cover proportionately less area, or are buffered from other resources, thus producing smaller, more localized disturbances to visual resources. Alternatives A and C are similar in that they allow slightly more disturbance compared to Alternative B, but still result in somewhat less adverse impacts to visual resources compared to Alternative D. Impacts to visual resources under Alternative E are less than Alternative D. The order of the alternatives in ascending degree of potential impact from the least adverse to the most adverse on visual resources is Alternative B, alternatives C and E, followed by alternatives D and then A.

4.6 Land Resources

The Land Resources section describes the potential impacts to lands and realty, renewable energy, ROW and corridors, transportation, OHV use, livestock grazing, and recreation with respect to each alternative. Within each resource, impacts common to all alternatives and the methods and assumptions used for the analysis are described.

4.6.1 Lands and Realty

The following discussion highlights the primary differences between alternatives and their anticipated impacts on the lands and realty program. Included in the lands and realty program are land-tenure adjustments (e.g., sales, exchanges, acquisitions), land use authorizations (i.e., leases and permits), and withdrawals, classifications, and segregations. This section focuses on how other resources potentially impact the lands and realty program by limiting or preventing realty actions. Refer to maps 40 through 44 for lands and realty.

The purpose of the lands and realty program is to facilitate management of the Casper Field Office's lands and resources. The program adapts according to changing land management and resource needs and issues. As such, lands and realty program actions generally result in beneficial impacts within the Casper Field Office with regard to multiple use objectives. In addition, the presence of other resources could prevent lands and realty actions from being carried out and, thus, they are considered adverse impacts on the lands and realty program.

The only types of direct impacts to the lands and realty program occur when other resources are present, preventing or making it considerably more difficult to complete a transaction. For example, mitigating resource values required for a land-disposal transaction substantially increase processing costs and timeframes required to complete the transaction and temporarily delay the transaction; this would be considered a long-term impact. Generally, there are no indirect impacts to the lands and realty program. Most adverse impacts possibly occurring to other resources as a result of lands and realty actions would be long-term. A direct impact to another resource as a result of the lands and realty program is a land classification precluding the use of that land for mining. An indirect impact could result from the impacts of development (e.g., noise) on disposed of lands. The most beneficial impacts to other resources associated with lands and realty actions would be direct and long-term. For example, acquiring lands for the purpose of improving resource conditions would be a permanent transaction, yielding a long-term beneficial impact. Similarly, disposal of lands to consolidate lands within the Casper Field Office also would be a permanent transaction yielding long-term beneficial impacts.

4.6.1.1 Methods and Assumptions

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

- The demand for land-tenure adjustments will increase, but the 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.
- Land acquisition is a support function for resources programs (e.g., cultural resources, fish and wildlife, recreation). The priority or the urgency associated with any acquisition is established by the resource program benefiting from the acquisition.
- Land-tenure adjustments (e.g., disposal, acquisition) focus on disposing scattered parcels within eastern Converse, Platte, and Goshen counties and acquiring lands in Natrona and western Converse counties to consolidate ownership and improve management opportunities.

- In general, all public lands are managed under BLM's existing guidance and established policy. The lands and realty program follows existing guidance when disposing of public lands or when acquiring lands to support BLM management programs. When existing policy or guidance makes it difficult to complete a transaction or when mitigation is required for a land-disposal transaction, these restrictions are considered adverse impacts to the lands and realty program.
- The number of land use authorizations will increase over the life of the plan.
- Existing withdrawals to other federal agencies (i.e., USFWS, the U.S. Bureau of Reclamation [USBR], the U.S. Department of Energy [DOE], the USFS, the Federal Aviation Administration [FAA], the National Park Service [NPS], and the Federal Energy Regulation Commission [FERC]) will continue.
- The resource programs having the most potential to affect lands and realty include cultural resources, fish and wildlife, special status species (wildlife, fish, and plants), riparian vegetation and wetland communities, water resources, recreation, special designations, and other MAs.

4.6.1.2 Analysis of Alternatives

Allowable uses and management actions that could adversely impact lands and realty primarily include restrictions prohibiting or delaying lands and realty transactions. For example, lands and realty actions that benefit one or more resources or programs may result in adverse impacts to others.

Impacts Common to All Alternatives

The lands and realty program alternatives identify a broad range of actions that can directly and indirectly change existing land uses (maps 40 through 44). Land disposal to private entities or local governments could result in some lands being available for future development. Land use authorizations could authorize a variety of uses on public lands. Withdrawals set aside, withhold, or reserve public lands for public purposes that could prevent certain land use changes and development.

Under current conditions, large-scale changes in land use are not expected to occur. Any public lands transferred out of federal ownership are typically used for the same or similar purposes as they are currently used. Urban expansion is one of the most probable large-scale land use changes, but most communities in the planning area, aside from the Midwest and Edgerton areas, are surrounded by large areas of private land. The large amount of private land is expected to satisfy the demand for community growth and expansion over the life of the plan. These land use changes would be coordinated with local governments in consideration of existing land use plans and policies (e.g., county comprehensive plans).

Land exchanges, sales, and purchases would help to consolidate the relatively fragmented public land ownership pattern within the planning area and allow for better management of public lands over the long term. Consolidating public land holdings improves access to public lands, reducing the number of access easements needed and helping to reduce encroachment problems from adjacent property owners. These impacts are considered beneficial impacts. Land use authorizations include leases and permits under Section 302(b) of the Federal Land Policy and Management Act (FLPMA) for various activities including habitation, cultivation, and trade and manufacturing uses; airport leases; and (Recreation and Public Purposes) R&PP leases and conveyances. Historic low demand for leases, permits, and airport leases is expected to continue. Demand for R&PP leases and conveyances will be needed to meet the land needs of communities and nonprofit groups.

Withdrawals, Classifications and Segregations. Table 4-13 summarizes withdrawals, classifications, and other segregations by alternative. These actions are generally beneficial to resources, resource uses, special designations, and other MAs because they prohibit land disposal and exclude mining location or some additional form of mineral development. Withdrawals, classifications, and other segregations of

lands suspend them in whole or in part from the operation of public land and (or) mineral laws. Operations under the mining laws are not discretionary actions with the Secretary of the Interior. Segregation is the act or action applied to prohibit operations under the mining law and an underlying reason for withdrawals, classifications, and other segregations. Mineral material disposal and mineral leasing are discretionary actions, and no existing or proposed withdrawal segregates from disposal of mineral materials. Only in rare instances does a withdrawal segregate against mineral leasing. The four occurrences of segregation from mineral leasing are (1) Naval Petroleum Reserve No. 3, where oil and gas extraction occurs under authority of the DOE and all such mineral production is Congressionally directed; (2) Fort Laramie National Historic Site, where oil and gas leasing is incompatible with preservation and management of the unique resources at this historic site; (3) Camp Guernsey, where oil and gas leasing and development is incompatible with military training exercises, including heavy artillery use and the presence of unexploded ordinance; and (4) Spook Site Mills Tailings, where oil and gas exploration could compromise the purpose of the withdrawal (i.e., consolidating, containing, and controlling radioactive mill tailing wastes). Public lands withdrawn to enlarge Fort Laramie or Camp Guernsey, and lands considered to be withdrawn for the Umetco Mills tailings area under the alternatives, also segregate from mineral leasing. In most instances, mining is prohibited on withdrawn lands.

Alternative A

Land-Tenure Adjustment. Under Alternative A, approximately 1,248,068 acres of land within the planning area are identified for retention and management, whereas 103,725 acres are identified for standard disposal, and 9,784 acres are identified for restricted disposal (see Map 40). Public lands around communities are disposed of on a case-by-case basis to meet community expansion needs. Lands needed for community expansion are sold or transferred under the R&PP Act. The BLM also pursues acquisition of land in identified areas, as well as lands and interests in areas of high recreation or paleontological value, with sensitive cultural resources, with important fish and wildlife habitats, and along historic trail segments. The primary method for acquiring land is to complete land exchanges as opportunities arise; in some instances, outright purchases are pursued. Public land tracts not critical to current management objectives are disposed of to acquire land in these areas as exchange opportunities arise.

Land-tenure adjustments consolidate and reduce fragmented ownership of lands within the planning area, thereby improving management of public lands. Disposing of scattered and isolated parcels reduces management costs and eliminates inefficiencies. Land disposal may benefit ongoing development of private lands by making additional lands available. Future development of these disposal lands has a potential indirect, long-term impact on other resource programs, but not on the lands and realty program. Several resources, resource uses, special designations, and other MAs could impact proposed land disposal actions by either delaying a final decision or by preventing the proposed transfer. Prior to each disposal action, inventories for cultural resources, fish and wildlife, special status species (wildlife, fish, and plants), riparian vegetation and wetland communities, water resources, recreation, and mineral resources are completed. In addition, disposal actions are reviewed to determine whether they occur within MAs. If any of these resources or MAs are present, mitigation may be required or the proposed disposal may be prohibited. Disposal actions may be revised or modified to avoid impacts. Changing disposal actions can increase processing costs and timeframes, generally resulting in direct long-term impacts to the lands and realty program. Restricted disposal parcels recognize the presence of important resources, resource uses, or MAs, and require inclusion of restrictions in the disposal.

Table 4-13. Summary of Withdrawals, Classifications, and Other Segregations by Alternative (Acreage)

Resource	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)	Segregates/Withdraws from		
						Disposal	Leasables	Locatables
OTHER MANAGEMENT AREAS								
Alcova Fossil Area*	1,613	6,913	5,805	0	5,805	Yes	No	Yes
Cedar Ridge TCP*	0	19,637	4,058	0	4,058	Yes	No	Yes
Jackson Canyon*	10,546	11,387	10,546	10,546	11,387	Yes	No	Yes
North Platte River	3,226	3,226	3,226	3,226	3,226	Yes	No	Yes
Sand Hills Management Area*	0	17,601	17,601	0	17,601	Yes	No	Yes
South Bighorns/Red Wall*	0	216,459	309,854	0	75,913	Yes	No	Yes
RESOURCE PROTECTION								
Bald Eagle Roosts (excludes Jackson Canyon)*	37,290	37,290	37,290	37,290	37,290	Yes	No	Yes
Fremont Canyon C&MU	0	1,261	0	0	1,261	Yes	No	Yes
Habitat Fragmentation*	0	580,007	238,724	0	168,386	Yes	No	Yes
Muddy Mountain C&MU	1,027	1,027	1,027	0	1,027	Yes	No	Yes
NHTs and Other Historic Trails*	0	924,153	80,285	0	80,285	Yes	No	Yes
Public Water Reserves	1,389	1,389	1,389	0	1,389	Yes	No	No
Stock Driveways	101,636	101,636	56,328	0	56,328	Yes	No	No
Table Mountain, Bump-Sullivan and Springer C&MU and Rawhide	2,018	2,201	0	0	0	Yes	No	Yes
CLASSIFICATIONS								
Coal Classifications	417,000	417,000	417,000	0	0	Yes	No	Yes
R&PP Classification	3,468	3,468	3,468	623	3,468	Yes	No	Yes
OTHER SEGREGATIONS								
Exchange Land	9,618	9,618	9,618	0	0	No	No	Yes
Sale Land	187	187	187	0	0	No	No	Yes
OTHER FEDERAL AGENCY WITHDRAWALS								
Air Navigation Site (FAA)	198	198	198	198	198	Yes	No	Yes
Camp Guernsey	5,620	11,850	11,850	5,620	11,850	Yes	Yes	Yes
Fort Laramie National Historic Site (NPS)	792	940	940	940	940	Yes	Yes	Yes
Grey Reef Power Site (FERC)	29	29	29	29	29	Yes	No	Yes
Mill Tailings Spook (DOE)	90	90	90	90	90	No	Yes	Yes
Mill Tailings UMETCO*	0	987	987	987	987	Yes	Yes	Yes
National Forests (USFS)	81,768	81,768	81,768	81,768	81,768	Yes	No	No
Thunder Basin National Grasslands (USFS)	163,238	163,238	163,238	163,238	163,238	Yes	No	No
National Wildlife Refuge (USFWS)	7,458	7,458	7,458	0	7,458	Yes	No	Yes
Naval Petroleum Reserve Number 3 (DOE)	9,324	9,324	9,324	9,324	9,324	Yes	Yes	Yes
Reclamation (USBR)	18,078	18,078	18,078	18,078	18,078	Yes	No	Yes

Notes: Alternative A reflects existing withdrawals and withdrawals proposed in the current plan.

* Areas not listed in Table 3-25 because they are not existing withdrawals.

C&MU Classification and Multiple Use Act of 1964
DOE U.S. Department of Energy
FAA Federal Aviation Administration
FERC Federal Energy Regulatory Commission
NHT National Historic Trails
No. Number
NPS National Park Service
R&PP Recreation and Public Purposes
TCP Traditional Cultural Property
USBR U.S. Bureau of Reclamation
USFS U.S. Forest Service
USFWS U.S. Fish and Wildlife Service

Land Use Authorization. Under Alternative A, the Casper Field Office responds to specific proposals for land use authorizations on a case-by-case basis. Similar to land-tenure adjustments, resources, resource uses, and MAs potentially impact land use authorizations. During processing, an inventory is completed to determine the presence of cultural resources, fish and wildlife, special status species (wildlife, fish and plants), riparian vegetation and wetland communities, water resources, recreation, and mineral resources. If any of these resources or MAs are present, mitigation may be required or the proposal may be prohibited. Disposal actions may be revised or modified to avoid impacts. Change in these actions can increase processing costs and timeframes, generally resulting in direct, long-term impacts to the lands and realty program. The limited demand for land use authorizations is anticipated to have minimal impact on the lands and realty program.

Alternative B

Land-Tenure Adjustment. Under Alternative B, about 1,236,083 acres of land within the planning area are identified for retention and management, whereas 109,210 acres are identified for standard disposal and 16,344 acres are identified for restricted disposal (see Map 41). In addition, public lands around communities are disposed of on a case-by-case basis to meet community expansion needs, but only when there are critical needs that must be met. Under Alternative B, the BLM pursues acquisition of land in all areas described under Alternative A, as well as lands on Cedar Ridge and along the 13-mile stretch between Fort Laramie and Guernsey. The BLM also pursues acquisition of lands and interest in lands with high paleontological values, sensitive resources, and historic trail segments to enhance resource management opportunities. Due to the similarity of the proposed lands and realty actions, impacts to land disposal under Alternative B are similar to those described for Alternative A.

Land Use Authorization. Under Alternative B, land use authorizations are prohibited with the exception of sites required to meet critical management needs. It is anticipated that demand for land use authorizations would be the same as under Alternative A, but fewer proposals would meet the critical management criteria. Under Alternative B, other resources, resource uses, and MAs have similar, but smaller, impacts on the lands and realty program compared to Alternative A.

Alternative C

Land-Tenure Adjustment. Under Alternative C, approximately 1,114,064 acres of land within the planning area are identified for retention and management, whereas 241,364 acres are identified for standard disposal and 6,149 acres are identified for restricted disposal (see Map 42). Also, public lands within a 5-mile buffer of communities are disposed of on a case-by-case basis to meet community expansion needs. Under Alternative C, the BLM pursues acquisition of all lands described under alternatives A and B, except no lands are acquired at Table Mountain. Due to an additional 137,639 acres of land identified for disposal, impacts to land disposal under Alternative C are similar, but greater than, those described for Alternative A.

Land Use Authorization. Under Alternative C, land use authorizations are allowed to meet public demand and are evaluated on a case-by-case basis. Impacts on the lands and realty program under Alternative C are similar to Alternative A.

Alternative D

Land-Tenure Adjustment. Under Alternative D, about 1,131,290 acres of land within the planning area are identified for retention and management, whereas 224,834 acres are identified for standard disposal and 5,453 acres are identified for restricted disposal (see Map 43). Also, public lands within a 5-mile buffer of communities are disposed of on a case-by-case basis to meet community expansion needs. Under Alternative D, land acquisition occurs on a case-by-case basis as identified by BLM resource

program needs, including lands with high paleontological values, sensitive cultural resources, and historic trail segments. Due to an additional 121,109 acres of land identified for disposal and additional lands identified on a case-by-case basis, impacts to land disposal under Alternative D are similar but greater than those described for Alternative A.

Land Use Authorization. Under Alternative D, land use authorizations are allowed to meet public demand and evaluated on a case-by-case basis. Impacts on the lands and realty program under Alternative D are similar to Alternative A.

Alternative E (Proposed Casper RMP)

Land-Tenure Adjustment. The acreage for retention, disposal, and restricted disposal under Alternative E are the same as those proposed under Alternative D (see Map 43). Public lands within a 5-mile buffer of communities are disposed of on a case-by-case basis to meet community expansion needs. Under Alternative E, land acquisition occurs through exchange, purchase, or donation as identified by BLM resource program needs, including lands with high paleontological values, sensitive cultural resources, and historic trail segments. Due to an additional 121,109 acres of land identified for disposal and additional lands identified on a case-by-case basis, impacts to land disposal under Alternative E are similar to Alternative D and greater than those described for Alternative A.

Impacts from other resources, resource uses, special designations, and other MAs would likely increase under Alternative E (similar to Alternative D) as compared to Alternative A because Alternative E seeks to dispose of an additional 121,109 acres of identified lands, as well as additional lands on a case-by-case basis.

Land Use Authorization. Under Alternative E, land use authorizations are allowed to meet public demand and evaluated on a case-by-case basis. Impacts on the lands and realty program under Alternative E are similar to alternatives A and D.

4.6.1.3 Conclusion

Disposal and land use authorizations are the only aspects of the lands and realty program with the potential for adverse impact under the alternatives. The impacts from alternatives, as reflected by the acreage of lands identified for land disposal, in decreasing order, are C, D, E, B, and A.

4.6.2 Renewable Energy

Actions occurring through implementing each alternative could affect renewable energy. Direct impacts on renewable energy include management actions permitting or prohibiting renewable energy development. Market demand will drive the development of renewable energy sources on public lands in the planning area. Indirect beneficial impacts on renewable energy sources include management actions encouraging or facilitating renewable energy development. Indirect adverse impacts include management actions constraining renewable energy development.

In general, public utilities and private interests will develop renewable energy facilities based on market demand. Wind-energy development, the fastest growing sector of the renewable energy market, has recorded consistent growth of more than 20 percent over the last 10 years (Research and Markets.com 2003). Many initiatives both in the public and private sectors have increased renewable energy production in Wyoming, with 284.65 megawatts (MW) of current installed renewable capacity (GAO 2004; Energy Atlas 2004). Solar and biomass energy development are not projected to impact available renewable energy resources in the planning area; therefore, wind energy is the primary focus of this analysis. Refer to Map 45 for renewable energy.

4.6.2.1 Methods and Assumptions

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

- Wind-energy development is expected to increase, relating directly to energy prices, national policy involving renewable energy, and other factors that encourage demand for alternative energy sources.
- Future wind-energy development proposals on BLM-administered lands within the planning area are subject to the decisions and policy developed in the BLM's *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (BLM 2005d). The EIS proposes a Wind Energy Development Program that implements policies and BMPs for ensuring impacts of wind-energy development on BLM lands are kept to a minimum.
- Individual pieces of public land within the planning area have varying wind-energy potentials: 146,129 acres with outstanding/superb potential; 999,468 acres with fair, good, or excellent potential; and 215,980 acres with poor or marginal potential.
- The acreage with the potential for wind-energy development is relatively large compared to the current demand. Market demand, rather than BLM policy, will be the primary future constraint on wind-energy development. The utility companies will use economic data to plan for future wind-energy development.
- For analysis purposes, the national wind-energy capacity is projected to increase to 48,000 MW or more by 2025 (GAO 2004).
- The mapping of wind-energy potential areas 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.

4.6.2.2 Analysis of Alternatives

Allowable uses and management actions potentially impacting renewable resources are described as impacts common to all alternatives and specific to individual alternatives.

Impacts Common to All Alternatives

The types of impacts projected to occur to renewable energy as a result of the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts to renewable energy are described under individual alternatives (Map 45).

Resource management actions, other than those associated with the renewable energy program itself, potentially affecting renewable energy include vegetative resources, visual resources, cultural resources, historic trails, wildlife resources, and ROW and corridors. In general, managing these resources could constrain renewable energy development. Specifically, renewable energy development would be restricted due to habitat fragmentation.

Alternative A

Under Alternative A, the BLM responds to specific proposals for renewable energy on a case-by-case basis, with no limitations based on wind-energy potential. Wind-energy development is constrained by existing management policies and prohibitions involving lands with high resource values.

Approximately 429,294 acres of public land is available for wind-energy development without use limitations. On 723,619 acres of public land, wind-energy uses are restricted in a minor way (e.g.,

seasonal restriction). The areas unavailable for location of any wind-energy development, also called wind-energy ROW exclusion areas, would affect 208,664 acres of public land.

Under Alternative A, direct impact to renewable energy development increases administrative costs due to the increased time associated with environmental data gathering under the case-by-case permitting process. Direct impacts also may include possible increases in the complexity of infrastructure to support more dispersed renewable energy development.

Alternative B

Under Alternative B, approximately 146,129 acres of BLM surface land are available for wind-energy development. This acreage represents those areas classified as having only outstanding/superb wind-energy potential. Wind-energy development is further constrained by various management policies and prohibitions involving lands with high resource values (e.g., measures to protect habitats, historic trails, and visual resources).

Under Alternative B, restrictions are greater for renewable energy development than under Alternative A. Approximately 27,005 acres of public land are available for wind-energy development without use limitations. Minor restrictions (e.g., seasonal restriction) to wind-energy development would be implemented on 29,768 acres of public land. The areas unavailable for location of any wind-energy development, also called ROW exclusion areas for wind development, would be greater than Alternative A and affect 89,356 acres of public land.

Under Alternative B, administrative costs and infrastructure complexity associated with wind-energy development are reduced. If Alternative B leads to concentrating renewable energy development, it also could reduce the costs of operation and maintenance of facilities within the planning area.

Alternative B limits wind-energy development on public land more than Alternative A and other Action Alternatives because of VRM program constraints. Indirect benefits for the local economy would result from diversification of local energy sources. These constraints may prompt interested developers to bypass public land in favor of private lands in the planning area.

Alternative C

Alternative C allows wind-energy development in areas identified as having outstanding/superb and good/excellent/fair wind-energy potential (1,145,597 acres) in the planning area.

Alternative C has greater restrictions on wind-energy development compared to Alternative A, but less than Alternative B. Approximately 307,560 acres of public land are available for wind-energy development without use limitations. On 276,287 acres of public land, wind-energy uses are restricted in a minor way (e.g., seasonal restriction). The areas unavailable for location of any wind-energy development affect 561,750 acres of public land.

Alternative D

Alternative D actively markets renewable energy development in the planning area on all public lands without regard to wind-energy potential and responds to specific proposals on a case-by-case basis. Alternative D allows wind-energy development in areas identified as having outstanding/superb and good/excellent/fair wind-energy potential (1,145,597 acres) in the planning area.

Approximately 541,230 acres of public land are available for wind-energy development without use limitations. Minor restrictions (e.g., seasonal restriction) to wind-energy development would be

implemented on 422,761 acres of public land. Approximately 181,606 acres of public land are unavailable for location of any wind-energy development.

Direct impacts under Alternative D include a decrease in revenues to the U.S. Treasury (general fund) as a result of cost reimbursement or rental reductions and (or) waivers, increased costs to developers due to the increased need for and time associated with environmental data gathering under the case-by-case permitting process, and possible increased management, maintenance, and infrastructure development of dispersed facilities.

Alternative E (Proposed Casper RMP)

Alternative E opens 146,129 acres of public lands identified as having outstanding/superb and 999,468 acres good/excellent/fair wind-energy potential for wind-energy development. Under Alternative E, the BLM responds to specific solar energy development proposals on a case-by-case basis. Also under Alternative E, the potential administrative costs and infrastructure complexity could be reduced. If Alternative E leads to concentrating renewable energy development, it may also reduce the costs of operation and maintenance of facilities within the planning area. With respect to other resource management, wind-energy development may be constrained by implementing various BLM programs. For example, VRM programs under Alternative E, including viewshed management for considerable cultural resources, could constrain wind-energy development.

Approximately 324,013 acres of public land are available for wind-energy development without use limitations. Wind-energy uses are restricted on 458,006 acres of public land in a minor way (e.g., seasonal restriction). The areas unavailable for location of any wind-energy development affects 363,578 acres of public land.

Indirect beneficial impacts for the local economy result from diversification of local energy sources; however, constraints limiting wind-energy development to specific areas may prompt interested developers to bypass public land in favor of private lands in the planning area.

4.6.2.3 Conclusion

Public utilities or private interests develop wind energy based on general market demand and the constraints placed on energy development opportunities in the planning area. In general, alternatives B, C, and E are the most constraining to wind-energy development, while alternatives A and D are the least constraining. However, because areas suitable for wind-energy development exceed current demand, it is expected that market demand, rather than BLM policy, is the primary constraint of wind-energy development.

4.6.3 Rights-of-Way and Corridors

The purpose of the ROW and corridors program is to provide routes needed to cross public lands. Impacts to ROW and corridors include restrictions on accommodating new facilities.

Impacts to ROW include restrictions on accommodating new facilities, possible restrictions on ROW uses, and, to some degree, changes in permitting timeframes, including restrictions protecting resource values, special designations (e.g., ACECs), MAs, economics, and recreation areas.

4.6.3.1 Methods and Assumptions

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

- ROW increase in conjunction with expanded oil and gas, utility, and communication development.
- Corridors and communication site windows, also called ROW use areas, are designated as the preferred future locations for ROW and can be designated only in an RMP or plan amendment.
- ROW for smaller distribution facilities for minerals development and transportation, power and telephone services, and access roads are expected to remain at current levels, but could fluctuate with the degree of development.

4.6.3.2 Analysis of Alternatives

Allowable uses and management actions potentially impacting ROW and corridors are described as impacts common to all alternatives and impacts specific to individual alternatives.

Impacts Common to All Alternatives

The types of impacts projected to occur to ROW and corridors as a result of the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts to ROW and corridors are described under individual alternatives.

The difference between the five alternatives involves the level of development resulting from other land uses and primarily oil and gas development, as well as the levels of restrictions (avoidance and exclusion areas) on the locations of ROWs. All alternatives include restrictions on surface-disturbing land uses, including ROWs. Corridors could beneficially impact oil and gas development and major utility projects. Major transporting pipelines would benefit from placement in a corridor where land use conflicts have been eliminated or reduced. Designated corridors are intended to reduce resource and land use conflicts as much as possible. The corridors (ROW use areas) included in the alternatives are all considered viable, with few known conflicts.

ROWs concentrated in a corridor tend to localize or confine disturbance to a smaller area and prevent disturbance in areas identified as sensitive.

Alternative A

Under Alternative A, the restrictions or limitations placed on ROW and corridors by BLM management actions would not change. Current management accommodates new ROW on a case-by-case basis. No new corridors are planned under Alternative A.

Impacts under Alternative A could include longer routes from new major facilities based on preferred corridor alignment for those ROW, resulting in a possible increase in the cost of construction. Increased environmental data gathering and analysis for ROW proposals outside the identified corridors also could increase overall cost. Direct impacts to new communication sites might increase time for permitting and possible increased environmental data gathering and analyses if designated sites cannot be used. Short-term direct impacts to shorter ROWs may result in a longer route as a result of requiring alignment in corridor fashion alongside existing ROW. The proposed ROW corridors under Alternative A are consistent with the Western Utility Group (WUG) study described in Chapter 3.

Under Alternative A, 94,584 surface acres of public land are committed to newly designated ROW corridors as the preferred locations for major ROW uses and ROW use areas for communication sites. Approximately 429,294 acres of BLM-administered surface lands are open to ROW without use

limitations (except for standard stipulations associated with the construction of ROW such as BMPs). Areas where ROW uses are restricted in a minor way (e.g., seasonal restrictions for wildlife habitats), called ROW avoidance areas, include 723,619 acres of BLM-administered surface lands (see Map 46). Areas unavailable for location of any ROW, called ROW exclusion areas, include 208,664 acres of BLM-administered surface lands. Indirect impacts to ROW and corridors under Alternative A could include economic impacts from the preference for locating major ROW within designated corridors (versus more direct routes).

Alternative B

Under Alternative B, the Oregon Trail Road ROW Corridor, Segment A, is removed and the Cabin Creek Corridor added. All ROW would be required to be located within designated corridors or communication site windows. The proposed ROW corridors under Alternative B are consistent with the WUG study described in Chapter 3.

Alternative B provides expedited permitting processes for applicants requesting to locate facilities along the designated corridors and at the designated communication sites. However, Alternative B is more prohibitive than Alternative A and the most prohibitive of all alternatives with respect to shorter, individual ROW activities with all ROW being restricted to locations within designated corridors.

Indirect economic impacts may be felt by future ROW users with the loss of the Oregon Trail Road ROW Corridor, Segment A. Under Alternative B, no ROW located outside a designated ROW corridor (or use area) could be approved, creating adverse economic and social impacts to smaller ROW users, as well as failing to provide ROW for development or transportation of minerals not located near existing ROW corridors.

Under Alternative B, 110,873 surface acres of public land are committed to designated ROW corridors as the required locations for all ROW uses. Approximately 94,592 acres of BLM-administered surface lands are available for ROW without use limitations (except standard stipulations). Areas where ROW uses are restricted in some minor way include 167,379 acres of BLM-administered surface lands (see Map 47). ROW exclusion areas impact 1,099,606 acres of BLM-administered surface lands.

Alternative C

Under Alternative C, management encourages ROW to route in corridor fashion, but also provides for case-by-case evaluations of all ROW projects. While existing corridors would continue, restrictions on uses of all but one corridor segment would be removed. The proposed ROW corridors under Alternative C would be consistent with the WUG study described in Chapter 3, similar to alternatives A and B.

Surface ROW facilities are restricted, but not prohibited, in the Oregon Trail Road ROW, Segment A. Under Alternative C, case-by-case site evaluations are implemented, resulting in impacts to uses of communication sites similar to Alternative A.

Alternative C could result in adverse economic impacts to companies wanting to add aboveground facilities along the Oregon Trail Road ROW corridor, Segment A. Indirect impacts to smaller ROW users are similar to Alternative A.

Under Alternative C, 94,584 surface acres of public land are committed to designated ROW corridors as the preferred location for major ROW uses. Approximately 373,626 acres of BLM-administered surface acres are available for all ROW without use limitations (except standard stipulations). Areas where ROW uses are restricted in some minor way include 311,758 acres of BLM-administered surface lands (see Map 48). ROW exclusion areas affect 676,193 acres of BLM-administered surface lands.

Alternative D

Alternative D allows the most energy development with the least constraints. Under Alternative D, all corridor and communication site window designations are removed and ROW facility locations are unconstrained to corridors. Alternative D increases the potential for resource conflicts (e.g., cultural resources) and the need for gathering or verifying environmental data, as well as increases the time added to permit new ROW. By eliminating corridor designations, Alternative D is not consistent with the WUG study described in Chapter 3.

Economically, parties interested in developing ROWs could benefit from the ability to locate anywhere in the planning area; however, these benefits might be offset by increased costs for environmental analysis and permitting.

Under Alternative D, approximately 633,642 acres of BLM-administered surface area are available for all ROW without use limitations (except standard stipulations). Areas where ROW uses are restricted in a minor way include 489,922 acres of BLM-administered public land (see Map 49). ROW exclusion areas affect 238,013 acres of BLM-administered surface lands.

Alternative E (Proposed Casper RMP)

Under Alternative E, existing corridors remain in place, but restrictions on types of uses in those corridors could be removed on a case-by-case basis. Similar to Alternative A, communication sites are the preferred location, with eight windows (or use areas) designated under Alternative E. However, as under Alternative A, additional communication sites outside these areas could be allowed on a case-by-case basis. Alternative E allows the most flexibility for ROW projects of all kinds, while taking advantage of the benefits provided by corridor designations. The proposed ROW corridors under Alternative E are consistent with the WUG study described in Chapter 3 (Map 50).

Similar to Alternative C, Alternative E could result in adverse economic impacts to companies wanting to add aboveground facilities along the Oregon Trail Road ROW Corridor, Segment A. In addition, a new corridor, the Cabin Creek Corridor, is designated. Indirect impacts to shorter ROWs are similar to Alternative A.

Under Alternative E, 116,327 surface acres of BLM-administered land is committed to designated ROW corridors. Approximately 379,738 acres of BLM-administered surface lands are available for all ROWs without use limitations (except standard stipulations). Areas where ROW uses are restricted in a minor way include 539,799 acres of BLM-administered surface lands. ROW exclusion areas affect 442,040 acres of BLM-administered surface lands.

4.6.3.3 Conclusion

For the most part, major ROW uses could be accommodated by designated corridors traversing through the planning area. The areas closed to occupancy in the planning area are not so extensive that they could not be bypassed by major ROW. Some additional project costs, however, may result.

Alternative D results in the least constraints and, therefore, the fewest adverse impacts on ROW use. Alternative D also provides the most acreage for ROWs without use limitations of all alternatives. Alternative C provides designated corridors with the least restrictions for major ROW uses and case-by-case analyses for new ROW. Alternative B is most restrictive in terms of accommodating new ROW and would preclude ROWs located outside a designated corridor. In terms of least potential adverse impacts to most potential adverse impacts to ROW and corridors, the alternatives rank as follows: Alternative D, followed by alternatives A, C, E, and B.

4.6.4 Transportation

The following section describes potential impacts to the transportation program resulting from the different alternatives and associated resource management opportunities. This section includes a description of potential impacts on the BLM's ability to acquire access across private lands, develop access across public lands, identify acquisition areas, and manage the transportation network. Refer to Map 51 for transportation.

For the purposes of this analysis, providing access to sections of the planning area previously inaccessible is considered a beneficial impact to the transportation program. These beneficial impacts can be direct, such as when the BLM acquires access to an area for recreation purposes, or indirect, such as when a road developed for oil and gas activities opens previously inaccessible areas of the planning area. Routine and emergency maintenance activities on roads and trails are considered inherent requirements of the transportation program, and would not represent an adverse impact on the transportation program. Because access would be acquired only from willing land owners, impacts to private land interests would be minimal. Certain resource management actions could adversely impact the transportation program by placing limitations on transportation development.

4.6.4.1 Methods and Assumptions

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

- The transportation network (i.e., highways, railways, airports) within the planning area is essentially complete and no major transportation infrastructure facilities are anticipated. Developing new roads for recreational access will be limited.
- Additional roads will be developed, as needed, to support expanded oil and gas operations in compliance with the multiple use concepts within FLPMA; the transportation program may adopt some of these roads for specific uses, such as recreational access.
- Use of roads will increase based on anticipated increases in oil and gas activity and recreational use demands.
- Unauthorized or unneeded roads may be closed and reclaimed.
- Road design and construction will consider other resource programs to minimize impacts.

4.6.4.2 Analysis of Alternatives

Allowable uses and management actions with the potential to impact transportation include cultural and paleontological resources, fish and wildlife, soils, special status species, riparian and wetland communities, VRM, water resources, recreation, OHV use, special designations, and MAs.

Impacts Common to All Alternatives

The types of impacts projected to occur to transportation resulting from the various alternatives are similar; however, the intensity of impacts is anticipated to vary by alternative. Therefore, impacts to transportation are described under individual alternatives.

The alternatives allow varying amounts of new development directly and indirectly to meet the demand for recreational access. The increased level of development associated with oil and gas and other minerals and forest management would modify the road network, which provides additional access through the planning area. This additional access provides opportunities for recreation, particularly OHV use and dispersed recreational activities. The transportation program attempts to capitalize on these developments as opportunities to meet access demand. Access acquisition is primarily focused in

Natrona County. Access would be acquired only from willing landowners, so it is anticipated that impacts on private land ownership would be minimal. Access to some acquisition areas may require multiple access routes, as well as multiple types of access (e.g., roads, pedestrian, or equestrian trails). Managing new roads would require routine and emergency maintenance. Other resource considerations (e.g., cultural resources, special status species) may constrain routing alternatives, require that other routing alternatives be adopted, may increase acquisition costs, or may determine that access acquisition would not be feasible.

Alternative A

Under Alternative A, the BLM pursues acquisition of 16 easements for access across approximately 36 miles of private land. In addition, the BLM seeks to obtain access to 12 identified areas for acquisition. Acquiring the easements would provide legal public access to areas with high recreation demand and facilitate use of public lands otherwise inaccessible to and unusable by the public, as well as allow administrative access for management of natural resources. Acquiring easements would be a direct, long-term beneficial impact to the transportation program.

Alternative B

Under Alternative B, the BLM pursues acquisition of the same number of easements as under Alternative A. Access is obtained to five identified areas for acquisition where demand and public use are high. Alternative B results in a considerably lower level of direct, long-term beneficial impacts to the transportation program, as compared to Alternative A, by providing less public and administrative access to lands currently inaccessible and unusable.

Alternative C

Under Alternative C, the BLM pursues acquisition of eight easements for access across approximately 25 miles of private land. Access is obtained to all identified areas for acquisition under Alternative A, with the exception of Table Mountain. Alternative C results in a somewhat lower level of direct, long-term beneficial impacts to the transportation program as compared to Alternative A by providing less public and administrative access to lands currently inaccessible and unusable.

Alternative D

Under Alternative D, the BLM pursues acquisition of easements only where needed to meet critical resource needs. Easements are identified on a case-by-case basis where public access demand is high. Access is obtained to all areas identified for acquisition under Alternative A, with the exception of Table Mountain. However, if these areas do not have critical needs, access might not be pursued. Alternative D would likely result in the lowest level of direct, long-term beneficial impact, since only the most critical of public access needs would be met.

Alternative E (Proposed Casper RMP)

Under Alternative E, the BLM pursues acquisition of easements only where legal access is needed for resource management. Areas are identified on a case-by-case basis to meet program needs and where public access demand is high. Alternative E results in somewhat higher level of direct, long-term beneficial impacts to the transportation program than Alternative A by providing more public and administrative access to lands currently inaccessible and unusable. These access acquisitions focus on a clear definition of public access needs and would be developed in conjunction with a long-term travel management plan.

4.6.4.3 Conclusion

Impacts associated with transportation management (i.e., routine and emergency road maintenance) generally are commensurate with the number of easements acquired under a particular alternative. Alternative E requires somewhat more maintenance than required under Alternative A, while Alternative C requires somewhat less maintenance than required under Alternative A. Alternative B requires considerably less maintenance than required under Alternative A. Alternative D may require the least amount of maintenance, since only areas with critical access needs would be served.

Overall, Alternative E could provide the most growth to the transportation network and increase access within the planning area to the greatest degree, primarily due to increased mineral and oil and gas development and forest products management. Alternative B could provide the lowest level of transportation and access development in favor of resource conservation. Alternatives A and C could be similar in these respects, and potentially provide a balance between increasing transportation and access for resource development and conservation of resources, although this would occur through a slightly different combination of actions. Compared to Alternative A, Alternative E could result in a somewhat higher level of beneficial impacts to transportation and public access.

4.6.5 Off-Highway Vehicles and Travel Management Areas

The following section describes the impacts of each alternative on OHV use and management in terms of short-term and long-term impacts. As appropriate, impacts are described as beneficial or adverse with respect to OHV use and management in the planning area. Refer to maps 52 to 56 for OHV use designations by alternative in the planning area. See Appendix R for additional information on OHV management.

4.6.5.1 Methods and Assumptions

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

- OHV use is motor vehicle use of the nonhighway road and trail network on public lands. It includes all resource-related activities, including recreation and those associated with livestock grazing and mineral development.
- OHV use will increase at a faster pace than the rate of population growth because of the increasing popularity of off-road travel, improvements to OHV technology, and intensity of development and use of public lands.
- Recreational OHV use is highest within large blocks of public land with legal access and with special resource values such as those associated with hunting and fishing.
- If adequate infrastructure exists and is maintained, the majority of recreational OHV users choose routes that minimize environmental degradation.
- The analysis assumes OHV designations are to be fully implemented 5 years after approval of this RMP.

4.6.5.2 Analysis of Alternatives

Allowable uses and management actions with the potential to impact OHV use primarily include land use designations and restrictions. Impacts are described in two ways: the impact a particular designation has on OHV use, and the impact OHV use has on lands due to a particular designation.

Impacts Common to All Alternatives

All alternatives designate areas within the planning area as open, closed, limited to existing roads and trails, or limited to designated roads and trails. All designations except "closed" allow for off-road vehicle travel during the performance of necessary tasks provided no resource damage incurs.

Impacts from the Designation "Open to All Motor Vehicles." This designation would be of great benefit to users of all-terrain vehicles, motorcycles, and other strictly off-road vehicles. The impact is that such designations benefit OHV users and the community by providing an appropriate, managed place for a kind of OHV recreation considered inappropriate in most areas. "Open" designations often allow for unmanaged road proliferation, damage to or loss of vegetation, soil erosion, or degradation of the visual quality of the landscape. Such designations are often in direct conflict with other resource values, such as wildlife habitats and scenic quality.

Impacts from the Designation "Limited to Existing Roads and Trails." Under this designation, unauthorized user-created roads and trails would continue to add to the number and miles of motor vehicle routes already in existence on public lands. No existing inventory of roads exists, making it difficult for the BLM to determine what existed at the time of the RMP decision. A new set of vehicle tracks is often confused with an "existing" road and as these tracks attract use, new roads are made. Accordingly, the road system continues to grow. Neither public access nor OHV opportunities would be diminished by this designation.

Impacts from the Designation "Limited to Designated Roads and Trails." Under this designation, the incremental growth of unauthorized user-created roads and trails would be curtailed, as would unauthorized OHV use. OHV use would be limited to a specific, designated network of roads and trails. Such a limitation would be beneficial to soils and limit the spread of INPS, but would have no impact on commercial or industrial uses of public lands because roads necessary to facilitate those uses are handled under permits or authorizations. This designation would not affect public access, nor would it diminish OHV opportunities. Further, it would have no impact on other resource uses, such as mineral development, because under such a designation, access roads are authorized as needed.

Impacts from the Designation "Closed to All Motor Vehicle Use." This designation eliminates motor vehicle access from closed areas, limiting access to nonmotorized means (e.g., foot or horseback). However, no alternative proposes more than 2 percent of the public lands administered by the Casper Field Office to be "closed," so the impact is minor. This designation would be highly beneficial to the resources and resource uses, (wildlife habitats, etc.) it earmarks for protection. "Closed" designations adversely affect uses requiring road access, such as minerals, when there is a need for road access in closed areas to develop the minerals.

Alternative A

Alternative A continues current OHV use designations, including 187 acres (< 1%) open to OHV use within the Poison Spider OHV Park; 1,311,715 acres (96%) designated as limited to existing roads and trails; 47,014 acres (4%) designated as limited to designated roads and trails; and 2,661 acres (< 1%) as closed to OHV use. This alternative would have no impact on the volume of OHV use either in the short or long term. Because of the designation's nature, some degree of unauthorized road proliferation would continue. The "open" designation of the Poison Spider OHV area would continue to fill a need and is considered to be a positive impact. The "closed" area, less than 1 percent of the planning area, would curtail soil erosion and damage to vegetation for critical resources—a positive impact that would far outweigh any adverse impact due to the exclusion of motor vehicle access.

Alternative B

Alternative B has no impact on the overall pattern of OHV use in the planning area, even though the OHV designations would change substantially. Further, there would be no change in access to public lands. The biggest impact is that OHV management would be more effective on 425,657 acres (31% of the planning area) of public lands designated as "limited to designated roads and trails." OHV use in about 33 percent of the planning area would be managed to protect erosive soils, riparian habitats, and important wildlife habitats. Limitations in these areas would help protect sensitive resources.

For the remainder of the planning area, 909,651 acres (67%) would be designated as "limited to existing roads and trails"; 26,027 acres (2%) would be "closed"; and 242 acres (< 1%) would be "open" to all OHV use.

In the area "limited to existing roads and trails," a degree of unauthorized road and trail proliferation would continue.

The expansion of the Poison Spider OHV Park by 55 acres (from 187 to 242 acres) would help alleviate congestion resulting from increasing popularity of the site. The expanded open area would reduce some conflict and safety issues associated with OHV use at the site. This "open" designation is a positive impact, since it provides an appropriate venue for unlimited OHV activities in an environmentally appropriate setting.

The OHV closure (26,027 acres) would help protect irreplaceable paleontological and historic resources and areas of particular environmental concern.

Mineral use of public lands approved by this RMP remain unaffected by this alternative because roads necessary for development are routinely authorized.

Alternative C

Alternative C would result in 285 acres (< 1%) "open to all OHV use"; 1,162,113 acres (85%) designated as "limited to existing roads and trails"; 191,236 acres (14%) "limited to designated roads and trails"; and 7,943 acres (1%) "closed to all OHV use."

Overall, the impacts under this alternative are similar to Alternative A. The difference is that a greater degree of improved management would be directed toward protecting erosive soils, riparian habitats, and important wildlife habitats. Limitations in these areas would help protect sensitive resources.

The large area proposed for designation as "limited to existing roads and trails" would see some degree of continued unauthorized road and trail proliferation.

The benefits of expanding the Poison Spider OHV Park described under Alternative B apply to this alternative as well, but to a larger degree given the larger expansion area.

The proposed "closed" area would provide significant protection for critical resources, but be insignificant in terms of a loss of OHV opportunities.

Mineral use of public lands approved by this RMP would remain unaffected by this alternative because roads necessary for such development are routinely authorized.

Alternative D

Alternative D has no significant impact on the overall pattern of OHV use within the planning area. The acreage of lands include 285 acres open to all OHV use; 1,292,630 acres (95%) designated as "limited to existing roads and trails"; and 66,001 acres (5%) designated as "limited to designated roads and trails." These two "limited" categories are nearly identical to Alternative A. Under this alternative, 2,661 acres would be "closed to all OHV use," an area almost equal to the acreage also proposed for closure in alternatives B and C.

The impacts regarding the Poison Spider OHV Park are identical to Alternative C. The benefits of expanding the Poison Spider OHV Park would continue as described for Alternative C and be long-term in nature. A potential second OHV park would benefit urban OHV users by providing a needed venue for activities unsuitable elsewhere on public lands.

The proposed "closed" area provides substantial protection for critical resources, but would otherwise be insignificant in terms of a loss of OHV opportunities or motorized access to public lands. The OHV closure (2,661 acres) would help protect irreplaceable paleontological and historic resources and areas of particular environmental concern.

Mineral use of the public lands approved by this RMP would remain unaffected by this alternative because roads necessary for such development are routinely authorized.

Alternative E (Proposed Casper RMP)

Alternative E changes OHV designations within specified areas, resulting in 285 acres "open to all OHV use"; 196,824 acres (15%) designated as "limited to designated roads and trails"; 1,162,244 acres (85%) designated as "limited to existing roads and trails"; and approximately 2,224 acres "closed to all OHV use." Alternative E expands the existing Poison Spider OHV Park as done in alternatives C and D.

This alternative is similar to the others in that the majority (85%) of the public lands in the planning area are proposed for the "existing roads and trails" category. When implemented, this alternative would help curtail unauthorized road proliferation on the majority of the planning area. Alternative E provides a balanced approach to OHV management anticipated to have a minimal impact to OHV users and other resource values.

This alternative does not limit public access or change the authorized use of the public lands; however, it has fewer adverse impacts than the present situation across the spectrum of resource values and uses of public lands, including livestock grazing and wildlife habitats. Recreational activities and settings would be protected from degradation due to road and trail proliferation.

The proposed "closed" area, less than 1 percent of the planning area, would provide substantial protection for critical resources, but be insignificant in terms of a loss of OHV opportunities. The OHV closure would help protect irreplaceable paleontological and historic resource and areas of particular environmental concern.

Mineral use of public lands approved by this RMP would be unaffected by this alternative because roads necessary for such development are routinely authorized.

4.6.5.3 Conclusion

Alternatives B, C, and E substantively change OHV-use designations compared to Alternative A. These three alternatives provide more effective management of motorized use to sensitive areas and decrease environmental impacts from motor vehicle use.

Alternatives A and D have the greatest potential for user conflicts and degradation of natural resources. These alternatives do not provide the BLM with management tools needed to reduce unauthorized activities, such as off-trail OHV use and OHV use in sensitive areas and (or) habitats. The impacts of all alternatives are incurred in the short term and last through the life of the RMP.

4.6.6 Livestock Grazing

Allowable uses and management actions limiting, reducing, or prohibiting livestock grazing or animal unit months (AUMs) in the planning area are considered adverse impacts. Deterioration in rangeland health also is considered adverse to livestock grazing. For example, restrictions on livestock grazing or AUMs from other resources are considered adverse impacts. Conversely, beneficial impacts to livestock grazing include those allowable uses or actions that improve rangeland health, increase AUMs, or decrease restrictions and costs to graze livestock.

Direct impacts to livestock grazing from RMP alternatives are anticipated from actions that change AUM allocations, alter rangeland health, or restrict livestock grazing. For example, the BLM policy requirement for deferring two growing seasons of grazing following prescribed burns and wildland fire would be considered a direct adverse impact to livestock grazing because it would prohibit grazing. Indirect impacts to livestock grazing are anticipated from actions that change rangeland health and productivity or that change livestock grazing management on BLM-administered public lands within the planning area. For example, the deferment of grazing following fire may require the lessee to lease additional pasture, feed livestock for longer periods of time, install additional fencing, or reduce herd size. On the other hand, deferment enhances vegetative recovery, which over time could benefit livestock grazing through improved forage conditions. In addition, surface-disturbing activities could decrease forage availability indirectly by decreasing range productivity due to the introduction of INPS.

For the purpose of this analysis, short-term impacts to livestock grazing include activities that change the AUM allocation or range health within 5 years of when the activity occurs. Long-term impacts are those remaining or occurring after 5 years. For example, the 2-year grazing deferment following fire would be a short-term impact; a long-term beneficial impact to livestock grazing also may occur if the result is an increase in the quality or quantify of forage.

4.6.6.1 Methods and Assumptions

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

- No net change in AUMs is expected in the planning area from implementing land-disposal and land-acquisition actions.
- All surface-use proposals are to be fully implemented during the planning period.
- Surface disturbances reduce the amount of forage available to livestock and wildlife and can be short- and long-term (see Appendix M).
- Surface disturbances increase the likelihood for the introduction and spread of INPS, which degrade rangeland health.
- To varying degrees, areas of concentrated livestock and wildlife use exist in most allotments (i.e., riparian and wetland areas, salting areas, fence corridors, etc.). Range improvements and managed livestock grazing methods disperse livestock and minimize livestock concentrations.
- Grazing practices can maintain, improve, or degrade rangeland health. The *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b) are

designed to maintain or improve rangeland health. Approximately 10 percent of the public land acreage in the planning area is evaluated annually.

- Managing wildlife and special status plants and wildlife can affect livestock grazing allocations.
- Management actions for other resource uses can affect livestock grazing allocations and management.
- The BLM works with grazing lessees to identify and accomplish livestock grazing objectives. Over the last 50 years, rangeland health has improved across the planning area due to improved grazing management practices.

4.6.6.2 Analysis of Alternatives

Allowable uses and management actions potentially impacting livestock grazing include all surface-disturbing activities, restrictions protecting other resources, fire management, INPS, and proactive livestock grazing management practices. These allowable uses and management actions are anticipated to result in changes in AUM allocations and rangeland health. Although multiple factors influence AUM allocations and rangeland health, key planning issues identified during the scoping process identified surface-disturbing activities, restrictions protecting other resources, fire management, and INPS as the primary factors to be discussed in this section. Surface-disturbing activities and associated acreage are identified in Appendix M as part of the BLM's RFAs. Restrictions protecting other resources relate to inherit conflicts between completing resources and uses of the public lands and the challenges of managing for multiple use. The affect fire and, in some instances, lack of a natural fire regime, has on vegetative communities is another planning issue identified during the scoping process impacting livestock grazing. This impact could be through the short-term loss of forage and damage to range improvement facilities or the long-term changes occurring in forage quantity and quality or in plant community structure and composition. INPS also are a growing public concern in the planning area.

Grazing management practices are used to enhance rangeland health. Failure to implement proper grazing practices can adversely impact other resources, which, in turn, can affect management decisions related to livestock grazing. For example, season-long grazing in riparian areas can reduce riparian vegetation, breakdown streambanks, increase surface runoff and soil erosion, degrade wildlife habitats, and encourage the invasion or spread of INPS. Measures to mitigate these impacts could lead to changes in season of use, additional fencing, or reduction in AUMs. The impacts of livestock grazing on other resource topics (e.g., physical, biological, etc.) are discussed under the appropriate impacted resources.

Impacts to livestock grazing are described and organized according to (1) changes in AUM allocations, (2) changes in rangeland health, and (3) management actions. The description of management actions includes actions restricting livestock grazing, as well as actions that benefit livestock grazing. Refer to maps 57 through 59 for livestock grazing.

Impacts Common to All Alternatives

The types of impacts projected to occur to livestock grazing as a result of alternatives are similar and include changes in AUM allocations and changes in rangeland health. The factors anticipated as causing these impacts to livestock grazing primarily include surface-disturbing activities, restrictions protecting other resources, fire management and ecology, INPS, and proactive management actions of individual alternatives. Changes in AUM allocations and rangeland health, and the associated causative factors of these changes, are described below as impacts common to all alternatives. How the intensity of these impacts vary by alternative is described under individual alternatives.

Livestock grazing continues to occur within the majority of the planning area under all alternatives. Only 6,016 acres would be not available for livestock grazing. The *Standards for Healthy Rangelands and*

Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming (BLM 1998b) would be applied, regardless of alternative. Vegetation treatment projects designed to benefit rangeland health also are anticipated to occur under all alternatives. Over the life of the plan, it is estimated that to achieve or maintain the DFC for rangelands, approximately 500 acres of mechanical treatment, 8,000 acres of chemical treatment, and 20,000 acres of prescribed burning need to occur (Fifield 2004). Mechanical treatment of rangeland includes the mowing of sagebrush and the mowing or shredding of limber pine and juniper. This type of treatment is done to increase forage production and improve forage quality, as well as to facilitate grazing management activities (e.g., moving livestock between pastures). Chemical treatments are implemented to thin stands of sagebrush for improved forage production and to facilitate grazing management objectives, as well as to supplement INPS control activities in specific areas of the planning area. Prescribed burning is anticipated to be a higher priority over the life of the plan than it has been in the past. Prescribed burns are used to attain DFC, such as maintaining rangeland in a specific seral condition and to achieve wildlife, livestock, and watershed management objectives.

The analysis of alternatives is based on existing conditions and considers that over the last 40 to 50 years, an improvement in range conditions has occurred (see Livestock Grazing in Chapter 3). Such improvement is due largely to improved grazing management practices, development of range improvement projects (e.g., fences and water developments), and, in some cases, reduction in livestock numbers or change in kind of livestock. To various degrees, improvements in range conditions generally are anticipated to continue under all alternatives based on vegetation treatment, range-improvement projects, and development of guidelines for areas determined as not meeting rangeland health standards. Approximately 10 percent of the public land acreage in the planning area is assessed annually for rangeland health. INPS is one factor that may adversely impact the improving trend. Rangeland improvement projects, such as fencing and water development, also occur under all alternatives. It is anticipated that throughout the planning area, the development and maintenance of springs impact approximately 32 acres, new reservoir construction 80 acres, well installation 13 acres, water pipeline installation 36 acres, reservoir maintenance 40 acres, and fencing approximately 432 acres (Appendix M). Impacts associated with fencing and water pipelines generally are considered to be short-term and typically regeneration occurs within two to three growing seasons. While impacts associated with the construction of these facilities are short-term, the indirect impacts of these actions can be long-term. For example, new fences and new water developments are expected to change livestock grazing patterns and distribution within the allotment. Moreover, congregation of livestock and wildlife around the water source and trailing patterns also are expected to change as a result of constructing these facilities. Overall, the long-term impacts from these facilitates are anticipated to be a beneficial improvement of rangeland health. Rangeland improvement projects allow livestock managers and permittees to better implement grazing management practices and manage the distribution and movement of livestock within allotments.

Changes in AUM Allocation. Changes in AUM allocations within the planning area may occur for several reasons, but generally would be limited to specific allotments. In many cases, a change in AUM allocations reflects a change in management of livestock within an allotment, or a change in management of another resource that affects livestock. For example, if grazing management and (or) range improvement projects have increased the overall productivity of an allotment, then it may be appropriate to increase the number of AUMs permitted under the grazing lease for that allotment. Conversely, if forage productivity changes due to surface disturbances, fire, wildlife use (e.g., elk, prairie dogs), INPS increases, and (or) if monitoring indicates a downward trend in rangeland health, the number of AUMs permitted in an allotment may decrease. The number of AUMs permitted in an allotment also may decrease if it is discovered that the number of AUMs originally permitted over-allocated the forage resource. This may occur in allotments where features such as rock outcrops, steep slopes, rock or bare ground, or other factors limiting forage utilization by livestock were not adequately accounted for when

AUMs were originally allocated. Any potential changes to AUM allocations would be based on the amount of available forage in an allotment as determined through monitoring or other means. The number of AUMs permitted in an allotment may be adjusted permanently, placed into suspended use for the short-term (i.e., 3 to 5 years), or placed into temporary (1-year) non-use status. Temporary non-use status is re-evaluated on an annual basis. Changes in AUM allocations have more impact on individual allotments and lessees than they do to AUM allocations in the entire planning area.

Management actions potentially affecting the allocation of AUMs within the planning area include land disposal, mineral development, revocation of SDW withdrawals, managing big game crucial winter range, dedicating lands for recreational use (e.g., campgrounds), as well as management actions related to drought and wildland fire. Any changes in AUM allocations affect revenues generated by grazing fees, 50 percent of which are used by the Casper Field Office for range-improvement projects. The remaining 50 percent of grazing fee revenues on public lands in the planning area are used for public schools in the State of Wyoming. A more complete comparison of revenues generated by grazing fees among alternatives is described in the Socioeconomics section in this chapter.

Land disposal could occur throughout the planning area, but is focused primarily in Converse, Goshen, and Platte counties. The majority of land disposed would likely continue to be grazed under different (e.g., private) ownership; however, grazing fees would no longer be collected by the BLM for these areas. Frequently, land disposal is tied to land exchanges, resulting in no net change in AUMs, or only a slight increase or decrease in AUMs. Land exchanges between the BLM and private entities typically result in the BLM acquiring fewer acres of higher overall quality than the acreage disposed, resulting in a reduction in the number of acres managed by the BLM. However, the impact on overall AUMs in the planning area cannot be predicted due to the differences in forage production among sites. In addition, the Casper Field Office targets lands for acquisition that helps to consolidate public lands into larger blocks, making management more efficient. Therefore, land disposal and acquisition may or may not occur in the same allotment. Consequently, land exchange frequently has a more dramatic impact on specific allotments than on the total number of AUMs in the planning area.

Mineral development on public lands can result in the direct removal of forage available to livestock. As shown in Appendix M, projected surface disturbance from mineral development is anticipated to include short- and long-term removal of forage. Rangeland health and forage production can be indirectly affected by mineral development through the introduction and spread of INPS and soil loss. Both the direct and indirect impacts of mineral development are associated with surface disturbance caused by constructing road networks; drilling; installing well pads, pumps, pipelines, and water-detention facilities; other associated infrastructure; and ongoing maintenance. When compared to other minerals, oil and gas development is anticipated to cause the most surface disturbance and, hence, the most adverse impact on livestock grazing in the planning area. Forty allotments administered by the Casper Field Office are in areas considered having a high-to-moderate potential for oil and gas development. All or portions of these 40 allotments would likely be affected by oil and gas development. Both short-term and long-term impacts to AUM allocations may occur, of which the long-term impacts are of greater concern to livestock grazing. The degree of impact would depend on the rate of development, production success, and how quickly disturbed areas are reclaimed. For example, it is expected that disturbed areas associated with nonproducing wells would be reclaimed fairly quickly and AUMs taken out of production restored. This would be considered a short-term impact. On the other hand, for producing wells, it may take many years before disturbed areas are reclaimed and made available for grazing use. This would be a long-term impact. Reducing AUMs would be local in nature since development is unlikely to occur simultaneously across the entire area (e.g., all wells developed at the same time). The impact on AUM allocations could be substantial for individual allotments, but the overall impact of disturbance from oil and gas development on AUMs in the planning area is expected to be negligible.

In some instances, oil and gas development can benefit livestock by increasing the number of water wells available for livestock watering, thereby improving livestock distribution in an allotment. In other words, wells developed through oil and gas development can, in some instances, be converted to water wells for use by livestock and wildlife.

The revocation of SDW withdrawals would not substantively affect the total number of AUMS within the planning area, but would change how they are allocated among allotments. See Appendix T for SDW management standards.

Subdividing base property for recreation or housing developments is a recent activity that could potentially impact the BLM's ability to effectively manage adjacent public lands for grazing. Subdividing would primarily impact individual grazing allotments and could result in breaking allotments into smaller units or in canceling the grazing lease entirely. In addition to structures, subdivisions generally result in more roads, fences, powerlines, and other facilities—all of which can fragment habitat and increase the opportunity for introduction or spread of INPS. The long-term impact could result in loss of AUMs and degradation of rangeland health.

Long-term disturbances due to development on lands not administered by BLM are expected to be substantially greater than projected long-term disturbances on BLM-administered lands for all alternatives (Appendix M).

Under alternatives A, C, D, and E, the projected long-term oil and gas development assumes a decrease in the number of AUMs (an average of approximately 2,270 AUMs) on BLM surface lands. These actions would have the most substantial impact on the 40 allotments that possess a moderate-to-high potential for oil and gas development. However, when the entire planning area is considered, a decrease of 2,270 AUMs represents only 1 percent of the AUMs administered by the Casper Field Office.

Changes in Rangeland Health. Several natural and manmade factors can adversely affect rangeland health and productivity within the planning area. Natural factors include climatic cycles, such as drought, overpopulation of wild ungulates, and catastrophic events (e.g., flash floods or wildland fire). Manmade factors within the planning area generally include improper grazing, prescribed fire, surface disturbances, and INPS.

Grazing management practices are used to enhance rangeland health. Failure to implement proper grazing practices can indirectly impact livestock grazing through changes to rangeland health. Improper grazing by livestock within an allotment can increase soil compaction and hummocking in riparian and wetland areas and around water sources, decrease cover and vigor of native vegetation, increase the spread of INPS, increase trailing, increase soil erosion, accelerate streambank erosion, increase stream channel down-cutting, and generally degrade riparian and wetland areas. Of those allotments that failed to meet rangeland health standards, two main reasons were the condition of riparian and wetland areas and the presence of INPS. To the degree that livestock grazing was the cause, proper grazing management can help offset these conditions. Breaking up soil crust that restricts infiltration and inhibits seedling establishment and increasing cover and vigor of native vegetation are two ways of improving livestock grazing management. Increased cover and vigor of native vegetation could minimize soil erosion. The health of riparian and wetland areas also can be affected by grazing management and implementing rangeland improvement projects. Of note is that wildlife can cause similar types of adverse impacts to an allotment as those described for livestock. For example, in crucial big game winter range, heavy browse use by pronghorn has had a detrimental impact on rangeland health in these communities. Other examples of wildlife impacts include over-browsing important shrub species and increasing the spread of INPS; however, within the planning area, the intensity of these types of adverse wildlife-caused impacts to rangeland health typically is less than those caused by livestock. All alternatives strive to prevent

improper grazing through implementation of the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b). Therefore, it is anticipated that the degree and extent of grazing-related impacts on public lands over the long term should continue the current trend of improvement.

Fire can have both beneficial and adverse impacts on livestock grazing. In the short term, fire burns forage that livestock depend on and can damage facilities, such as fences. This damage can have a substantial adverse economic impact on grazing operations by requiring leasing of additional pasture, feeding livestock for longer periods of time, building more or repairing fences, and reducing herd size. BLM policy requires deferment of livestock grazing following prescribed burns or wildland fire for a minimum of two growing seasons; however, deferment depends on the severity of the fire and the types of restrictions placed on grazing use on public land. In the long term, fire may improve the quality and quantity of forage, thereby improving flexibility in managing livestock.

Both prescribed and wildland fires can increase the extent of INPS found on an allotment. The extent that fire degrades rangeland health through propagation of INPS typically depends on the proximity to a source of INPS seed, the type of vegetation community burned, and fire severity. For example, within the planning area, fires in mountain big sagebrush communities appear to be more resistant to cheatgrass infestation following a fire than other vegetation communities (e.g., mountain mahogany). Fire management using prescribed fire can benefit livestock grazing by improving the quality, quantity, and availability of forage for livestock. Prescribed fire also can help meet specific management objectives, such as improving distribution of livestock or removing dense stands of brush. However, prescribed burns generally are less likely in areas with mineral and energy development. Fire-suppression activities can limit the loss of livestock, short-term loss of forage, and in some cases, the long-term damage to vegetation caused by fire, but it can also increase the likelihood of INPS introduction and (or) spread into an allotment. The long-term impact of repeated fire suppression is the buildup of hazardous fuels and the increased risk of severe or catastrophic wildland fire.

One of the primary indirect impacts of surface disturbance affecting rangeland health and productivity is the introduction and spread of INPS. INPS displace native vegetation and, because they typically are unpalatable to livestock and wildlife, remain ungrazed. This places more strain on remaining native vegetation to support grazers, giving INPS an additional advantage over native vegetation in their competition for water, nutrients, and light. Invasion of some weed species (e.g., cheatgrass) can alter the fire regime of an area, causing long-term adverse impacts to livestock grazing. Surface-disturbing activities (see Glossary in Volume 2) typically include mechanized or mechanical disturbance, such as construction of well pads, roads, pits, reservoirs, pipelines, and powerlines; mining; and vegetation treatments. Although typically reclaimed, these activities can increase INPS infestations and soil erosion within allotments in both the short and long term. Land reclaimed from oil and gas or other activities generally has a short-term beneficial impact on rangeland productivity due to the reseeding and subsequent growth of native grasses.

Although not classified as a surface-disturbing activity, livestock grazing on public lands can decrease forage and disturb soils, thereby providing opportunities for INPS. Moreover, livestock, wildlife, and OHV use can transport INPS seeds to new locations, thereby expanding INPS to new locations. For example, without a holding period to allow flushing, movement of livestock onto or within public lands can spread INPS to new locations. Dust is another type of indirect impact caused primarily by roads. Dust can affect rangeland health and productivity and decrease the palatability of forage for livestock and wildlife.

In areas accessible to livestock, vegetation treatments, such as forest clear-cutting and thinning, also can indirectly benefit livestock grazing by allowing more light to reach understory vegetation, thereby

increasing herbaceous growth and temporarily increasing the amount of available forage to livestock. However, the authorized use of the area would be unlikely to change. Forest clear-cutting and thinning also could increase soil erosion and the spread of INPS.

Management Actions. Stipulations or restrictions designed to protect or manage other resources may adversely impact livestock grazing. Conversely, management actions designed for livestock grazing (see Chapter 2 alternatives) may benefit livestock grazing. Management actions of both types are described in this section. Impacts resulting from these actions anticipated to vary by alternative are described under individual alternatives.

Managing cultural resources can restrict the location and design of rangeland improvement projects and consequently grazing systems. For example, avoidance of important cultural resource sites, limitations on activities located within ¼ mile of historic trails, and activities impacting the historic landscape, may limit the BLM's ability to construct rangeland improvement projects in an allotment aimed at better management of livestock. In addition, cultural resource management can delay construction of range-improvement projects by requiring additional surveys and designing changes in projects to avoid important cultural sites.

Management for plant and wildlife species designated as threatened or endangered under the ESA or considered to be sensitive species by the BLM in the planning area, can affect livestock grazing in allotments where these special status species occur. Specifically, restrictions on the type, location, or time period the activity is allowed could limit livestock management options in allotments where sensitive species occur. For example, NSO restrictions could affect development or placement of range improvement projects and potentially affect the ability of the BLM or a grazing operator's ability to implement grazing management practices. In addition, special status species management can increase costs to livestock grazing operations by requiring additional surveys and design changes to projects. Water developments for livestock located in the Platte River watershed (part of the planning area) need to consider potential adverse consequences to threatened and endangered species found in the Platte River in Nebraska. In sagebrush habitats, where greater sage-grouse or other sagebrush-dependent species may occur, the placement of range-improvement projects, season of grazing use, level of grazing use, use of prescribed fire, adjustments in grazing preference, and seasonal restrictions all may be affected. Prairie dogs are another species that may affect livestock grazing. Though neither the white-tailed prairie dog nor the black-tailed prairie dog are listed as threatened or endangered, the black-tailed prairie dog is a BLM sensitive species, and both species are important food sources for several raptors and provide habitat for the burrowing owl and the black-footed ferret. The agricultural community in the planning area is concerned about large towns of prairie dogs and how they could affect the forage base, as well as how managing these species affects their grazing operations.

Nine special status plant species are known to or may occur in the planning area (see Special Status Species – Plants). Special considerations for the management of these plant species as they are discovered or as critical habitat is designated, could also impact livestock grazing. To prevent trampling by livestock, water developments and placement of salt, mineral, or forage supplements for livestock would not be allowed in areas inhabited by special status species or other sensitive areas under all alternatives; however, the size of the buffers vary by alternative. Any sort of buffer may restrict the placing and (or) timing of constructing range-improvement projects. In addition, no surface disturbance and no wildlife-disturbing activities would occur under any alternative within ¼ mile of all potential mountain plover nesting areas between April 10 and July 10. Each alternative poses different variations on buffer sizes and timing for raptors, greater sage-grouse, and special status plants (see Special Status Species sections).

Resource management actions pertaining to fish and wildlife management, special status species management, mineral development, lands and realty management, OHV use, recreational use, MA management, INPS management, fire management, soil management, forest and woodland management, grassland and shrubland management, and riparian and wetland management could potentially affect livestock grazing. Those actions that are anticipated to substantively impact livestock grazing are identified by alternative under the headings "Changes in AUM Allocations" and "Changes in Rangeland Health," below.

Alternative A

Changes in AUM Allocations. Most of the planning area continues to be open to livestock grazing under Alternative A (6,016 acres are not available for livestock grazing). Currently, approximately 182,479 AUMs are in the planning area. Over the life of the plan, AUMs are anticipated to decrease approximately 1 percent (to 179,977) under Alternative A. The anticipated decline in AUMs is due primarily to the 21,087 acres of projected long-term surface disturbance (Table 4-1). Prescribed fire, wildland fire, silvicultural practices, and other vegetative treatments impact livestock grazing in the short-term. Livestock grazing would be removed for one or more growing seasons to allow for regeneration of vegetation. In the long-term, these activities have beneficial impacts by improving the quantity and quality of forage available to livestock.

Changes in Rangeland Health. Current management seeks to maintain and improve rangeland health on all grazing leases with emphasis on I and M category allotments (refer to Glossary). Ten percent of public land acreage in the planning area is evaluated annually to determine whether they meet standards for healthy rangelands, including an assessment of soil erosion condition and stability. Indirect adverse impacts in rangeland health under Alternative A are anticipated from the invasion and spread of INPS, which is a function of surface disturbance.

Alternative B

Changes in AUM Allocations. Most of the planning area continues to be open to livestock grazing under Alternative B. Over the life of the plan, AUMs are anticipated to decrease less than 1 percent to 181,247 under Alternative B. The anticipated decline in AUMs is due primarily to the 11,565 acres of projected long-term surface disturbance (Table 4-1). As in Alternative A, prescribed fire, wildland fire, silvicultural practices, and other vegetative treatments impact livestock grazing in the short term. Livestock grazing would be removed for one or more growing seasons to allow for revegetation. In the long-term, these activities would have beneficial impacts by improving the quantity and quality of forage.

Alternative B requires that livestock grazing be managed to maintain a protective cover of vegetation and litter on all BLM-administered surface in the planning area. All grazing allotments would be monitored every year. Forage utilization would be limited to 40 percent of the current year's production. Implementing this alternative could result in the reduction of AUMs in many allotments throughout the planning area and affect management of a large number of grazing operations. Changes in herding practices and season of use, placement of supplement, additional fencing, and water developments may be needed to meet the target utilization levels. Some grazing operations may have to find additional forage or possibly reduce numbers. The reduction in AUMs is difficult to project, but could be greater than those lost due to surface disturbance. In some allotments, forage quantity and quality could improve with these changes and in the long-term, there could be an increase in AUMs. Wildlife accounts for some of the use, and while livestock would be removed when 40 percent utilization is reached, wildlife use would continue.

Changes in Rangeland Health. Alternative B seeks to maintain and improve rangeland health on all grazing leases with an emphasis on all grazing allotments. Alternative B monitors all grazing allotments

annually to limit forage utilization to 40 percent of the current year's production. Indirect adverse impacts in rangeland health under Alternative B are anticipated from the invasion and spread of INPS, a function of surface disturbance. Impacts from INPS are anticipated to be the least of any alternative under Alternative B (see INPS section). Under Alternative B, the placement of salt, mineral, or forage supplements for livestock would not be allowed within ½ mile of water, wetlands, and riparian areas, unless NEPA analysis shows that watershed, riparian, wetland, wildlife, and vegetative values would not be adversely affected. This management practice would lessen the amount of time livestock spend in these areas and improve the overall distribution of livestock. This would benefit the overall health of riparian and wetland communities and also the upland communities. Various factors including slope, vegetative communities, drainage patterns, location of water sources, and kind of livestock would influence the location and effectiveness of supplement placement. In some grazing allotments, it may be difficult to find suitable locations to meet this distance requirement.

Alternative C

Changes in AUM Allocations. Most of the planning area continues to be open to livestock grazing under Alternative C. Over the life of the plan, AUMs are anticipated to decrease approximately 1 percent to 180,075 under Alternative C. The anticipated decline in AUMs is due primarily to the 20,358 acres of projected long-term surface disturbance (Table 4-1). All opportunities to utilize wildland fire in commercial forest stands to reduce fuel loads would be taken. This would result in improved forest and woodland health in this fire-dependent ecosystem. However, this would have a short-term impact on livestock grazing by removing units of land for two growing seasons to allow for regeneration (BLM 2004e). Alternative C establishes target forage utilization levels for allotments with substantive erosive soils. Implementing this alternative could result in the reduction in AUMs in some allotments and affect management of these areas. Changes in herding practices and season of use, placement of supplement, additional fencing, and water developments may be needed to meet the target utilization levels. Some grazing operations may have to find additional forage or possibly reduce numbers. In some areas, forage quantity and quality could improve with these changes and, in the long-term, there could be an increase in AUMs. Wildlife would account for some of the use and, while livestock would be removed when 40 percent utilization is reached, wildlife use would continue.

Changes in Rangeland Health. Similar to current management, Alternative C seeks to maintain and improve rangeland health on all grazing leases with emphasis on all I and M category allotments. Alternative C establishes target forage utilization levels for allotments with substantive erosive soils. Indirect adverse impacts in rangeland health under Alternative C are anticipated from the invasion and spread of INPS, a function of surface disturbance. Impacts from INPS under Alternative C are anticipated to be less than under Alternative A (see INPS section). Under Alternative C, the placement of salt, mineral, or forage supplements for livestock would not be allowed within ¼ mile of water, wetlands, and riparian areas unless NEPA analysis shows that watershed, riparian, wetland, wildlife, and vegetative values would not be adversely affected. Similar to Alternative B, this management practice lessens the amount of time livestock spend in these areas and improves livestock distribution. This would benefit the overall health of all vegetative communities; however, due to the difference in distance, probably not as much as Alternative B.

Alternative D

Changes in AUM Allocations. Under Alternative D, most of the planning area continues to be open to livestock grazing. Over the life of the plan, AUMs are anticipated to decrease approximately 1 percent to 179,845. The anticipated decline in AUMs is due primarily to the 22,080 acres of projected long-term surface disturbance (Table 4-1). Under Alternative D, silviculture treatments in forests and woodlands, such as burning for regeneration purposes, impact livestock grazing in the short term similar to current management.

Changes in Rangeland Health. Alternative D seeks to maintain and improve rangeland health on all grazing leases with an emphasis on all I category allotments. Alternative D continues current management with respect to monitoring rangeland health. Indirect adverse impacts in rangeland health under Alternative D are anticipated from the invasion and spread of INPS, which is primarily a function surface disturbance. Impacts from INPS under Alternative D are anticipated to be the most of any alternative (see INPS section). Similar to Alternative C, Alternative D would not allow the placement of salt, mineral, or forage supplements for livestock within ¼ mile of water, wetlands, and riparian areas unless NEPA analysis shows that watershed, riparian, wetland, wildlife and vegetative values would not be adversely affected.

Alternative E (Proposed Casper RMP)

Changes in AUM Allocations. Most of the planning area continues to be open to livestock grazing under Alternative E. Over the life of the plan, AUMs are anticipated to decrease approximately 1 percent to 179,899. The anticipated decline in AUMs is due primarily to the 21,672 acres of projected long-term surface disturbance (Table 4-1). Livestock grazing and big game browsers and grazers may be restricted in the short term for stands that have burned and are regenerating. Alternative E establishes target forage utilization levels for allotments with substantive erosive soils, similar to Alternative C; therefore, the same impacts would be expected.

Changes in Rangeland Health. Similar to Alternative B, Alternative E seeks to maintain and improve rangeland health on all grazing leases with an emphasis on all grazing allotments. Similar to Alternative C, Alternative E establishes target forage utilization levels for allotments with substantive erosive soils. Indirect adverse impacts in rangeland health under Alternative E are anticipated from INPS, a function of surface disturbance. Impacts from INPS under Alternative E are anticipated to be less than under Alternative A and similar to Alternative C (see INPS section). Similar to alternatives C and D, Alternative E would not allow the placement of salt, mineral, or forage supplements for livestock within ¼ mile of water, wetlands, and riparian areas unless NEPA analysis shows that watershed, riparian, wetland, wildlife, and vegetative values would not be adversely affected.

4.6.6.3 Conclusion

Based on projected surface disturbance, INPS, and fire management and ecology, Alternative B is anticipated to have the least adverse impact to rangeland health relative to all alternatives. However, Alternative B places the most restrictions on livestock grazing and, therefore, is anticipated to have the most adverse impact to livestock grazing. Conversely, Alternative D is projected to have the most adverse impact to rangeland health and the least restrictions on livestock grazing. Therefore, Alternative D is anticipated to have the least potential adverse impact to livestock grazing in the short term. Alternatives A, C, and E fall between the extremes of alternatives B and D relative to anticipated adverse impacts to rangeland health and restrictions to livestock grazing. INPS is expected to adversely impact rangeland health under all alternatives. Alternative B is expected to have the least potential to spread INPS, whereas alternatives D and A are expected to have the greatest potential. Differences in projected AUMs among alternatives are approximately 1 percent and, therefore, not considered substantially different among alternatives.

4.6.7 Recreation

This section describes the impact of each alternative on recreational uses of public lands in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts are described as beneficial or adverse.

Direct impacts to recreation affect recreational use of public lands and facilities. For example, certain resource development actions might displace recreational uses from a given area, thus directly impacting recreation. An example of an indirect impact is where competing uses of the land adversely affect wildlife habitats, resulting in a decrease in big game populations and, therefore, a decrease in hunting (recreational) opportunities. Beneficial impacts to recreational resources include actions that improve the recreational setting, contribute to better recreational experience opportunities, and ultimately contribute to increased benefits from recreational use of the public lands. Adverse impacts are those that adversely affect the recreational setting, detract from the recreational experience opportunities of users, or decrease benefits from recreational uses.

4.6.7.1 Methods and Assumptions

This section describes environmental consequences as specifically as possible, but because RMP decisions are mostly broad resource allocations, a high degree of specificity often is not possible. Site-specific analysis normally is conducted as RMP decisions are implemented on the ground. For the purpose of this analysis, short-term impacts occur within 5 years of a given management action. Long-term impacts continue past 5 years or take more than 5 years to materialize.

4.6.7.2 Analysis of Alternatives

NHTs and Other Historic Trails and National Back Country Byways are discussed under Special Designations and Other MAs. Impacts to OHV use and visual resources are discussed in their respective sections.

Impacts Common to All Alternatives

Under all alternatives, activities related to resource development (e.g., construction of facilities, land clearing, and drilling activities related to minerals exploration and development; ROWs; and transportation) result in adverse impacts or the displacement of recreational opportunities and the degradation of recreational experiences for the life of those projects. Conversely, some development activities present opportunities to improve legal access to public lands, as well as to improve roads. In addition, management actions limiting development activities, such as developing stipulations (e.g., no surface development restrictions, CSU restrictions, and “no-leasing” restrictions) and mineral withdrawals could benefit recreation by protecting recreational facilities and providing long-term assurance that areas traditionally used for recreational purposes would not be affected by future development activities.

Management actions may inconvenience some users while enhancing the recreational experience of others; however, these actions are not expected to cause large-scale impacts on any level in the planning area.

Table 4-14 shows the SRMAs proposed under the alternatives. By identifying SRMAs, the respective areas become a higher priority for recreation management. Recreational management matrices in Appendix O identify the primary market strategy, niche, recreation management objective, targeted outcomes, prescribed setting character, and implementation strategy/actions for each proposed SRMA.

Accordingly, the BLM would be able to respond to the need for more intensive management efforts. SRMAs are eligible for construction funding, while Extensive Recreation Management Areas (ERMAs) normally are not. Without identifying SRMAs, recreational management would be a lower priority, management actions custodial in nature, and recurring needs not addressed.

Table 4-14. Recreation Management Areas by Alternative

Area	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Muddy Mountain EEA	SRMA	SRMA	SRMA	SRMA	SRMA
Goldeneye Wildlife and Recreation Area	SRMA	-	SRMA	SRMA	SRMA
North Platte River	SRMA	-	-	SRMA	SRMA
Poison Spider OHV Park	-	SRMA	SRMA	SRMA	SRMA
Middle Fork SRMA in Cooperation with BLM's Buffalo and Worland Field Offices	SRMA	SRMA	SRMA	SRMA	SRMA
National Historic Trails and Other Historic Trails	-	-	SRMA	SRMA	SRMA
Semino/Alcova National Back Country Byway	-	-	-	SRMA	-
South Bighorns/Red Wall National Back Country Byway	-	-	-	SRMA	-
Remainder of Casper Field Office Planning Area	ERMA	ERMA	ERMA	ERMA	ERMA

- No SRMAs
EEA Environmental Education Area
ERMA Extensive Recreation Management Area
OHV off-highway vehicle
SRMA Special Recreation Management Area

Impacts to Recreation Visitation

Recreational visitation is affected by population growth and the relative attractiveness of recreational opportunities. Alternatives promoting industrial development encourage population growth in both the short and long term, resulting in an increase in the demand for recreational use of public lands. Alternatives enhancing recreational resources increase their relative attractiveness, thereby increasing recreational demand. Recreational visitation would increase accordingly.

Fish- and wildlife-dependent recreational opportunities would increase or decrease in proportion to the overall productivity of habitats. Habitat management resulting in fish and wildlife population increases would increase recreational visitation. Habitat loss in response to allocation of lands and resources to competing industrial development could cause population decreases that, in turn, would decrease recreational visitation. This would be a long-term adverse impact.

As a state with a substantial tourism market, nonresident recreationists benefit from Wyoming opportunities, as well as provide economic benefits to the state. Nonresident visitation could be affected, although not greatly, by the various alternatives. These impacts are discussed briefly under the individual alternatives. Annual growth rates for nonresident recreation recently were estimated in a USFS study, providing the basis for this analysis (Bowker et al. 1999).

Alternative A

Recreation Management

Surface-disturbing Activities. Under Alternative A, approximately 59,990 short-term and 21,087 long-term acres of BLM-administered surface are expected to be disturbed by BLM actions over the life of the plan (Appendix M). These management actions could cause direct and indirect adverse impacts to recreation resources as conflicts between recreational use and development occur in developed areas. The quality of dispersed recreation would diminish over time in areas where large-scale development occurs. The impacts to recreation from surface-disturbing activities under Alternative A, while minor, are

anticipated to be adverse and similar in type to all other alternatives; however, the intensity of adverse impacts varies by alternative. Alternative A projects the second lowest acreage of surface disturbance among the alternatives.

Withdrawals and Closures to Mineral Resources. The impacts to recreation from closures and withdrawals under Alternative A are anticipated to be beneficial and similar in type to all other alternatives. However, the intensity of adverse impacts varies by alternative. The greater the acreage withdrawn, closed, or administratively unavailable for mineral development, the greater the beneficial impact to recreation. Alternative A withdraws, closed or makes administratively unavailable the least acreage of all the alternatives and, therefore, is considered the least beneficial to recreational uses of the land.

Special Recreation Management Areas

Proactive Recreation Management Actions. Under Alternative A, the following four existing SRMAs continue (see Table 4-14):

- Muddy Mountain EEA
- Goldeneye Wildlife and Recreation Area
- North Platte River
- Middle Fork (in cooperation with BLM's Buffalo and Worland field offices)

The existing NSO restriction within the Muddy Mountain EEA, along with the protective withdrawal segregating the area from operation of the public land laws, protects the recreational values of this SRMA. The existing areas not available for livestock grazing limit conflict between recreational users and livestock use. Vegetation treatments, if any, cause minimal short-term displacement of recreational use from areas where forest-management activities occur.

In the North Platte River SRMA, the development of new facilities, road upgrades, and reclamation of heavily impacted areas enhance river-related activities and user experiences. Developing recreational facilities would mitigate environmental impacts related to recreational use.

For the Goldeneye Wildlife and Recreation Area, an SRMA identification enables the BLM to respond to recreation management needs in a timely manner, while an ERMA identification may not.

As an area of long-standing interest to recreationists from Wyoming, the Middle Fork area benefits by being identified as an SRMA. Problems created by high recreation use adversely affecting the setting (primarily OHV use) have a much better chance of being addressed if identified as an SRMA.

Recreational Use

Other Resource Management Actions. Consolidating land ownership and additional public access to lands within the planning area increases recreational opportunities for recreational users seeking both primitive and more-developed recreational experiences.

Managing certain resources could influence recreational use patterns, opportunities, and preferences within the planning area to a limited extent. For example, current management actions for vegetation, water, soil, livestock grazing, and fire management actions are anticipated to influence the distribution of fish and wildlife throughout the planning area, thereby influencing recreational use. Increases in fish and wildlife populations translate to increased recreational opportunities, such as hunting, fishing, and viewing wildlife.

Cultural, paleontological, and VRM limitations could preclude the development of recreational facilities and opportunities in localized areas by protecting resources of interest. Forest-management activities would temporarily displace recreational use from areas where vegetation treatments occur, but would be of short-term duration and limited to specific locations within the planning area. None of these actions substantially alter the opportunities for, or distribution of, recreational activities within the planning area.

Under Alternative A, the established protection measures benefit recreation because of the direct link between recreational use (fishing, hunting, wildlife viewing, and photography) related to these resources. Under this alternative, nonresident visitation would increase in the short term by about 0.5-percent annually. Nonresident recreational visitation would increase annually in the short-term by 0.5 percent for hunting, 1.0 percent for fishing, and 1.5 percent for other dispersed recreation under this alternative (Bowker et al. 1999; Bennett 2004).

Alternative B

Recreation Management

Surface-disturbing Activities. Under Alternative B, approximately 36,650 short-term and 11,565 long-term acres of BLM-administered surface acres are expected to be disturbed by BLM actions over the life of the plan (Appendix M). These management actions could result in direct and indirect adverse impacts to recreation resources as conflicts between recreational use and development may occur in all disturbed (commercially developed) areas. The quality of dispersed recreation would diminish over time, but only in areas where large-scale development occurs. Potential adverse impacts to recreation resources from surface-disturbing activities under Alternative B would be less than those identified under Alternative A. Alternative B projects the lowest acreage of surface disturbance among the alternatives.

Withdrawals and Closures to Mineral Resources. The impacts to recreation from closures and withdrawals under Alternative B would be beneficial and similar in type to all other alternatives. Alternative B withdraws, closes, and (or) makes administratively unavailable more acreage to mineral resources than all other alternatives, resulting in the greatest beneficial impact to recreation of all alternatives.

Special Recreation Management Areas

Proactive Recreation Management Actions. Because the Muddy Mountain EEA would be administratively unavailable for the life of the plan from oil and gas leasing and geophysical operations, more protection for the recreational resources would be provided under this alternative than under Alternative A. Alternative B also provides for the least amount of forest-management activities in the Muddy Mountain EEA and, accordingly, poses the least potential to adversely affect recreational uses.

Compared to Alternative A, removing Goldeneye Wildlife and Recreation Area as an SRMA would result in an adverse impact to recreation resources.

Management actions proposed for the Middle Fork SRMA provide additional protection and recreational opportunities. The recreational setting is enhanced through the long-term. The quality of recreation experiences would improve and benefits from recreational activities increase. The North Platte River is managed as an ACEC.

Expansion of the Poison Spider OHV Park provides additional long-term recreational opportunities in this area. Further analysis of OHV use is included in the OHV section of this chapter.

Recreational Use

Other Resource Management Actions. Under Alternative B, management actions concerning vegetation, water, soil, livestock grazing, and fire would enhance fish and wildlife habitats throughout the planning area and preserve the landscape aesthetics for recreation to a greater extent than under Alternative A.

The increased restrictions would further protect resources of interest to the recreating public. Because forestlands would be managed for watershed stability, wildlife habitat, and recreational considerations, beneficial long-term impacts to recreation would occur.

Under Alternative B, nonresident visitation to the area would increase by about 1.3-percent annually through the short term. Nonresident recreational visitation would increase annually in the short term by 1.3 percent for hunting, 0.8 percent for fishing, and 3.8 percent for other dispersed recreation under this alternative (Bowker et al. 1999; Bennett 2004).

Alternative C

Recreation Management

Surface-disturbing Activities. Under Alternative C, approximately 58,689 short-term and 20,358 long-term acres of BLM-administered surface acres are expected to be disturbed by BLM actions over the life of the plan (Appendix M). These management actions could result in direct and indirect adverse impacts to recreation resources as conflicts between recreational use and development may occur in disturbed (commercially developed) areas. The quality of dispersed recreation would diminish over time in areas where large-scale development occurs. Potential adverse impacts to recreation resources from surface-disturbing activities under Alternative C are similar to those identified under Alternative A. Alternative C projects the third lowest acreage of surface disturbance among the alternatives.

Withdrawals and Areas Administratively Unavailable to Mineral Resources. The impacts to recreation from areas administratively unavailable and withdrawals under Alternative C would be beneficial and similar in type to all other alternatives. Alternative C withdraws, closes or makes administratively unavailable more acreage to mineral resources than Alternative A and the second highest acreage of all alternatives.

Special Recreation Management Areas

Proactive Recreation Management Actions. The impacts from proactive recreation management actions under Alternative C are the same as those identified under Alternative B, except for the following: the Muddy Mountain EEA would have slightly less protection than Alternative B, although actual recreational use would remain unchanged and recreational opportunities from an expanded Poison Spider OHV Park would be somewhat greater. These adjustments are minor and the nature and intensity of impacts to recreation resources would be the same as those identified in Alternative B.

As an SRMA, managing recreational use of NHTs and Other Historic Trails would be similar to statewide management of those trails. Recreational management of places such as Ryan (Prospect) Hill and Bessemer Bend would be a priority. Funding for management and maintenance, while not assured, would be more likely than if the areas were managed as an ERMA.

Recreational Use

Other Resource Management Actions. Impacts to recreation under Alternative C as a result of vegetation, water, soil, and fire management are similar to those under Alternative B, but to a somewhat limited extent due to a slight relaxation of restrictions under this alternative.

Cultural, paleontological, and VRM restrictions under Alternative C are more stringent than under Alternative A and less stringent than under Alternative B. These restrictions would not result in substantial differences in impacts to recreational resources.

A moderate relaxation of protective actions would be realized under Alternative C in relation to fish and wildlife management. Beneficial impacts described for Alternative B would, therefore, be expected under Alternative C, but to a lesser extent and would still be greater than those afforded under Alternative A.

Under Alternative C, visitation to the area by nonresidents would increase by about 0.8 percent per year through the short term. Non-resident recreational visitation would increase annually in the short-term by 0.8 percent for hunter, 0.8 percent for fishing, and 3.8 percent for other dispersed recreation under this alternative (Bowker et al. 1999; Bennett 2004).

Alternative D

Recreation Management

Surface-disturbing Activities. Under Alternative D, approximately 63,649 short-term and 22,080 long-term acres of BLM-administered surface acres are expected to be disturbed by resource development actions over the life of the plan (Appendix M). These actions would result in direct and indirect adverse impacts to recreation resources as conflicts between recreational use and other resource development occurs. The quality of dispersed recreational experience opportunities would diminish over time in areas where intensive development occurs. Potential adverse impacts to recreation resources from surface-disturbing activities under Alternative D are similar to, but greater than, those identified under Alternative A.

Withdrawals and Closures to Mineral Resources. The impacts to recreation from closures and withdrawals under Alternative D would be beneficial and similar in type to all other alternatives. Alternative D removes, closes, or makes administratively unavailable the fewest acres to mineral development, resulting in the least beneficial impact to recreation of all alternatives.

Special Recreation Management Areas

Proactive Recreation Management Alternatives. Under Alternative D, eight SRMAs are identified including all four existing SRMAs (refer to Table 4-14).

Accelerated forest-management activities in the Muddy Mountain EEA under Alternative D would have minor, short-term adverse impacts on recreational use of the area. Subsequent mineral location in the area would adversely impact the recreational resources for which the area was established by increasing surface disturbance.

The Goldeneye Wildlife and Recreation Area would continue to be managed for wildlife resources. The NSO restrictions would be carried forward within the boundary, continuing to protect the area from surface-disturbing activities; all other protective measures would be removed.

Under Alternative D, the North Platte River, managed as an SRMA (2,238 acres of BLM-administered surface), continues and includes the Trapper's Route Landing Sites and public lands within ¼ mile on

either side of the river from the high water mark between Pathfinder Reservoir and Casper. The lessening of restrictions on this portion of the river adversely affects the recreational setting and, as a result, adversely affects recreational experience opportunities.

While SRMAs may incorporate management actions to enhance and protect recreational values, they do not preclude development of other, often competing resources. Since this alternative emphasizes resource use over resource conservation, it can be expected that recreation uses would be in more direct competition with other resource use opportunities. The less stringent management prescriptions for the Muddy Mountain EEA SRMA and the North Platte River SRMA would result in long-term adverse impacts when compared to alternatives A and B. Proactive recreation management actions under Alternative D, while beneficial, are the least beneficial of all alternatives. Refer to Table 4-14 to compare the number of SRMAs by alternative.

Recreational Use

Other Resource Management Actions. Management actions and related impacts under Alternative D are similar to those described for Alternative A with regard to impacts from vegetation, fire, cultural, paleontological, and livestock resources, but would be less restrictive. The lesser restrictions are not expected to impact recreational use patterns to a substantial degree, with the exception of the revocation of all SDW withdrawals, which would likely preclude the use of these areas for heritage tourism. In addition, visual resources would be managed in accordance with the 2004 inventory, which more accurately categorizes the visual resources of the planning area and provides for more suitable management of the resource. Visual resources of interest would be better protected, providing for long-term protection of key aesthetic resources.

While seasonal motorized vehicle restrictions in crucial big game areas would be carried forward under Alternative D, all other wildlife management actions afford the least protection to wildlife resources under this alternative. Alternative D would have the greatest potential for degrading the wildlife resource, which could adversely impact recreational users relying on wildlife resources. At the same time, relaxation of protective measures provide minor benefits to recreational users seeking a more rural and (or) motorized recreational experience, since this alternative affords the least restriction to access. However, this alternative could have an adverse impact on the quality of the recreational experience.

Alternative D has the greatest potential for access and road infrastructure acquisition; however, it also has the most potential to displace recreational users and diminish the quality of recreational experiences throughout the planning area, including areas known to have sensitive resource values.

Under this alternative, visitation by nonresidents to the area would increase by about 0.5-percent annually through the short term. Nonresident recreational visitation would increase annually in the short term by 0.5 percent for hunting, 0.8 percent for fishing, and 0.9 percent for other dispersed recreation under this alternative (Bowker et al. 1999; Bennett 2004).

Alternative E (Proposed Casper RMP)

Recreation Management

Surface-disturbing Activities. Under Alternative E, approximately 61,274 short-term and 21,672 long-term acres of BLM-administered surface acres are expected to be disturbed by BLM actions over the life of the plan (Appendix M). These management actions could result in direct and indirect adverse impacts to recreation resources, as conflicts between recreational use and development may occur in disturbed (commercially developed) areas. The quality of dispersed recreation would be diminished over time in areas where large-scale development occurs. Potential adverse impacts to recreation resources from

surface-disturbing activities under Alternative E are similar to those identified in Alternative A (Appendix M). Alternative E projects the second highest acreage of surface disturbance among the alternatives.

Withdrawals and Closures to Mineral Resources. The impacts to recreation from closures and withdrawals under Alternative E are beneficial and similar in type to all other alternatives. Alternative E is more beneficial to recreation than alternatives A and D, but less beneficial than alternatives B and C.

Special Recreation Management Areas

Proactive Recreation Management Alternatives. The impacts from proactive recreation management actions under Alternative E would be the same as those identified under Alternative B, except for the following: the Poison Spider OHV Park would be expanded by 98 acres (to 285 acres). These adjustments are minor and the overall intensity of impacts to recreation resources are the same as those identified in Alternative B.

Recreational Use

Other Resource Management Actions. Management actions and related impacts under Alternative E proactively identify and pursue opportunities to acquire public access to areas with high recreational use value within the planning area to increase recreational opportunities for the public. Impacts are similar to those described for Alternative A.

Management actions and related impacts under Alternative E are similar to those described for Alternative A with regard to impacts from vegetation, fire, cultural, paleontological, and livestock resources. Visual resources would be managed in accordance with the updated visual inventory, which manages the current visual resource conditions and more accurately provides for the protection of key aesthetic values impacting the quality of recreational experiences.

Fewer adverse impacts on recreational users are expected due to the minor changes in protective actions to fish and wildlife habitats under Alternative E. Minor beneficial impacts to recreational users seeking a rural and (or) motorized recreational experience would exist because this alternative provides fewer access restrictions than does Alternative A. Beneficial impacts would be greater and the adverse impacts less under Alternative E than under Alternative A.

If parcels of public lands were disposed of that had legal public access, were of sufficient size to support recreational activities, or were adjacent to state or other public lands, their loss would be an adverse impact to recreational use of the public lands.

Nonresident recreational visitation would increase annually in the short term by 1.3 percent for hunting, 0.8 percent for fishing, and 0.9 percent for other dispersed recreation under this alternative (Bowker et al. 1999; Bennett 2004).

4.6.7.3 Conclusion

Allowable uses and management actions described in this section for the various alternatives were used to forecast impacts to recreational resources. Meaningful differences in surface disturbance, areas withdrawn, closed or administratively unavailable for mineral development, proactive recreation management actions, and other resource management actions form the basis for the following conclusion: impacts to recreation resources from the alternatives are anticipated to be similar in type, but different in intensity.

Although none of the alternatives is expected to impact recreational use, distribution, or experience opportunities substantially, Alternative B enhances the recreational experience of users expecting a more

primitive recreational experience more than any of the other alternatives by limiting development to the greatest extent. Alternative B provides the greatest protection for wildlife resources, providing long-term benefits to hunters. Alternative C proposes the most acreage of BLM-administered surface (206,155) and the most acreage of BLM-administered mineral estate for the South Bighorns/Red Wall MA, which emphasizes recreation and wildlife. The special designations and SRMAs proposed under Alternative C provide more recreational opportunities compared to Alternative A. Alternative D provides more access, which benefits some recreational users, but also allows for the greatest amount of development. More development adversely impacts recreational users, especially those seeking recreational experiences in undisturbed settings or recreational experiences dependent on significant fish and wildlife populations.

In general, displacement of dispersed recreational use tends to be localized and result from management activities related to competing resource-development activities. Long-term displacement occurs where concentrated, large-scale development is located. Such development could reduce the quality of the recreational experience and displace recreational users over time, but would be spatially limited. Management actions directed at improving recreational opportunities enhance both primitive and developed recreational experiences.

Alternative E provides more balanced recreational experience opportunities for both natural and modified settings compared to alternatives B and D. Alternative E provides the most flexibility for management to enhance the recreational experience of those users wanting a more developed (rural) recreational experience, as well as more natural settings for recreational activities.

4.7 Special Designations and Other Management Areas

Special designations and other MAs provide specific areas with special management for unique natural, historic, scenic, or recreational resources in the planning area. Management of special designations on public lands administered by the BLM is directed by a variety of laws, regulations, policies, and other requirements. The Casper Field Office operates under the protocols set forth in appendices B, K, and M. The remainder of the Special Designations and Other MAs section discusses ACECs, MAs, National Back Country Byways, NHTs and Other Historic Trails, and Wild and Scenic Rivers (WSR).

4.7.1 Areas of Critical Environmental Concern and Other Management Areas

This section presents an analysis of management actions involving 11 proposed or existing special designations or other MAs (seven ACECs and four MAs, respectively,) within the planning area (see Table 4-15). The discussions are organized alphabetically first by existing ACECs, then proposed ACECs/MAs. A brief introduction is provided for each area, followed by a focused analysis of potential impacts. The ACEC/MA analysis, unlike the other analyses in this chapter, considers the impacts of special designations and other MAs on other resources within the field office rather than how other resources would impact the areas themselves. This decision is based on the following assumptions: (1) special designations or other MAs are managed in a manner to protect specific resources within their boundaries; therefore, resources not specifically protected may be impacted by these designations or establishments; and (2) to make management choices between alternatives, information on the impacts on other resources from special designations or other MAs is necessary.

Table 4-15. Proposed and Existing ACECs/MAs by Alternative

Name	Alternatives				
Existing ACECs					
	A	**B**	**C**	**D**	**E**
Jackson Canyon	ACEC	ACEC	ACEC	ACEC	ACEC
Salt Creek Hazardous Area	ACEC	ACEC	ACEC	-	-
Proposed ACECs/MAs					
Alcova Fossil Area	-	ACEC	ACEC	MA	ACEC
Bates Hole	-	MA	MA	-	MA
Black-tailed Prairie Dog	-	ACEC	ACEC	-	-
Cedar Ridge TCP	-	ACEC	MA	-	-
North Platte River	-	ACEC	ACEC	-	-
Salt Creek	-	-	MA	MA	MA
Sand Hills	-	MA	MA	-	MA
South Bighorns/Red Wall	-	ACEC	MA	-	MA
Wind River Basin	-	-	MA	MA	MA

ACEC Area of Critical Environmental Concern
MA Management Area
TCP Traditional Cultural Property
\- No Special Designation or Other MA Under This Alternative

The impact analysis takes into account impacts from the administrative action of designating or establishing a specific area, the management plan that would follow, and implementing that management plan over time. At this time, general assumptions are used because, with the exception of Jackson Canyon and the Salt Creek Hazardous ACECs, detailed management plans and implementation programs for the 11 areas are not available. The management plans under the ACEC and MA designations and establishments are not substantially different because their primary objectives and secondary responsibilities for managing other resources are similar. An ACEC is a regulatory designation created in

the FLPMA and can be designated only during the land use planning process. An MA, on the other hand, is a management decision and can be established at any time, as long as the MA conforms to the current RMP. Management assumptions are the basis for the impact analyses that follow. Where appropriate, uncertainties (i.e., a lack of available data or incomplete information) are identified.

The following discussions are limited to important considerations and impact findings as compared with the existing conditions in the planning area. If a potential impact is (1) virtually identical for all alternatives, (2) inconsequential, or (3) otherwise minor relative to other issues, it is either noted for clarification or not mentioned. This approach to the analysis avoids presenting redundant and unnecessary discussions. In general, each analysis covers a selected set of environmental disciplines and generally presents the issues in order of importance.

Jackson Canyon ACEC (Existing)

Maintaining and enhancing the quality of the bald eagle winter roost and associated habitat is the primary objective of the Jackson Canyon ACEC. Each of the alternatives incorporates most of the management prescriptions defined in the Bald Eagle HMP. In general, little difference exists among alternatives with respect to impacts on bald eagles and roost areas.

The Jackson Canyon ACEC is in south-central Natrona County at the western end of Casper Mountain. Impacts analyzed for the ACEC are limited to the area within this boundary.

4.7.1.1 Methods and Assumptions

Methods and assumptions used in this impact analysis are identified at the beginning of Chapter 4.

4.7.1.2 Analysis of Alternatives

Impacts Common to All Alternatives

Under all alternatives, the Jackson Canyon ACEC is retained and the existing boundary is revised by enlarging it approximately ¼ mile to the south, making use of topographic features to screen bald eagle roosts. Under all alternatives, developing existing oil and gas leases is subject to an NSO restriction, a condition of those existing leases. All federal mineral estate in the ACEC remains available for oil and gas leasing, with any leases issued subject to the NSO restriction. The NSO restriction requires drilling outside the ACEC boundary, increasing costs of drilling and production.

Mining is not allowed within the ACEC and the public surface and federal mineral estate are withdrawn from location and appropriation under the mining laws. Considering the amount and quality of limestone and its proximity to the city of Casper, this removes an important source of commercial material from development.

Alternative A

Vegetative treatments are used to manage forests within the Jackson Canyon ACEC, but approximately 163 acres of commercial forest within the Jackson Canyon ACEC can not be commercially harvested in the roost area. Timber is actively managed to maintain healthy-aged, structured stands for the benefit of bald eagle roosting habitats. Managing to achieve DFC within Jackson Canyon ACEC forest and woodlands enhances species diversity and composition. Woodland species composition and habitats within existing woodland communities are conserved over the long term. Forest-management treatments would be used within the ACEC to thin stands, control pine beetles, and improve stand condition. Beetle control has provided a source for firewood and the product is sold to local vendors and private permittees. The practice provides a forest product but increases traffic within the ACEC both on and off-road. The November 1 to March 31 restriction on burning and OHV travel within the ACEC results in curtailing

slash disposal and hazard reduction during a burn window that seasonally provides the most opportune time for burning.

Revising the boundary on the eastern end of the ACEC by approximately 1,400 acres would not appreciably affect any other resource; however, moving the boundary away from encroaching development on the east eliminates some of the private land and federal minerals within the present ACEC.

In the event of a wildland fire, Alternative A requires the use of full suppression tactics to protect the Jackson Canyon ACEC. Over the long term, emphasis on full-suppression tactics under Alternative A contribute toward higher fuel loads and, consequently, a greater risk of high-intensity fire in the area. Alternative A makes use of prescribed fire for achieving forest and range objectives. Using unlimited suppression tactics inside the ACEC increases the potential of adversely affecting ACEC quality and could impact roost sites.

Alternative A allows for improved access to the archery range located adjacent to the eastern boundary of the ACEC. The allowance is for a 60-foot road that meets county requirements. If the road is built across the archery range, it is likely that OHV use would increase in the ACEC. Impacts to roosting depend on the time of year and intensity of OHV use.

Alternative B

Under Alternative B, impacts to forest production are the same as described under Alternative A.

Alternative B restricts road expansion and new road construction during fire suppression. The alternative does not allow road construction or grading for wildland fire control. Restricting heavy equipment could result in a fire escaping the ACEC, which could directly impact residences and cabins. These provisions are expected to reduce surface disturbance.

Under Alternative B, the boundary adjustments on the eastern portion of the ACEC would not be made. Bald eagle habitat objectives on split-estate lands are better met, as these lands would remain under ACEC management.

Management actions and resulting impacts to recreation under Alternative B are essentially the same as under Alternative A, with the exception of not upgrading the road to the archery range under Alternative B, which would have only a minor impact on future recreational opportunities.

Alternative C

Under Alternative C, impacts to forest production are the same as described under Alternative A, except that forest management around bald eagle roosts would manage stands for old growth. In addition, Alternative C allows the use of temporary skid trails to promote forest management and product removal. This may result in short-term adverse impacts to wildlife in the area; however, these activities are prohibited from November 1 to March 31 to protect the eagle roost. Impacts on fire management are the same as described under Alternative B. Boundary adjustments on the eastern portion of the ACEC would be made with impacts identical to those described under Alternative A.

Alternative D

Under Alternative D, commercial harvest is allowed within the ACEC to meet bald eagle management objectives, but would not be allowed to meet the BLM's commercial harvest quotas. Allowing

commercial harvest increases the amount of commercial forest products within the ACEC and increases impacts to soil, vegetation, and water in the short term.

Fire suppression under Alternative D is the same as under Alternative A. Grading of roads is not allowed during fire-suppression activities and prescribed fires are used to meet bald eagle habitats, livestock grazing, and forestry objectives, with impacts being the same as described for Alternative B.

Boundary adjustments on the eastern portion of the area are made with impacts identical to those described under Alternative A. Impacts to recreational resources as a result of the archery range road upgrade are also identical to Alternative A.

Alternative E (Proposed Casper RMP)

With the exception of forest production, Alternative E has the same impacts on the management of other resources as described under Alternative A.

Under Alternative E, forest management to reduce fuel loads and disease is compatible with the Bald Eagle HMP objectives. Alternative E seeks to actively manage forest stands by reducing fuel loads and managing beetle infestations and disease. As stated in Alternative C, temporary skid trails are permitted; however, under Alternative E, this trail would be closed and reclaimed once activities are completed. This could result in a minor, long-term beneficial impact by improving overall health of forest stands in the ACEC, as well as providing a small local flow of wood products. This action would adversely impact recreation, but have a beneficial impact to wildlife resources.

4.7.1.3 Conclusion

All alternatives continue the protection of Jackson Canyon ACEC and the associated bald eagle roosts. Surface-disturbance restrictions, locatable mineral withdrawals, and mineral materials restrictions are identical across all alternatives. Management actions under alternatives A and E are most restrictive to other resources due to the general provisions for wildland fire control and providing the greatest long-term benefit for wildlife (especially bald eagles), vegetation, soils, water resources, and forest and woodlands. Forest management and harvest would be allowed to a greater degree under Alternative D. Alternative D could have the most beneficial impact to forests and woodland products.

Salt Creek Hazardous Area ACEC (Existing)

The BLM designated the Salt Creek Hazardous Area ACEC to reduce environmental hazards caused by impacts from oil and gas production in oil fields along the Salt Creek drainage. The BLM also designated it to improve air and water quality, promote public safety, increase resource utility, improve visual resources, and enhance vegetative growth. The ACEC was designated initially to address watershed and environmental issues created by 80 years of oil field development.

The Casper Field Office did not implement most of the provisions in the ACEC management plan because of budget constraints. Although the field office was unable to adhere to the ACEC plan, operators substantially reduced environmental hazards in the oil fields in the ACEC area since the early 1980s, mainly as a result of working with the BLM on a case-by-case basis. Operators installed warning signs to make the public aware of hazards, reclaimed numerous oil and gas well sites, and cleaned up numerous oil spills. Although environmental hazards have been reduced, a substantial amount still exists and more work needs to be done to mitigate impacts to other resources. INPS, such as salt cedar and Russian knapweed, have spread throughout the area due to surface disturbance associated with oil and gas development and grazing practices.

Approximately 235,325 acres (77,566 acres of BLM-administered surface and 203,228 acres of BLM-administered mineral estate) of the original Salt Creek Hazardous Area ACEC lie within the planning area in northeastern Natrona County and northwestern Converse County. The remaining portion of the ACEC is located in Johnson County, which is under the jurisdiction of the Buffalo Field Office. However, the Buffalo Field Office did not carry it forward in their most recent RMP revision.

The Casper Field Office portion of the Salt Creek Hazardous Area ACEC contains 23,179 acres of high oil and gas development potential, 210,641 acres of low oil and gas development potential, and 1,505 acres of very low oil and gas development potential based on the RFD (BLM 2005c). Based on GIS data, the area contains eight greater sage-grouse leks; two are on BLM-administered surface and seven on BLM-administered mineral estate and 12,001 acres of highly erosive soils of which 8,548 acres are BLM-administered surface and 10,875 acres are federal mineral estate.

4.7.1.4 Methods and Assumptions

Methods and assumptions used in this impact analysis are identified at the beginning of Chapter 4.

4.7.1.5 Analysis of Alternatives

Impacts Common to All Alternatives

Impacts of the Salt Creek Hazardous Area ACEC vary by alternative, as described below.

Alternative A

Under Alternative A, the BLM manages the ACEC to meet the goals and objectives outlined in the ACEC plan, makes efforts to secure cooperative agreements with private landowners and developers, and potentially assists in the cleanup of existing hazards in the area. The BLM would prescribe cultural surveys for the area with the goal of identifying and protecting historical sites still in the ACEC area having a beneficial impact to heritage resources. Amoco conducted a block cultural survey of the Salt Creek light oil unit between 1988 and 1989, but this area represents only a small portion of the total ACEC area. Under Alternative A, soil, water, vegetative, and visual resources benefit due to monitoring produced water and stream quality, conducting field inspections on an annual basis, and continuing cleanup of environmental hazards.

Alternative B

Under Alternative B, the BLM retains the ACEC and implements the original management plan. Impacts to resources are the same as for Alternative A.

Alternative C

Alternative C modifies the ACEC boundary to include only the portion of the ACEC in the planning area. The boundary adjustment is an administrative issue and only slightly changes the strategy for managing resources within the Salt Creek Hazardous Area ACEC. Impacts are the same as described in Alternative A, but would occur over a smaller area.

Alternative D

Alternative D removes the ACEC designation. The BLM handles environmental hazards on a case-by-case basis. This directive is consistent with current management directives in the rest of the planning area. This management practice is not as effective as a comprehensive management plan, so there would likely be more adverse impacts to other resources from environmental hazards under this alternative.

Alternative E (Proposed Casper RMP)

Alternative E does not retain the ACEC, and the impacts are the same as Alternative D, with the exception of INPS. Under Alternative E, the BLM would implement a weed-management plan according to directives under INPS alternatives. Implementing a weed-management plan would reduce the spread of weeds in the Salt Creek drainage area and have a beneficial impact on biology and land resources.

4.7.1.6 Conclusion

Alternatives A, B, and C retain the existing Salt Creek Hazardous Area ACEC designation with Alternative C managing less area than alternatives A and B. Under alternatives A and B, management actions are implemented to monitor water quality, inventory cultural resources, and secure cooperative agreements with operators to clean up the existing hazards. Under alternatives D and E, the BLM would not retain the ACEC designation and would address environmental hazards on a case-by-case basis. Again, operators would clean up the area with the BLM's cooperation. The difference in both beneficial and adverse impacts among all alternatives is negligible.

Alcova Fossil Area ACEC/MA (Proposed)

The Alcova Fossil Area is a collective term used to designate specific public lands around the Alcova Reservoir. The ACEC/MA size and location varies by alternative, the largest of which encompasses lands on both the north and south sides of the Alcova Reservoir (7,073 acres).

4.7.1.7 Methods and Assumptions

Methods and assumptions used in this impact analysis are identified at the beginning of Chapter 4.

4.7.1.8 Analysis of Alternatives

Impacts Common to All Alternatives

Impacts to the Alcova Fossil Area vary by alternative, as detailed in the discussion below.

Alternative A

Alternative A provides for certain protections on 1,613 acres as described below. As use increases in this area, the potential for theft and vandalism also increases. Impacts due to theft and vandalism diminish the value of paleontological resources.

Alternative A involves further field investigations, including potentially identifying additional paleontological resources, which could benefit scientific knowledge. However, this knowledge would not be available to the public because no onsite resource interpretation would be done.

Under Alternative A, the Alcova Fossil Area is evaluated for importance and withdrawn from operation of mining laws, if appropriate. The withdrawal would be pursued for the entire area. NSO would be allowed inside the withdrawal area.

Under Alternative A, the potential resource management actions within this area are not expected to create visual impacts and generally would be consistent with the 1985 VRM class management, designating this area as Classes III and IV.

Alternative B

Alternative B designates 6,913 acres of BLM-administered lands on both the north and south sides of the Alcova Reservoir as an ACEC, provides no visitor facilities, and limits surface-disturbing activities unless

they are for scientific purposes. The potential for inadvertent impact, vandalism, and deterioration of the value of paleontological resources remains, but could be addressed in various ways in the management plans created following the ACEC designation. Similar to Alternative A, Alternative B provides further field investigations with the potential for identifying additional paleontological resources, which could benefit scientific knowledge. However, this knowledge would not be available to the public in terms of onsite resource interpretation. If noteworthy resources were identified, Alternative B would be more beneficial than Alternative A because special management practices and policies could be put into place to address new information more easily.

Surface-disturbing activities, such as those associated with geophysical exploration, are prohibited under Alternative B and, as with Alternative A, a mineral withdrawal would be pursued. As under Alternative A, there would be no prohibitions on oil and gas leasing; permanent structures would not be allowed and all development would be limited to directional drilling. Since this alternative involves a larger area, there would be a greater adverse impact to geophysical exploration and locatable mineral entry than under Alternative A. Given the limited area involved, mineral withdrawal and NSO restriction policies overall would have minor industrial productivity, energy, and economic impacts.

The potential resource management actions within the ACEC under Alternative B are not expected to create visual impacts and are consistent with the VRM policies of Alternative B. Managing resources under the ACEC designation would place more restrictions on development and use of other resources, thereby increasing the potential for meeting visual quality goals compared to Alternative A.

Alternative B has an adverse impact on recreation by closing the ACEC to OHV use. This closure has minor beneficial impacts on paleontological resources within the ACEC because it reduces the potential for inadvertent damage. Other than the restriction of OHV activities, Alternative B does not have a direct impact on the recreational potential of the area.

The NSO restriction could impact the accommodation of ROWs through the Alcova Fossil Area. Avoidance areas for ROWs have been established within the planning area. Communication site windows are outside of the proposed ACEC boundaries. Acquisition of lands and interests in lands in the area will be pursued, expanding the area to a minimal extent and providing both access to, and acquisition of, important resources.

Alternative C

Alternative C is identical to Alternative B, except the ACEC is smaller (5,805 acres of BLM-administered lands on the south side of Alcova Reservoir) and development of visitor interpretation facilities is limited. The smaller ACEC has a similar amount of adverse and beneficial impacts compared to Alternative B. Alternative C has a greater adverse impact on geophysical exploration than Alternative A because it involves a larger area. Under Alternative C, impacts to oil and gas drilling and production are the same as under Alternative B, but would be less given the smaller area within the proposed boundary.

The potential to achieve VRM goals increases under Alternative C compared to Alternative A, but would be virtually the same as under Alternative B. The potential resource management actions within this area are subject to VRM class management under current inventory, designating this area as Classes II and III.

The visitor interpretation facilities and efforts to publicize them would have recreational benefits, but could lead to an increased potential for vandalism. Vandalism could be addressed by details in the management plan created following the ACEC designation. Acquiring lands and interests in lands in the area would be pursued, expanding the area to a minimal extent and providing both access to, and acquisition of, important resources.

Alternative D

Alternative D is similar to Alternative C, but involves establishing an MA rather than designating an ACEC on the same 5,805-acre area on the south side of Alcova Reservoir.

Surface disturbance is allowed if paleontological resources are protected. This allows more industrial development of the area than under alternatives A, B, and C. OHV use would be limited in sensitive areas only, which would be less restrictive than alternatives B and C but slightly more restrictive than Alternative A. Alternative D includes more visitor facilities than alternatives A, B, and C.

Alternative D provides slightly less protective management of paleontological resources than alternatives B and C, but more than Alternative A. The size of the MA indicates that the beneficial and adverse impacts of Alternative D are more similar to Alternative C than to Alternative B.

Under Alternative D, geophysical exploration projects are evaluated on a case-by-case basis to determine potential degradation of the paleontological resources. A determination of no degradation would allow exploration. If degradation is determined to be likely, then exploration within the area would not be permitted. Alternative D has less adverse impacts than Alternative A because NSO is allowed. Under Alternative D, oil and gas drilling or production facilities would be allowed if development did not cause undue degradation of paleontological resources within the MA and would result in less adverse impacts than Alternative A.

Under this alternative, mining for locatable minerals is allowed. If mining occurs without proper mitigation, the paleontological resources could be destroyed. Partial mitigation, through periodic monitoring, would lessen the adverse impacts to the resource. The BLM promotes cooperative recovery efforts with claimants should sensitive resources be discovered.

Alternative E (Proposed Casper RMP)

Impacts under Alternative E are similar to those described under Alternative C. The same area is designated as an ACEC (5,805 acres on the south side of Alcova Reservoir). Under Alternative E, limitations on surface-disturbing activities to conserve paleontological resources within the designated ACEC are greater than under Alternative A. Alternative E has a greater adverse impact on geophysical exploration and locatable minerals than Alternative A due to the increased spatial area. Under Alternative E, impacts to oil and gas drilling and production are similar to those under Alternative D, as proposed surface-disturbing activities would be evaluated on a case-by-case basis. A mineral withdrawal would be pursued. Because of the same size of the area, impacts are the same as described under Alternative C.

The potential to achieve VRM goals increase under Alternative E compared to Alternative A. The potential resource management actions within this area are subject to VRM class management under current inventory, designating this area as Classes II and III.

Developing visitor interpretation facilities and allowing some OHV use benefits recreation, but could lead to increased vandalism on paleontological resources by drawing additional people to the area. This potential for vandalism could be addressed in the management plans created following the ACEC designation. If noteworthy paleontological resources are identified, Alternative E would be more beneficial than Alternative A because special management practices and policies would be put into place to address site-specific paleontological resource information more easily.

4.7.1.9 Conclusion

Alternatives B through E could provide greater benefits to the Alcova Fossil Area than Alternative A. All the alternatives have potential for adverse impacts to geophysical exploration and minerals development;

the extent of these impacts varies by alternative with Alternative B having the most potential adverse impact and alternatives A and D having the least. Impacts to all other resources are expected to be minimal.

Bates Hole MA (Proposed)

The BLM manages the proposed Bates Hole MA to protect highly erosive soils, fragile watersheds, and important and crucial wildlife habitats, specifically greater sage-grouse habitats. Currently, the Jackson Canyon ACEC and Muddy Mountain EEA are located within the larger Bates Hole area and are managed according to the decisions for which they were established.

The Bates Hole area generally coincides with the Bates Creek and North Platte River-Bolton Creek watersheds. Impacts to resources are limited to those falling within the proposed 375,221-acre boundary (158,023 acres of which are BLM-administered surface lands).

4.7.1.10 Methods and Assumptions

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

- Existing and future special designations or MAs within the boundary of the proposed Bates Hole MA are managed under the decisions for those areas.
- Impacts to existing special designations or MAs within the proposed Bates Hole MA are not addressed in this discussion, as they are expected to be minimal.
- All surface-disturbing activities in the Bates Hole MA under alternatives B, C, and E will be intensively managed, as described in Appendix U.
- Installing and maintaining erosion controls and other mitigation measures, such as BMPs, result in a substantial reduction in offsite erosion ranging between 40 and 97 percent, depending on site conditions (USFS 2003b). However, these measures may not reduce adverse impacts on soil compaction and productivity.
- To be effective on highly erodible soils, more extensive BMPs than those commonly used are required to be installed and maintained aggressively. The risk of BMP failure is greater on highly erodible soils.
- Due to the mixed land ownership, the area is managed in cooperation with adjacent landowners.
- 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" in the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11, Lease for Oil and Gas).
- The Tenth Circuit Court of Appeals in *Sierra Club vs. Peterson* (717 F.2d 1409, 1983) found that "on land leased without an NSO stipulation, the DOI cannot deny the permit to drill…once the land is leased the DOI no longer has the authority to preclude surface-disturbing activities even if the environmental impact of such activity is significant. The Department can only impose mitigation upon a lessee who pursues surface-disturbing exploration and/or drilling activities." The court goes on to say "notwithstanding the assurance that a later site-specific environmental analysis will be made, in issuing these leases the DOI has made an irrevocable commitment to allow some surface-disturbing activities, including drilling and road building."
- Provisions in leases that expressly provide Secretarial authority to deny or restrict development in whole or in part depends on an opinion provided by the USFWS regarding impacts to endangered or threatened species or habitats of plants and animals that are listed or proposed for listing (e.g., bald eagle). If the USFWS concludes that the development would likely jeopardize the continued existence of any endangered or threatened plant or animal species, then the development may be denied in whole or in part.

4.7.1.11 Analysis of Alternatives

Impacts Common to All Alternatives

Surface-disturbing activities occur under all alternatives and BMPs for surface-disturbing activities are applied under all alternatives. Under normal circumstances, standard mitigation guidelines are effective in minimizing impacts to resources; however, conditions, such as steep slopes, highly erosive soils, or extreme environmental events may require more aggressive management actions to mitigate adverse impacts. Impacts from the Bates Hole MA vary by alternative, as described below. Grazing use is maintained as presently authorized.

Alternative A

Under existing management practices TLSs and CSU restrictions are used to protect big game crucial winter range and greater sage-grouse habitats. Surface-disturbing activities are prohibited on slopes greater than 25 percent and within ¼ mile of the North Platte River and 500 feet of streams, lakes, reservoirs, canals, riparian habitats, water wells, or springs. No special management actions are required to mitigate impacts to highly erosive soils.

The TLS restrictions used to protect big game crucial winter range and greater sage-grouse habitats do not prohibit development in these areas; rather, they limit the development to a time that is less disruptive to wildlife. TLS restrictions do not preserve or protect habitats, so over time, development activities can reduce the amount of big game crucial winter range and greater sage-grouse habitats.

Standard BMPs and mitigation guidelines, combined with the restriction on development on slopes greater than 25 percent, generally are effective in mitigating impacts to soil and water resources under normal conditions. Oil and gas production within the MA is mature and fully developed. Current management actions have little adverse impact on oil and gas exploration and production. Under Alternative A, big game crucial winter range and greater sage-grouse habitats may be lost to development over time, resulting in a long-term adverse impact to wildlife.

The Bates Hole MA contains substantial acreage of highly erodible soils. The lack of special management actions relating to highly erodible soils under this alternative may result in accelerated erosion and sedimentation to the North Platte River due to development activities.

Alternative B

Alternative B establishes the Bates Hole MA on approximately 375,221 acres, of which 158,023 acres are BLM-administered surface. Under this alternative, the proposed Bates Hole MA would have beneficial impacts on controlling soil erosion, sedimentation to the North Platte River, and important wildlife habitats. Establishing the MA would have adverse impacts on surface-disturbing activities, mineral development, and ROW actions resulting from additional restrictions on operations.

Under Alternative B, greater sage-grouse and their habitats is a priority resource. A combination of NSO, CSU, and TLS restrictions will be applied to minimize disturbance to greater sage-grouse and their habitats. Greater sage-grouse habitats will improve through vegetative treatments; residual herbaceous cover will be maintained for nesting cover. Protecting greater sage-grouse habitats will create a long-term beneficial impact.

As explained in Chapter 3, the Bates Hole MA comprises nearly 15 percent (50,617 acres) of all the high water erosion potential soils on public land in the entire planning area. Under Alternative B, the area is intensively managed as described in Appendix U to control soil erosion and meet watershed goals. Surface-disturbing activities are subject to a CSU restriction, which prohibits additional development

until satisfactory mitigation is developed. Intensive management includes avoiding highly erosive soils and full topsoil salvage, protecting surface treatments on disturbed areas within 30 days, and completing final reclamation within two growing seasons.

Management actions for this MA would effectively control soil erosion by prohibiting surface-disturbing activities until appropriate mitigation is developed. Applying intensive management on those areas would further reduce impacts. Preventing soil erosion will benefit water quality and channel conditions in the North Platte River by minimizing sediment reaching the river. Due to the large amount of highly erosive soils and the close proximity to the North Platte River (a Class I stream), a high potential exists for beneficial impacts to both soils and water resources from the formation of this MA.

Of the proposed MA, 3.5 percent currently is leased for oil and gas and approximately 1 percent is held by production (refer to "Held by Production" in Glossary). Forming this MA has adverse impacts on future development by imposing additional restrictions on surface-disturbing activities, as explained above. These restrictions would impose additional costs of drilling and developing oil and gas prospects. Additional costs could make developing some prospects uneconomical to pursue; however, 96 percent of the proposed MA is located in a very low oil and gas development potential area; the other 4 percent is rated as having no development potential. No new corridor designations are allowed under this alternative, potentially increasing the cost and time to transport the product to market.

Alternative C

Alternative C is identical to Alternative B, so the impacts of Alternative C are the same as those described for Alternative B.

Alternative D

Under Alternative D, the Bates Hole MA is not established and management is in accordance with the RMP revision decisions for each resource or resource use in the area. Management actions for Jackson Canyon ACEC and Muddy Mountain EEA are in accordance with decisions for those areas. Direct and indirect impacts are expected to be similar to those under Alternative A. No beneficial impacts to wildlife, soil, vegetation, and water resources would exist.

Alternative E (Proposed Casper RMP)

Alternative E has the same impacts on the management of other resources as described under Alternative B.

4.7.1.12 Conclusion

Under alternatives B, C, and E, the proposed Bates Hole MA has identical beneficial impacts to highly erosive soils, fragile watersheds, and important crucial wildlife habitats. Approximately 50,617 acres of highly erosive soils will be managed intensively. Soil erosion will be controlled effectively, minimizing sediment reaching the North Platte River. Thirty greater sage-grouse leks and 122,799 acres of crucial wildlife habitats will be protected.

Under alternatives B, C, and E, oil and gas leases on 3,478 acres of federal mineral estate (1% of the MA) are held by production, an additional 13,174 acres (approximately 5% of the MA) presently leased, and the remaining federal mineral estate (95%) is unleased. Additional constraints proposed under this MA cannot be applied to existing leases without consent of both the lessee and the BLM; however, surface-use mitigation measures can be developed through the NEPA process and applied as COAs to any new development action. New leases in the remainder of the MA will be issued with a CSU restriction and intensively managed as described above. Operations in new areas would face major constraints on

surface-disturbing activities, limiting the opportunities for new exploration and production in the MA. Since existing fields appear to be fully developed and oil and gas development potential is low, the major constraints on new activity in this area will have limited impact on the development of oil and gas from federal minerals.

Under alternatives A and D, the Bates Hole MA is not established; therefore, the beneficial impacts to highly erosive soils, fragile watersheds, and important crucial wildlife habitats would not occur. Oil and gas and other mineral development generally would continue as described under Alternative A.

Black-tailed Prairie Dog ACEC (Proposed)

The proposed black-tailed prairie dog ACEC helps to ensure a self-sustaining population of the black-tailed prairie dog in the planning area by focusing management on one area: to preserve black-tailed prairie dog colonies, complexes, and associated habitats.

The proposed black-tailed prairie dog ACEC comprises one township (Township 39 North, Range 74 West) in northwestern Converse County. Of the 22,937 acres in this area, approximately 3,103 surface acres (in eight different parcels) comprising 13.5 percent of the area are under BLM administration. The area comprises approximately 14,846 acres of BLM-administered mineral estate, or approximately 65 percent of the area. Impact discussions are limited to public lands falling within the proposed ACEC.

4.7.1.13 Methods and Assumptions

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

- Sylvatic plague can have disastrous impacts on prairie dog populations; no management approaches can mitigate that impact.
- Recreational shooting is considered a casual use, managed by the WGFD, and not controlled by the BLM.
- The BLM cannot dictate management of prairie dogs on private lands.

4.7.1.14 Analysis of Alternatives

Impacts Common to All Alternatives

Impacts related to designating the black-tailed prairie dog ACEC vary by alternative, as described below.

Alternative A

Black-tailed prairie dog colonies and complexes currently are not managed under any special designations or MAs within the planning area, but rather are managed in accordance with Special Status Species.

Impacts to other resources or uses are based on standard stipulations regarding prairie dog colonies. Surface development within or adjacent to black-tailed prairie dog colonies is evaluated for an action on the ground and impacts mitigated. Depending on the amount and type of mitigation, various proposed surface development may be affected in terms of time and cost. Proposed projects usually are mitigated based on avoidance of the colony, in which case impacts would be low. Surface disturbance that results in modification of a colony, including the proliferation of surface facilities near or within the colony, would directly impact black-tailed prairie dogs and indirectly impact wildlife species who depend on prairie dogs for their survival. Lethal control is not used where the colony is ½ mile or more from private land, which minimizes health and safety concerns and impacts.

Alternative B

Alternative B designates a black-tailed prairie dog ACEC for the protection of prairie dog habitats. Direct and indirect beneficial impacts on associated wildlife, including black-tailed prairie dogs, are expected as a result of ACEC designation and management.

Under this alternative, the ACEC remains open to oil and gas leasing, but restricts geophysical exploration. Geophysical exploration conducted under the rights granted by the lease is allowed. These restrictions, combined with limiting oil and gas facilities to one well pad per 160 acres of federal mineral estate and rerouting linear facilities around colonies and complexes, reduces ground disturbance and benefits resources often affected adversely by surface disturbance (cultural, soil, water, vegetation, and wildlife). Directional drilling techniques would have to be used to recover resources from formations that are authorized a tighter well spacing by WOGCC, thereby increasing costs of developing those resources. If the cost associated with directional drilling makes development uneconomical, the oil and gas resources would not be recovered. Restricting geophysical exploration impacts exploration for oil and gas resources where public surface is involved. Mineral development requires the construction of access roads and transport facilities. Wildlife species depending on prairie dogs and their complexes directly benefit from the surface-development restrictions.

Within the ACEC boundary, poisoning of prairie dogs is prohibited except when human health and safety are a concern. Anti-raptor perching devices are required on facilities within ¼ mile of the ACEC. Artificial nesting structures are prohibited within the boundaries of the ACEC. Incorporating these conservation measures likely results in an increase in prairie dog population. Prairie dog expansion could benefit other wildlife species closely associated with prairie dogs (e.g., burrowing owl, swift fox). Conversely, these requirements increase developing and operating costs on permits and leases, eventually borne by the permit or lease holder. These restrictions would result in direct beneficial impacts to black-tailed prairie dog colonies and complexes in the ACEC while directly benefiting other symbiotic species.

Fire management in the ACEC is directed at establishing a natural fire regime. Fire interacts with the landscape and affects nutrient recycling, thus promoting plant productivity. Using fire to create a desired community would likely benefit grazing animals and wildlife.

Managing for the black-tailed prairie dog may create cultural and social impacts for private landowners in the ACEC. Public surface is minimal in the township, so the success of an ACEC where the goal is to increase prairie dogs would be critically dependent on private landowner cooperation.

Establishing the black-tailed prairie dog ACEC has a beneficial impact on cultural resources because surface-disturbing activities are somewhat more restrictive in degree and scope. These restrictions provide an additional level of protection to cultural resources.

Alternative C

Alternative C is identical to Alternative B and direct and indirect impacts are the same as described in Alternative B.

Alternative D

Under Alternative D, the black-tailed prairie dog ACEC is not established. The area is managed for multiple use; impacts are identical to those in Alternative A.

Alternative E (Proposed Casper RMP)

Alternative E is identical to Alternative A; direct and indirect impacts are expected to be the same as described under Alternative A. Prairie dogs would be managed as discussed in accordance with INPS pest control.

4.7.1.15 Conclusion

Establishing the black-tailed prairie dog ACEC under alternatives B or C could beneficially impact wildlife resources. Under alternatives A, D, or E, surface-use proposals involving public land are evaluated relative to the impact on prairie dogs where the action involves that species. In all cases, the action would be mitigated such that the impacts to prairie dogs are minimal or result in no impact.

Cedar Ridge Traditional Cultural Property ACEC/MA (Proposed)

The Cedar Ridge TCP ACEC/MA is proposed to protect sensitive and significant cultural values known to exist in the area.

The Cedar Ridge TCP is located in northwestern Natrona County. The area proposed for designation includes the TCP and the Periphery Area (defined as the 3-mile viewshed to the south and Badwater Road to the north). A portion of the TCP, as well as the western end of the Periphery extends into Fremont County (Lander Field Office planning area). This analysis is limited to a 21,742-acre area, 19,637 acres of which are BLM-administered lands within the planning area as discussed in this document.

4.7.1.16 Methods and Assumptions

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

- All surface-disturbing activities are intensively managed in the Cedar Ridge TCP and Periphery under alternatives B and E. See Appendix I.
- New NSO or CSU restrictions can be applied to new leases only. Existing lease stipulations will continue as they are.
- Future development in the Cedar Ridge Periphery Area will require ROW for roads, pipelines, and possibly powerlines. Specific placement of these ancillary facilities will be guided by compliance with Section 106 of the NHPA and planned to minimize visual intrusions. Restrictions on placing ROWs in the Periphery Area (as defined above) will be project-specific.
- The utility corridor crossing the southern edge of the Periphery Area will continue. New ROW in the corridor will comply with Section 106 requirements.
- Leases within the Cedar Ridge TCP and Periphery Area contain various stipulations concerning surface disturbance, surface occupancy, and limited surface use. In addition, the lease stipulations provide that the USDI may impose "such reasonable conditions, not inconsistent with the purposes for which [the] lease is issued, as the [BLM] may require to protect the surface of the leased lands and the environment." None of the stipulations, however, empower the Secretary of the Interior to deny all drilling activity because of environmental concerns.

4.7.1.17 Analysis of Alternatives

Impacts Common to All Alternatives

Impacts of the proposed Cedar Ridge TCP and Periphery Area vary by alternative, as described below. In general, land use authorizations can physically disrupt the archeological component with subsequent loss of valuable scientific data. Further, increased activity compromises traditional cultural values, such as

tranquility and isolation important to the Eastern Shoshone tribe, and renders Cedar Ridge useless for those purposes. Increased development in the Periphery Area could further diminish the suitability of the area for ceremonial purposes. The various alternatives define how land use activities would be balanced against scientific and traditional values.

Alternative A

Cultural resources at the Cedar Ridge TCP under Alternative A are protected on a case-by-case basis. Where resources are not protected, impacts to those resources could occur as a result of mineral development and other surface-disturbing activities. Compliance with Section 106 of NHPA prevents direct impacts, but indirect impacts to nontangible values could occur. The area is open to oil and gas leasing with exploration and development subject to various restrictions to protect resources under Alternative A. Without a defined periphery and viewshed protection, indirect adverse impacts to the TCP could result from adjacent land use activities. Not establishing the area under special designation or an MA would result in the least restrictive management of other resources, the most potential development and use of the area, and the least potential for protecting the traditional cultural values compared to all other alternatives. The potential resource management actions within this area would still be subject to the 1985 VRM class management, which designates this area as Class II and IV. Although the current impact to the viewshed from livestock management is relatively low, any new rangeland improvements could cause degradation. The potential for increased recreation (including hunting) and OHV use in the area, impacting the cultural resources on the site, also exists.

Under current management, oil and gas exploration and development, as well as geophysical operations are subject to restrictions within the TCP and portions of the Periphery Area. Proposed well locations would be denied or relocated and geophysical projects modified based on consultation with tribes. The area is open to disposal of mineral materials and locatable minerals entry. Direct or indirect impacts to other resources are not expected.

Alternative B

Under Alternative B, the 21,742-acre Cedar Ridge TCP and Periphery Area is designated as an ACEC. Approximately 19,637 acres within the proposed ACEC are BLM-administered lands. This alternative provides the maximum beneficial impact to the Cedar Ridge TCP and Periphery Area among the alternatives with respect to protection of cultural resources. Restrictions are applied to resource development and use throughout the ACEC, including NSO restrictions within the TCP and CSU restrictions in the Periphery Area. Implementing these and other restrictive actions would afford considerable protection to resources for which the ACEC/MA is proposed.

NSO and CSU restrictions within the area would have a direct adverse impact on the exploration and development of minerals, including oil and gas. The NSO restriction would prohibit mineral development within the TCP boundary and may require the use of other drilling techniques to recover oil and gas resources. Under the proposed CSU restriction, exploration and development of any potential oil and gas reserves would have to be done, where feasible and appropriate, by means of well twinning or directional drilling methods. Directional drilling would increase costs significantly compared to the drilling of a vertical well. The oil and gas resource may not be recoverable, depending on the number and location of well pads allowed in the Periphery Area. Portions of the TCP and Periphery Area are nonfederal minerals over which BLM has no jurisdiction. Productive wells drilled on these nonfederal minerals could result in potential drainage of federal oil and gas resources.

While exploration and development is allowed in the Periphery Area, activities would be subject to a CSU stipulation restricting exploration and development unless a satisfactory mitigation plan is developed. Approximately 9,479 acres of oil and gas leases are held by production within the proposed

boundary. These leases, which are held until production ceases, would conflict with the proposed management of the ACEC. Surface-disturbing activities within the ACEC would be subject to a CSU restriction prohibiting or restricting exploration and development unless a satisfactory mitigation plan is developed.

Under Alternative B, the TCP and the Periphery Area are withdrawn from mineral entry. Numerous mining claims exist in the area. The withdrawal would be pursued to segregate the area from operation of the mining laws, which would preclude staking new claims. Existing claims represent valid existing rights and would not be affected by the withdrawal. A validity examination may be initiated to contest existing claims. If the validity examination finds the claims are not valid, the claims would be declared null and void, and the segregation from operation of the mining laws would take effect. No mining activity would occur. Claims determined to be valid would not be affected by the withdrawal, and mining activity could continue. If a valid claim was abandoned or invalidated for any reason, the withdrawal segregation would then take effect on the land, precluding any further mining activity.

Developing mineral materials also would be prohibited within the TCP and limited in the Periphery Area, creating a minor adverse impact on that resource. Again, the impact would be minimal given the limited spatial extent of the proposed ACEC. Existing mineral material permits would be allowed to expire without renewal or expansion.

The NSO and CSU restrictions also limit range improvements on the property to maintenance of existing developments only, causing limited adverse impact to rangeland resources. This adverse impact would be enhanced by management actions aimed at maintaining or reducing the current level of livestock use.

Protective measures prohibiting surface disturbance (i.e., NSO restrictions and mineral withdrawal) on the TCP and required mitigation for disturbance in the Periphery Area are expected to minimize the spread of INPS, limit biological impacts, and increase the potential for meeting VRM goals compared to Alternative A. The potential resource management actions within this area would be subject to maintaining the ceremonial values, which generally coincide with VRM class management. Current VRM inventory designates this area as Classes II and III.

An ACEC designation may limit or prevent potential land disposal proposals associated with this area, resulting in a minor, long-term adverse impact. Because land use authorizations are prohibited under Alternative B, they would be impacted by the ACEC designation for the Cedar Ridge TCP.

Alternative C

Under Alternative C, the Cedar Ridge TCP is established as an MA on 19,055 acres, of which 12,481 are BLM-administered surface and 16,994 are federal mineral estate. The Periphery Area under Alternative C is bounded on the south by the Arminto/Lost Cabin Road and Badwater Road to the north. Alternative C would have the same beneficial impact to visual resources, the same adverse impacts to rangeland resources, and the same impacts to lands and realty (i.e., land disposal) as under Alternative B, but to a slightly smaller degree given the smaller spatial extent of the MA.

Adverse impacts to mineral resources under Alternative C are similar to those described under Alternative B, with the following exception: the CSU restrictions would apply to a smaller area given that the Periphery Area in Alternative C is smaller than in Alternative B; a mineral withdrawal would be pursued for the TCP, but not for the Periphery, under Alternative C, limiting impacts to locatable minerals. These area reductions would be negligible with regard to overall impacts to mineral resources.

Alternative D

Alternative D does not implement a special designation or an MA for the Cedar Ridge TCP. Alternative D provides a minor beneficial impact to the TCP by adding CSU restrictions within the TCP itself, compared to Alternative A. Adverse impacts to the cultural resources for which the area is proposed are similar to those under Alternative A. Adverse impacts to mineral resources as a result of the CSU restrictions would be minimal, unless an acceptable plan for mitigating impacts is not reached, restricting or prohibiting oil and gas development. No withdrawal from locatable mineral entry would be pursued and developing mineral materials would be allowed. Impacts to other resources are not expected.

Alternative E (Proposed Casper RMP)

Under Alternative E, the Cedar Ridge TCP is not designated as an ACEC or an MA; however, additional management actions are established to protect sensitive and important cultural values known to exist in the area. An NSO restriction would be applied within the TCP and a CSU restriction would be applied to the Periphery Area (from as far south as the Arminto/Lost Cabin Road and as far north as the Badwater Road), resulting in the same impacts to mineral resources and rangeland resources as described under Alternative C. The TCP only is withdrawn from mineral entry and mineral materials development is prohibited. The Periphery Area would be available for locatable mineral entry and mineral materials development. These actions would adversely impact locatable and salable minerals, as described under Alternative C.

4.7.1.18 Conclusion

Alternatives B and C serve to protect the resources for which the Cedar Ridge TCP ACEC/MA was proposed more than the other alternatives. Conversely, alternatives B and C could have the most adverse impacts on other resources, specifically minerals and rangeland resources. Alternative A provides the least protection for cultural resources in the Cedar Ridge TCP area and the least potential adverse impacts to other resources. Under Alternative E, the Cedar Ridge TCP would not be designated as an ACEC, nor established as an MA. However, specific management actions would protect important cultural values with the least practical impact on other resources. NSO would be allowed within the TCP. Maintenance of existing range improvements would be allowed, but no new improvements. The Periphery Area would extend only as far south as the Arminto-Lost Cabin Road. A CSU restriction would be applied to this area and use of directional drilling or well twinning would be encouraged. Developing mineral materials would not be permitted within the TCP, existing mineral material permits would be allowed to expire without renewal or expansion, and disturbed areas would be reclaimed. Mineral materials development within the Periphery Area would be limited to 5 acres or less, allowing for expansion of sites only after rehabilitation of the initial location. The BLM will pursue acquisition or interest in lands in the Cedar Ridge TCP area. Livestock would be managed to meet the objectives of the TCP. A withdrawal of 4,058 acres of mineral estate is pursued within the TCP, segregating these areas from operation of public land laws, including the mining laws.

Overall, the potential for mineral resources (leasable, locatable, salable) in the Cedar Ridge TCP is modest at best. Of 3,372 acres of public land and 4,082 acres of federal minerals, the area has 3,501 acres of moderate oil and gas potential and 581 acres of low oil and gas potential. CBNG potential is very low. The area contains 2,492 acres of poor to marginal wind-energy potential, 1,451 acres of fair potential, and 132 acres of good potential. Locatable and salable minerals (uranium, base metals, bentonite, gypsum, limestone) are all rated at 0 acres of high-moderate potential, and 4,082 acres of low-to-no potential. Applying constraints, such as an NSO restriction to this area will affect about one-third of the acres held by production (Hitchcock Draw and Madden Units), and have little adverse impact on locatable or salable minerals and moderate adverse impact to oil and gas. Considering the rugged terrain within the TCP, suitable drilling locations are rare, and interest will be more readily placed on the Periphery Area, where

the landscape is more suitable to construction of well pads and other ancillary facilities. Constrained only by CSU restrictions, development on 18,591 acres (Alternative B) or 15,948 acres (alternatives C, E) will be conditioned by topography and cultural issues, but not precluded. Withdrawing the TCP from mineral entry will have a negligible effect on locatable minerals; a locatable minerals withdrawal in the Periphery Area (Alternative B 19,637 acres; alternatives C and E, 4,058 acres) would be more substantial. For the most part, other resources or uses would be minimally affected, as limiting surface disturbance would enhance vegetation, soils, air quality, and wildlife. Range improvements would be limited to maintenance of existing facilities and grazing management would need to meet cultural resources management goals. Recreation is unlikely to experience substantial adverse impacts.

North Platte River ACEC (Proposed)

Designation of the North Platte River ACEC provides protection of the natural resources, wildlife habitats, and future recreational opportunities within the corridor of the North Platte River. The alternatives are similar, varying primarily in size and management intensity.

The North Platte River ACEC size and location varies by alternative, the largest of which encompasses public lands within ¼ mile on either side of the river from the high watermark for the entire length of the North Platte River within the planning area. Impacts of the ACEC are limited to the lands falling within the boundaries defined for each alternative.

4.7.1.19 Methods and Assumptions

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

- The existing SRMA designation for the North Platte River is carried forward for alternatives A, D, and E. The BLM is preparing an Environmental Assessment (EA) and a Recreation Area Management Plan for the SRMA.

4.7.1.20 Analysis of Alternatives

Impacts Common to All Alternatives

The North Platte River protective withdrawal, comprising 3,226 acres, is continued under all alternatives. Lands acquired by purchase or donation are segregated from operation of the public land laws, including the mining laws, and restoration projects focus on improving wildlife habitats and recreational opportunities.

Designation of a North Platte River ACEC (identification of a SRMA for alternatives A, D, and E) under all alternatives would establish the North Platte River as a priority area and, as such, management efforts would focus such that problems and issues can be dealt with more effectively, thereby serving to better protect cultural resources, visual resources, and wildlife and riparian habitats. A slight adverse impact to cultural resources may occur in that if disturbance is lessened, the need for a cultural resource survey may be less, and less cultural information would be generated. Overall, however, the ACEC would benefit cultural resources.

Alternative A

Under Alternative A, the SRMA continues on the Trappers Route landing sites between Alcova and Casper and 10 riverfront parcels of public surface between Casper and the Wyoming – Nebraska border. The SRMA has direct beneficial impacts to recreational opportunities. Developing new facilities, designating and upgrading roads, and reclaiming heavily impacted areas provides a range of river-related activities and user experiences. Developing recreational facilities mitigates environmental impacts related to recreational use.

Travel routes are limited to designated roads and trails. All roads existing prior to 1985 are available for use, and access roads are upgraded. Current travel management along the river provides for current levels of recreational use with increased access possibilities in the future. All newly acquired lands are managed according to the SRMA objectives.

Apart from recreational infrastructure, management actions limit surface development and exclude mineral material sales within ¼ mile of the North Platte River. New ROW are excluded within 1 mile of the North Platte River. Current management allows for changes to grazing leases as deemed necessary and acquired lands not available for livestock grazing. These actions have numerous benefits, such as minimizing the spread of INPS, reducing erosion and the associated sediment levels, and protecting the visual resources within the corridor. These management actions also benefit natural habitats, the integrity of NHTs and Other Historic Trails, and the quality of recreational experiences.

The ¼-mile surface-development restriction allows directional drilling to recover oil and gas reserves within the buffer. The 1-mile ROW restriction prevents only the building of new access roads on public surface within the corridor. Therefore, these actions do not have a major impact on oil and gas drilling and production and geophysical exploration. Prohibiting sand and gravel extraction on public lands between Alcova and the Wyoming – Nebraska border, removes approximately 15,000 acres of federal mineral estate and is considered a major adverse impact.

Management prescriptions within this area, including developing infrastructure, are subject to the 1985 VRM, which designates this area as Class III. Alternative A results in the least restrictive management of visual resources. Restrictions on surface development would limit impacts to visual resources.

Alternative B

Alternative B designates as an ACEC all public surface and federal mineral estate within ¼ mile of the high watermark on both sides of the river (3,488 acres of BLM-administered surface) throughout the entire length of the planning area. This is essentially the same area currently being intensively managed for recreation and wildlife habitats. Active management of recreation resources has similar impacts to those described under Alternative A, but to an inherently greater extent. OHV use is restricted to designated routes, as outlined in the North Platte River Recreation Area Management Plan.

The ACEC is closed or administratively unavailable to all mineral activities, including geophysical exploration, and is a ROW avoidance area. The area is not available for livestock grazing. These management actions provide additional protection to the North Platte River and have fewer impacts on soil and water resources than Alternative A. Designation of the North Platte River as an ACEC results in the most restrictions and adverse impacts to nonrenewable resources. However, the impacts of Alternative B are only slightly elevated compared to existing management. Limited leasing results in some long-term adverse impacts to oil and gas development. Impacts to sand and gravel operations are identical to those described in Alternative A.

Conservation measures under Alternative B are slightly more restrictive than those under Alternative A and would provide more benefits to riparian and wetland areas. Making livestock grazing unavailable on Trappers Route landing sites and acquired lands along the river enhances vegetative communities, improves bank stability, and encourages willow and cottonwood regrowth. Restoration of cottonwood stands is expected to result in long-term beneficial impacts on riparian communities and increase available perches for bald eagles and other raptors. Impacts to the local grazing community are not expected to be substantial.

Alternative C

Alternative C designates lands within ¼ mile from the high watermark on both sides of the river between Pathfinder Dam and the Dave Johnston Power Plant as an ACEC (2,387 acres of BLM-administered surface). The majority of public land parcels along the North Platte River lie within this area.

Public lands and minerals within the ACEC boundary are managed as described in Alternative B, with the exception that acquired lands are available to livestock grazing, excluding riparian zones. Within the boundaries of the ACEC, benefits to wildlife habitats, visual resources, historic trails, and recreational opportunities are expected to be similar to those described in Alternative B, but to a slightly diminished degree given the smaller spatial extent of the ACEC.

Public lands east of the Dave Johnston Power Plant and contiguous to the river are available for mineral development subject to CSU restrictions. Mineral use in these areas could occur under Alternative C, creating a beneficial impact for those resources.

Alternative D

Under Alternative D, the Trappers Route landing sites and public lands within ¼ mile on either side of the river from the high watermark between Pathfinder Dam and Robertson Road in Casper (2,238 acres of BLM-administered surface) are managed as an SRMA. Public lands within the SRMA boundary are managed for intensive recreation and are open to oil and gas leasing subject to an NSO restriction. Acquired lands are available for livestock grazing. Within these boundaries, benefits and impacts to all resource values, including mineral development, are similar to those under Alternative A but to a lesser degree, given the smaller spatial extent of the SRMA.

East of Casper, lands within a ¼ mile of the river are made available for mineral development, sand and gravel operations, and free-use areas, subject to CSU restrictions. Public lands adjacent to the Guernsey and Glendo reservoirs, however, are made available for disposal of mineral materials. All lands currently leased for grazing continue and no impacts are anticipated. The lessening of restrictions on this portion of the river benefit both leasable and salable mineral development, compared to the other alternatives.

Alternative E (Proposed Casper RMP)

Under Alternative E, the area is managed as an SRMA, but expanded to include the Trappers Route landing sites and public land parcels within ¼ mile on either side of the river from the high watermark between Pathfinder Dam and the Natrona/Converse county line (2,250 acres of BLM-administered surface). The corridor is open to oil and gas leasing, subject to NSO restrictions. Recreational landing sites and lands acquired along the entire river to enhance public access are not available for livestock grazing. Impacts are similar to those discussed under Alternative A for the SRMA.

Public lands within ¼ mile of the river segment and east of the Natrona/Converse county line are open to oil and gas leasing and development and mineral materials disposal on a case-by-case basis. All surface-disturbing activities on public lands in this section would be subject to CSU restrictions. Public lands adjacent to major reservoirs, including Glendo and Guernsey, are not available for mineral materials disposal and are subject to an NSO restriction. These restrictions have limited adverse impacts on mineral resources. Recreational facilities are not included under these restrictions.

Impacts to renewable resource values resulting from this alternative are not substantially different than those described in Alternative C. Impacts to nonrenewable resources are similar to Alternative D.

4.7.1.21 Conclusion

Alternative B provides the greatest protection to natural resources, wildlife habitats, and future recreational opportunities within the corridor of the North Platte River, but has the most adverse impacts to mineral resources. Alternatives A, C, D, and E have varying levels of restrictions, primarily based on adjusted ACEC/SRMA boundaries, but still afford protection for the river ecosystem, recreation, wildlife, cultural, and visual resources.

Salt Creek MA (Proposed)

The Salt Creek MA facilitates oil and gas exploration and development in the Salt Creek oil field area. The BLM issues all new oil and gas leases in this area with standard stipulations only (Appendix N) and development complies with nondiscretionary laws (e.g., ESA, NHPA). However, the BLM would not consider discretionary timing stipulations such as those imposed for the protection of greater sage-grouse, raptor, and mountain plover nesting habitats and big game crucial winter ranges.

The proposed Salt Creek MA falls completely within the existing Salt Creek Hazardous Area ACEC boundary in northeastern Natrona County. Impacts to resources are limited to the area within the MA boundary.

4.7.1.22 Methods and Assumptions

Methods and assumptions used in this impact analysis are identified at the beginning of Chapter 4.

4.7.1.23 Analysis of Alternatives

Impacts Common to All Alternatives

Impacts of the proposed Salt Creek MA vary by alternative, as described below.

Alternative A

Under Alternative A, no special management is prescribed for the Salt Creek MA. The BLM manages oil and gas development in this area under current directives, including those prescriptions designated under the Salt Creek Hazardous Area ACEC.

Alternative B

Under Alternative B, the BLM would not establish the Salt Creek MA, but manage the area according to the RMP revision decisions for that resource or use. Therefore, there would be no impact to other resource uses from special designations or MAs under Alternative B.

Alternative C

Alternative C designates a 23,911-acre Salt Creek MA, including 19,325 acres of BLM-administered surface, 22,228 acres of BLM-administered mineral estate, and a high oil and gas development potential as defined in the RFD (BLM 2005c). The BLM directs management actions at facilitating oil and gas exploration as well as development in the Salt Creek oil field, which is beneficial for oil and gas resources. Given the historic use of the area for extensive oil and gas exploration and development, the impacts to other resources are the same as Alternative A, with the exception of wildlife (e.g., greater sage-grouse, mountain plover, and raptors and big game) protected by discretionary laws. Management does not impose timing restrictions to protect these species and their habitats from oil and gas development in the proposed MA. The MA does not impact greater sage-grouse or big game crucial winter range because there are no known greater sage-grouse leks, greater sage-grouse nesting habitats, or crucial winter range

habitats within the proposed MA area. The area contains 10 raptor nests on BLM-administered surface and mineral estate (BLM 2006a), but the extent of mountain plover nesting habitats is unknown.

Establishing the Salt Creek MA has limited impacts on cultural resources because the MA requires adherence to nondiscretionary policies and restrictions. Historic preservation mandated by law in compliance with Section 106 of the NHPA would still be required. Cultural resources could experience secondary adverse impacts if other resource values (such as soils and vegetation) are de-emphasized.

Alternative D

The BLM establishes a much larger MA under this alternative (90,931 acres) and includes Salt Creek, South Salt Creek, West Salt Creek, Smoky Gap, East Teapot, North Sage Spring Creek, and Sage Spring Creek fields. Under this alternative, the proposed MA area includes 35,616 acres of BLM-administered surface and 79,420 acres of BLM-administered mineral estate. Based on the RFD (BLM 2005c), the area contains 23,872 acres of high oil and gas development potential and 67,059 acres of low oil and gas development potential. The impacts to other resources are the same as Alternative A, with the exception of wildlife species protected by discretionary laws. Management does not impose timing restrictions to protect these species from oil and gas development. The area comprises 432 acres of crucial big game winter range, of which 23 acres are on BLM-administered surface and 357 acres are on BLM-administered mineral estate; 3 greater sage-grouse leks, of which 1 is on BLM-administered surface and 3 are on BLM-administered mineral estate; approximately 9,160 acres of greater sage-grouse nesting habitats; and 28 known raptor nests, of which 10 are on BLM-administered surface and 26 are on BLM-administered mineral estate. The amount of mountain plover nesting habitats is unknown. The greater sage-grouse-leks and most of the nesting habitats are located in the southern portion of the proposed MA.

Alternative E (Proposed Casper RMP)

Establishing the Salt Creek MA under Alternative E has the same impacts on the management of other resources as described under Alternative C.

4.7.1.24 Conclusion

The Salt Creek MA facilitates oil and gas exploration in the Salt Creek oil field areas. Establishing the MA under alternatives C, D, and E could benefit oil and gas development activities, with Alternative D having the greatest potential benefit due to the larger size of the area proposed under that alternative. Conversely, Alternative D could have the greatest adverse impact to wildlife species subject to discretionary protection.

Sand Hills MA (Proposed)

The Sand Hills MA manages the public lands to protect the integrity of the soils and vegetation within this fragile area. The 17,633-acre Sand Hills area is about 10 miles northeast of Casper and extends into Converse County. This impact analysis is limited to the area within the proposed MA boundary.

4.7.1.25 Methods and Assumptions

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

- All surface-disturbing activities are managed intensively in the Sand Hills under alternatives B, C and E (See Appendix U).
- To be effective on highly erodible soils, more extensive BMPs than those commonly used will be installed and aggressively maintained. The risk of BMP failure is greater on highly erodible soils.

4.7.1.26 Analysis of Alternatives

Impacts Common to All Alternatives

The Sand Hills and associated uses defined in all alternatives are subject to the historic trail limitations related to the Bozeman Trail. The limitation includes protecting trail features and limiting surface-disturbing activities within a ¼-mile protective zone from either side of the physical trail or to the visual horizon, whichever is closer.

Alternative A

Current management for the area emphasizes the protection of fragile watershed values. The Sand Hills is not managed under any special designation or MA. The area is subject to various development activities and will remain open to oil and gas leasing, mining, and material extraction. Livestock grazing is maintained at current levels unless the application of the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b) indicates change is required. Oil and gas development has occurred in the Sand Hills for many years. Depending on the intensity of future development, habitat fragmentation, loss of vegetation cover, a substantial increase in INPS spread and wind and water erosion could result given the fragile nature of the soils in the Sand Hills.

Semiprimitive and primitive recreational opportunities are limited in the area due to intermingled land patterns and lack of legal access. Acquiring access to the area is limited to cooperative landowner agreements, and only if there is sufficient public demand to warrant access agreements. Acquiring public access into the Sand Hills, if not strictly controlled, likely would result in substantial damage to this fragile system. Cross-country ROW placement could occur under certain circumstances, potentially resulting in an impact to the viewshed.

Alternative B

Under Alternative B, the Sand Hills MA is established on approximately 17,633 acres of public lands. Ninety-five percent of the MA contains soils with high wind-erosion potential. Proposed management actions for this area have a beneficial impact on soil resources. Management actions under this alternative minimize surface disturbance, protecting both vegetation and soils. Wildlife habitats and associated species directly benefit. Beneficial impacts to cultural resources also could occur under this alternative as a result of reducing surface development.

New oil and gas leases are not issued for those areas currently unleased. Unleased federal minerals are administratively unavailable to geophysical exploration. Development constraints and management actions reduce surface disturbance and the opportunity for INPS spread compared to Alternative A.

Establishing the Sand Hills MA likely would limit or prevent potential land disposal proposals associated with this area, unless directed at adjusting the boundary or acquisitions that compliment the MA.

Motorized public access to the area is not pursued to protect fragile soils and vegetation from uncontrolled OHV use. Motorized access for ranching and oil and gas operations continue, but are limited to existing roads and trails. Acquiring nonmotorized legal access to the area further benefits recreation, but is restrictive in terms of class of users. Under Alternative B, exclusion of ROW could impact future oil and gas developments.

Making future oil and gas leasing and development administratively unavailable for the life of the plan to the Sand Hills MA has direct adverse impacts to oil and gas resources. Unleased lands within the MA are subject to drainage from producing wells completed on adjacent state and fee minerals. Portions of the

proposed MA are held by production and other areas within the MA are leased. Unleased federal minerals within the MA are not within any unitized area. Surface-disturbing activities on existing oil and gas leases are intensively managed to meet the objectives for management of the area. Ninety-eight percent of the MA is identified as having low oil and gas development potential, so impacts on future development are expected to be minor. However, a multimillion-dollar 3-D geophysical project was recently completed in this area, which could lead to further development and leasing.

The proposed Sand Hills MA also is withdrawn from locatable mineral entry under Alternative B and closed to mineral material development, reducing the availability of those resources. No new corridor designations are made in this alternative, and the area is a ROW avoidance area.

Alternative C

Under Alternative C, the Sand Hills MA is established on approximately 17,633 acres of BLM-administered lands, which is the same area as Alternative B. Managing the Sand Hills MA under Alternative C is the same as Alternative B, with the exception of obtaining motorized access to the area under Alternative C.

Alternative C allows for public road access to the area, which benefits recreational use; however, road access creates transport corridors for INPS spread and increases OHV use, resulting in increased erosion of soils in the area. Impacts to oil and gas and the disposal of mineral materials and locatable minerals are the same as Alternative B.

Alternative D

Under Alternative D, the Sand Hills MA is not established. Management is in accordance with the RMP revision decisions for each resource or resource use. Impacts to resources and resource uses are expected to be similar to those identified under Alternative A. Cross-country ROW could occur under certain circumstances.

Alternative E (Proposed Casper RMP)

Alternative E has the same impacts on the management of other resources as described under Alternative B.

4.7.1.27 Conclusion

Alternatives B and C are aimed at protecting the integrity of the soils and vegetation within the proposed MA. Alternatives B, C, and E, could have beneficial impacts on these resources to varying degrees, with Alternative B being most beneficial. Alternatively, restrictions imposed by alternatives B, C, and E, especially on mineral resources, have adverse impacts on resource availability and development. Additional constraints proposed under this MA cannot be applied to existing leases without consent of both the lessee and the BLM. However, surface-use mitigation measures can be developed through the EA process and applied as COAs to any new development action. Since no new oil and gas leases are issued, unleased lands within the MA are subject to drainage from producing wells completed on adjacent state and fee minerals.

South Bighorns/Red Wall ACEC/MA (Proposed)

The South Bighorns/Red Wall special designations and MAs are proposed to protect and enhance crucial wildlife habitats, unique vegetative communities, and cultural, historical, recreational, and visual quality. Management is directed toward maintaining habitats and preserving the diversity of resources in this area. The South Bighorns/Red Wall area is located in the northwestern portion of Natrona County. The actual area encompassed by each alternative varies.

4.7.1.28 Methods and Assumptions

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

- Existing and future special designations or establishments within the boundary of the proposed South Bighorns/Red Wall ACEC or MA are managed under the decisions for those areas.
- Impacts to existing special designations or establishments within the proposed South Bighorns/Red Wall ACEC or MA are not addressed in this discussion, as they are expected to be minimal.
- All surface-disturbing activities in the South Bighorns/Red Wall ACEC or MA under alternatives B, C, and E are intensively managed, as described in Appendix U.
- Impacts to locatable and saleable minerals are based on the acres of a given resource with moderate or greater potential for development.
- Due to the mixed land ownership, the area is managed in cooperation with adjacent landowners.
- Under normal circumstances, standard mitigation guidelines are effective in minimizing impacts to resources; however, conditions such as steep slopes, highly erosive soils, or extreme environmental events may require more aggressive management actions to mitigate adverse impacts.

4.7.1.29 Analysis of Alternatives

Impacts Common to All Alternatives

Grazing use is maintained as presently authorized. Allotment adjustments, if needed, are prescribed by applying the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming* (BLM 1998b). In general, grazing by large ungulates may adversely impact vegetation, soil, and water if not properly managed. Riparian and wetland communities can be adversely impacted, as livestock and wildlife tend to congregate in these areas. Competition for the same forage occurs between livestock and wildlife. Impacts to other resources vary by alternatives, as described below.

Alternative A

Currently, no special designations or MAs exist for the area. The area is managed for multiple use with an emphasis on wildlife habitats, cultural resources, grazing, and recreational use. Resource values found in the area are managed in accordance with existing RMP decisions for those resources and the prescriptions defined for resource management unit 1. For analysis purposes, the area proposed for designation under Alternative C was used, since it encompassed the greatest area.

Three natural landmarks currently occur within the proposed area: the Badwater/Grey Hills Natural Landmark, the Rainbow Hills of Arminto Natural Landmark, and Precambrian Gneiss of the Big Horns Natural Landmark. The area also is bisected by the South Bighorns/Red Wall National Back Country Byway. This portion of the planning area contains part of the Middle Fork Powder River SRMA.

Management restrictions designed to protect resources include no occupancy on slopes exceeding 25 percent and no surface development within a ½ mile of the Red Wall/Gray Wall complex. Various timing limitations and wildlife restrictions apply from October 1 to June 15. Management prescriptions include monitoring wildlife, habitat-improvement projects, and forest-stand improvement. The area is open to operation of the public land laws and mineral material sales. Necessary ROW are confined to county roads, but placement along the Big Horn Mountain, Okie Trail, and Buffalo Creek roads is excluded.

OHV use is limited to existing roads and trails. Approximately 20,179 acres, of which 12,539 acres is public surface and 20,179 acres are federal mineral estate, continue to be administratively unavailable for the life of the plan from oil and gas leasing. The area continues to be open to geophysical exploration with operations limited by NSO restrictions.

The impact resulting from the restrictions relative to oil and gas leasing continue. Salable and locatable mineral resources are available for use. Specific VRM mitigation standards have not been identified. Scenic quality evaluations or class determinations for the area were not completed, resulting in the least restrictive management of visual resources. Cultural resource inventories prior to authorized activities continue to comply with Section 106 of the NHPA.

Alternative B

Under Alternative B, the South Bighorns/Red Wall ACEC is designated on 262,901 acres, of which 146,812 acres are public surface and 216,460 acres are federal mineral estate. Under Alternative B, designation as an ACEC emphasizes management for renewable resource values, but allows for limited development of existing mineral material and oil and gas rights.

Restrictions include withdrawal from the mining laws, oil and gas leasing and geophysical operations on public surface that is administratively unavailable for the life of the plan, closure for mineral material development, and an NSO restriction for ½ mile on either side of the Red Wall/Gray Wall complex. A CSU restriction applies to all nonmineral-related surface-disturbing activities. The proposed area is a ROW exclusion area. These requirements protect the integrity of the ecosystem within the boundary of the ACEC.

Under Alternative B, valid existing rights are honored. Due to the closure of geophysical operations, it is harder to identify oil and gas reserves. Making oil and gas leasing and geophysical operations administratively unavailable for the life of the plan adversely impact these resources and result in an economic loss. This impact is expected to be minor, since 97 percent of the area has low to no potential for oil and gas development. Activities on existing oil and gas leases are intensively managed to meet the goals of the ACEC (see Appendix U), which may increase the operational costs of oil and gas development. To minimize surface-disturbing activities, oil and gas exploration and development use directional drilling techniques and well twinning whenever practicable. Since the area is closed to disposal of mineral materials, the existing pits in the area are closed when the permits expire. Thus, the resource is not developed. Any gravel needs have to be transported from sources outside the area. No impacts to uranium, trona, or other base and precious metal development occur since these resources have no acres with moderate or greater potential for development. Some adverse impacts to the development of bentonite, gypsum, limestone, and phosphate occur.

The more restrictive management of resources under this alternative provide a greater potential for achieving VRM goals compared to Alternative A. The proposed management and changes in Alternative B provide greater opportunity to manage OHV use than does Alternative A.

Designating the South Bighorns ACEC has a beneficial impact on cultural resources because surface-disturbing activities are more restricted and systematic block cultural inventories are conducted. In addition, lands are acquired to block and buffer sensitive cultural resources, such as concentrations of sites eligible for nomination to the NRHP.

Alternative C

Under Alternative C, the South Bighorns/Red Wall MA is established on 369,325 acres, of which 206,155 acres are public surface and 309,854 acres are federal mineral estate. Management of this area focuses on

renewable resources, such as wildlife and recreational values, but also allows for limited development of existing mineral material and oil and gas rights.

The MA is withdrawn from the mining laws, and is administratively unavailable for oil and gas leasing the life of the plan, and closed to geophysical operations. That portion of the viewshed of the South Bighorns/Red Wall National Back Country Byway and other county roads within the MA restrict surface disturbance associated with mineral material development to 5 acres or less, allowing for expansion of sites or contiguous disturbance only after rehabilitation of the initial location has been initiated. A CSU restriction is applied to the Red Wall/Gray Wall complex. The existing Lost Cabin-Arminto Road designated ROW corridor is to continue, but no new ROW corridors are designated. The remainder of the proposed area is a ROW exclusion area.

Making oil and gas leasing administratively unavailable for the life of the plan and closure of geophysical operations has the same impact as described in Alternative B because more than 99 percent of the area has low to no potential for oil and gas development. Activities on existing oil and gas leases are intensively managed to meet the goals of the MA (see Appendix I), which may increase the operational costs of oil and gas development. To minimize surface-disturbing activities, oil and gas exploration and development use directional drilling techniques and well twinning whenever practicable. A 5-acre development of mineral materials meets local needs and allows for expansion of operations resulting in negligible impacts to mineral material development. No impacts to uranium, trona, or other base and precious metal development occur, since these resources have no acres with moderate or greater potential for development. More adverse impacts occur to the development of bentonite, gypsum, and phosphate, but less adverse impacts to the development of limestone than Alternative B.

Establishing the South Bighorns/Red Wall MA has less beneficial impacts on cultural resources than Alternative B because surface-disturbing activities are less restricted, and block cultural inventories are conducted in high-site density areas only, rather than the entire area. Land acquisition to benefit cultural resources is the same as Alternative B.

Alternative D

Under Alternative D, the South Bighorns/Red Wall area is not designated as an ACEC or established as an MA. Management is in accordance with the RMP decisions for individual resources or resource uses.

Under Alternative D, ROW in the area are evaluated on a case-by-case basis. Since standard stipulations are the only restrictions applied, Alternative D results in a beneficial impact to oil and gas leasing or development, geophysical operations, mineral material development, or development of locatable minerals. These resources are limited by the potential for any given resource in the area.

Management of and impacts to cultural resources are the same as Alternative A.

Alternative E (Proposed Casper RMP)

Under Alternative E, 93,352 acres are established as an MA, of which 55,945 acres are public surface and 75,913 acres are federal mineral estate. Under Alternative E, establishing an MA emphasizes management for renewable resource values, but allows for limited development of existing mineral material and oil and gas rights.

Restrictions to be applied to all activities include withdrawal from the mining laws, making oil and gas leasing and geophysical operations on public surface administratively unavailable for the life of the plan, closure for mineral material development, and an NSO restriction for ½ mile on either side of the Red Wall/Gray Wall complex. All activities within the area outside the ½ mile on either side of the Red

Wall/Gray Wall complex are restricted by a CSU restriction. The area is a ROW exclusion area. These requirements protect the integrity of the ecosystem within the boundary of the MA.

Under Alternative E, valid existing rights are honored. Due to the closure of geophysical operations, it is harder to identify oil and gas reserves. Making oil and gas leasing administratively unavailable for the life of the plan and closing and geophysical operations adversely impact these resources and result in an economic loss. This impact is expected to be minor since 100 percent of the area has low to no potential for oil and gas development. Activities on existing oil and gas leases are intensively managed to meet the goals of the ACEC (see Appendix U), which may increase the operational costs of oil and gas development. To minimize surface-disturbing activities, oil and gas exploration and development use directional drilling techniques and well twinning whenever practicable. Since the area is closed to disposal of mineral materials, the existing pits in the area are closed when the permits expire. Thus, the resource is not developed. Any gravel needs have to be transported from sources outside the area. No impacts to uranium, trona, limestone, or other base and precious metal development would occur since these resources have no acres with moderate or greater potential for development under Alternative E. Adverse impacts to the development of gypsum and phosphate would occur, but they would be less adverse impacts than under alternatives B and C.

Management of and impacts to cultural resources are the same as Alternative A.

4.7.1.30 Conclusion

The South Bighorns/Red Wall ACEC/MA under alternatives B, C, and E could have long-term beneficial impacts to wildlife, soil, vegetation, and water resources by limiting surface and wildlife-disturbing activities in the area and managing the area intensively for these resources. Under alternatives A and D, the MA is not established and the added potential beneficial impacts to the listed resources not realized.

Alternatives B, C, and E could have a greater impact to resource development activities, including minerals exploration and development, by restricting surface activities to a much greater extent than under alternatives A and D. The severity of the impact is directly related to area size.

Alternatives B and C, in that order, have the greatest beneficial impact to cultural resources due to increased inventories and priority for land acquisitions to protect cultural resources.

Wind River Basin MA (Proposed)

The Wind River Basin MA facilitates oil and gas exploration and development in the Wind River Basin. The BLM issues oil and gas leases in this area with standard stipulations (Appendix N) only, and development complies with nondiscretionary laws (e.g., ESA, NHPA). Under alternatives C, D, and E, the Casper Field Office does not apply big game crucial winter range habitats, raptor nesting habitats, mountain plover, and greater sage-grouse nesting TLS restrictions within the Wind River MA-established area. A ¼-mile CSU restriction protects greater sage-grouse leks.

TLS restrictions do not prevent eventual loss of habitats, but rather prevent wildlife-disruptive activities for one season, including habitat loss during crucial times, such as breeding/nesting or winter conditions. The timing limitation delays development during these time periods. These TLS restrictions do not apply to development of nonfederal minerals.

The proposed Wind River Basin MA lies in the western portion of Natrona County. The Wind River Basin geologic province extends beyond Natrona County. Analysis of impacts is limited to the portion of the province located in Natrona County.

4.7.1.31 Methods and Assumptions

Methods and assumptions used in this impact analysis are identified at the beginning of Chapter 4.

4.7.1.32 Analysis of Alternatives

Impacts Common to All Alternatives

The RFD identified areas with high, moderate, and low conventional oil and gas development potential within the MA. The chart below shows the number of conventional wells predicted for each of the development potential areas.

Conventional Wells

	High Development Potential	Moderate Development Potential	Low Development Potential
Wells per Township	100 – 500	20 – 100	2 – 20

The RFD also identifies areas within the MA that have low to very low CBNG development potential. The RFD predicted 2 to 20 new wells per township in low development potential areas and less than one new well per township in areas with very low development potential. Some level of oil and gas development occurs under each alternative, resulting in loss of nesting and crucial winter range habitats. Impacts vary among alternatives, as described below.

Alternative A

Under Alternative A, the BLM manages oil and gas development under current management directives. Throughout the planning area, current management directives prohibit drilling and other surface-disturbing activities from November 15 to April 30 in big game crucial winter ranges. Three restrictions currently protect greater sage-grouse. Management directives prohibit surface-disturbing activities in greater sage-grouse nesting and early brood-rearing habitats from March 15 to July 15 within a 2-mile radius; prohibit surface disturbing activities in greater sage-grouse winter habitats from November 15 to March 14; and prohibit surface-disturbing activities or occupancy within ¼ mile of the perimeter of greater sage-grouse leks. Management directives also prohibit surface-disturbing activities or drilling from February 1 to July 31 within a ¼- to ½-mile buffer around raptor nests and from April 10 to July 10 in mountain plover nesting habitat areas.

Under Alternative A, the Wind River Basin geologic province area contains 292 raptor nests; 240 of which are on federal mineral estate. Under current management, portions of the Wind River Basin, including Cooper Reservoir, Waltman, and Cave Gulch fields, provide the following protection measures for raptors. Development activity initiated prior to February 1 may be completely finished as long as the development activity does not cease for 3 weeks or longer between February 1 and June 1. A certified biologist checks nest activity if development ceases for 3 weeks or longer during the raptor breeding and nesting season. If an occupied nest is present, activity is restricted during the critical period, which is usually February 1 to July 31 for golden eagles and March 15 to July 31 for other raptor species, or until chicks are fledged.

Under this alternative, oil and gas development in the Wind River Basin continues to be restricted in many areas. Some areas are restricted to a 3-month development window in which TLS restrictions for crucial winter range overlap with timing restrictions for greater sage-grouse, mountain plover, and (or) raptor nesting habitats. As a result, drilling and associated development becomes intensified because of the short timeframe and the amount of area disturbed at once by road, pipeline, and well pad construction. The same TLS restrictions confine reclamation activities so large areas of surface disturbance may not receive any reclamation activities for periods in excess of 1 year. In areas with highly erosive soils,

temporary reclamation measures can be required, but only the fall window from September 15 to November 15 is open for seeding activity. As a result, TLS restrictions can adversely impact other resources, such as air quality, water quality, INPS management, soils, and vegetation.

TLS restrictions do not prevent eventual loss of habitats. Tables 4-16 and 4-17 identify acres of greater sage-grouse breeding and nesting habitats and big game crucial winter range habitats that could be impacted by this alternative.

Alternative B

Alternative B establishes the Wind River MA. The BLM manages surface development according to the prescriptions identified under Alternative B, which include TLS restrictions and surface-use requirements. Alternative B proposes a 4-mile NSO restriction buffer around greater sage-grouse leks, impacting 311,182 acres of federal mineral estate in the Wind River Basin geologic province. The BLM already has leased 248,635 acres (80%) in this area without an NSO restriction. The remaining 20 percent of the area is located within no potential or low to very low development potential. The BLM could not deny drilling on existing leases that do not contain an NSO restriction, resulting in a direct conflict with the management of these areas.

Alternative C

Under Alternative C, the Wind River Basin MA is established on portions of the Wind River Basin that have been determined to have a moderate-to-high potential for oil and gas development (281,037 acres, of which 100,401 acres are BLM-administered surface and 233,496 acres are BLM-administered minerals). The area contains 16,198 acres of highly erosive soils, of which 5,943 acres are on BLM-administered surface and 14,076 acres are on BLM administered mineral estate. The area also contains 11,509 acres that are in a Class II VRM area (see Glossary).

The established MA area overlaps with the southern half of the proposed Cedar Ridge ACEC. The MA still protects the TCP under this alternative, but there is a direct conflict with the management directives for oil and gas development in the buffer area that surrounds the TCP.

Under this alternative, the BLM does not apply discretionary TLS restrictions. Operators could spread out drilling and surface-disturbing activities throughout the year rather than condensing the activities to a 3-month window as in Alternative A. There is less ground surface exposed at any given time, since reclamation would be ongoing throughout the year. As a result, there are beneficial impacts to other resources, such as air quality, highly erosive soils, vegetation, INPS management, visual resources, and grazing, as compared to Alternative A.

Refer to Table 4-16 for acres allocated to CSU or NSO restrictions surrounding leks and Table 4-17 for the acres of crucial winter range potentially impacted by this alternative. In the short term, Alternative C has a greater impact on the nine leks on BLM-administered minerals than Alternative A because use of the nesting habitats surrounding the leks could be lost during the nesting season, leading to abandonment of the leks. Similar short-term impacts occur to other wildlife species protected with TLS restrictions. Long-term impacts to wildlife are similar to Alternative A.

Table 4-16. Acres Within the Wind River Management Area Established with CSU or NSO Restrictions for Greater Sage-Grouse Breeding and Nesting Habitats (by Alternatives)

Oil and Gas Development Potential	Federal Mineral Estate (Acres)	Non-Federal Mineral Estate (Acres)	Total (Acres)
Alternative A – 32 leks, of which 28 are on federal mineral estate ¼-mile CSU restriction plus 1¾-mile TLS restriction or 2-mile buffer			
High	212.70	0.00	212.70
Moderate	50,440.18	108.20	50,548.38
Low	77,816.59	5,419.58	83,236.17
Very Low	20,932.76	2,108.35	23,041.11
Total Acres	149,402.23	7,636.13	157,038.36
Alternative B – 32 leks, of which 28 are on federal mineral estate 4-mile NSO restriction buffer			
High	10,353.16	1,176.23	11,529.39
Moderate	85,725.76	16,803.85	102,529.61
Low	152,309.40	39,432.58	191,741.98
Very Low	55,871.59	10,610.88	66,482.47
None	6,921.92	1,855.77	8,777.69
Total Acres	311,181.83	69,879.31	381,061.14
Alternative C – 10 leks, of which 9 are on federal mineral estate ¼-mile NSO restriction plus 1¾-mile TLS restriction or 2-mile buffer			
High	212.70	0.00	212.70
Moderate	43,397.62	7,150.76	50,548.38
Low	0.00	0.00	0.00
Very Low	0.00	0.00	0.00
Total Acres	43,610.32	7,150.76	50,761.08
Alternative D – Same as Alternative A			
Alternative E (Proposed RMP) – One lek, which is on federal mineral estate ¼-mile CSU restriction plus 1¾-mile TLS restriction or 2-mile buffer			
High	211.47	0.00	211.47
Moderate	2,552.31	315.06	2,867.37
Low	0.00	0.00	0.00
Very Low	0.00	0.00	0.00
Total Acres	2,763.78	315.06	3,078.84

NOTE: The oil and gas development potential presented is for conventional oil and gas only. The oil and gas development potential for coalbed natural gas ranges from low to very low or no potential.

CSU controlled surface use
NSO no surface occupancy
RMP Resource Management Plan
TLS timing limitation stipulation

Removing important big game crucial winter range stipulations in the Rattlesnake Hills area impacts big game, their winter survival, and ultimately, their populations.

There are 173 raptor nests within Alternative C's boundary area, 149 of which are on federal mineral estate. Under this alternative, the entire MA provides the same protection for raptors that currently is provided in Cooper Reservoir, Waltman, and Cave Gulch fields. Development activity initiated prior to February 1 may be completely finished as long as development activity does not cease for 3 weeks or longer between February 1 and June 1. A certified biologist checks nest activity if development ceases for 3 weeks or longer during the raptor breeding and nesting season. If an occupied nest is present,

activity is restricted during the critical period, which is usually February 1 to July 31 for golden eagles and March 15 to July 31 for other raptor species, or until chicks are fledged.

Table 4-17. Acres of Crucial Winter Range Within the Wind River Management Area (by Alternative)

Oil and Gas Development Potential	Federal Mineral Estate (Acres)	Non-Federal Mineral Estate (Acres)	Total (Acres)
Alternative A			
High	2,801.76	682.90	3,484.66
Low	22,143.38	3,848.33	25,991.71
Moderate	37,946.60	8,326.29	46,272.89
Very Low	69.26	24.48	93.74
Total Acres	62,961	12,882	75,843
Alternative B – Same as Alternative A			
Alternative C			
High	2,894.97	721.92	3,616.89
Low	0.00	0.00	0.00
Moderate	39,183.03	8,802.08	47,985.11
Very Low	0.00	0.00	0.00
Total Acres	42,078	9524	51,602
Alternative D – Same as Alternative A			
Alternative E (Proposed RMP)			
High	2,738.89	740.45	3,479.34
Low	0.00	0.00	0.00
Moderate	119.36	0.00	119.36
Very Low	0.00	0.00	0.00
Total Acres	2,858.25	740.45	3,598.70

NOTE: The oil and gas development potential presented is for conventional oil and gas only. The oil and gas development potential for CBNG ranges from low to very low or no potential.

RMP Resource Management Plan

Alternative D

Alternative D establishes the Wind River Basin MA on the entire Wind River Basin geological province within the planning area comprising 539,911 acres, of which 213,238 acres are BLM-administered surface and 446,615 acres are BLM-administered minerals. The area contains 80,617 acres of highly erosive soils, of which 44,881 acres are on BLM-administered surface and 71,941 acres are on BLM-administered minerals, as well as 13,068 acres that are in a Class II VRM area.

Impacts to the proposed Cedar Ridge ACEC are the same as Alternative C. Beneficial impacts to other resources such as highly erosive soils, water, vegetation, visual resources, and so on are similar to Alternative C, but occur over the entire extent of the Wind River Basin in the planning area.

Refer to Table 4-16 for the amount of acres allocated to CSU or NSO restrictions surrounding leks and Table 4-17 for the acres of crucial winter range potentially impacted under this alternative. Impacts to wildlife are similar to Alternative C except over a larger area.

In the short term, Alternative D has a greater impact on the 28 leks located on BLM-administered minerals than Alternative A because use of the nesting habitats surrounding the leks could be lost during the nesting season. Similar short-term impacts occur to other wildlife species protected by TLS restrictions. Long-term impacts to wildlife are similar to Alternative A

Within Alternative D's boundary area there are 292 raptor nests, 240 of which are on federal mineral estate. Under this alternative, protection for raptors is the same as Alternative C. Impacts are similar to Alternative C, but occur over a larger area.

Alternative E (Proposed Casper RMP)

The Wind River Basin MA is established on portions of the Wind River Basin determined to have a moderate-to-high potential for oil and gas development—54,575 acres, of which 18,277 acres are BLM-administered surface and 44,302 acres are BLM-administered minerals. The area comprises 4,794 acres of highly erosive soils, of which 1,837 acres are on BLM-administered surface and 4,245 acres are on BLM-administered minerals, but does not contain any Class II VRM areas (see Glossary). Beneficial impacts to other resources, such as highly erosive soils, water, and vegetation are similar to Alternative C, but occur over a small area.

Refer to Table 4-16 for acres allocated to CSU or NSO restrictions surrounding leks and Table 4-17 for acres of crucial winter range potentially impacted under this alternative. Under Alternative E, the BLM does not apply TLS restrictions, except on proposed activities for one active greater sage-grouse lek and its 2-mile nesting habitat. The known lek is located on BLM-administered surface and minerals in the far southeastern portion of the MA boundary. In this area, a ¼-mile CSU restriction protects the lek, and greater sage-grouse TLS restrictions apply. Seasonal protections of 3,079 acres of greater sage-grouse habitats occur under this alternative. Impacts to greater sage-grouse nesting habitats are the same as Alternative A.

The BLM does not apply big game crucial winter habitat restrictions under this alternative. Adverse impacts to big game crucial winter habitat under this alternative are slightly more than Alternative A because the area comprises 3,599 acres of crucial winter range.

Within Alternative E's boundary area, there are 92 raptor nests, 81 of which are on federal mineral estate. Raptors are managed the same under this alternative as under Alternative C. Adverse impacts to raptors under this alternative are much less than alternative C or D due to the smaller aerial extent of the MA.

4.7.1.33 Conclusion

The Wind River Basin MA facilitates oil and gas exploration and development and associated reclamation activities. Establishing the MA under alternatives C, D, and E could have beneficial impacts on oil and gas development and associated reclamation activities, with Alternative D having the greatest potential beneficial impact due to the larger size of the area proposed under that alternative. Conversely, Alternative D could have the greatest adverse impact to wildlife protected by discretionary TLS restrictions.

4.7.2 National Back Country Byways

Actions occurring through implementing each alternative could impact National Back Country Byways. This section describes the impacts of each alternative on National Back Country Byways in terms of direct, indirect, short-term, and long-term impacts. As appropriate, impacts also are described as beneficial or adverse.

National Back Country Byways are an important recreational resource on BLM-administered lands. These travel routes are used frequently and are susceptible to impacts over the long term. Direct impacts to the byways include any action that substantially limits or prevents the use of the byways. Indirect impacts include actions that alter the use of the byways.

Two National Back Country Byways exist within the planning area: the Seminoe/Alcova National Back Country Byway and the South Bighorns/Red Wall National Back Country Byway.

4.7.2.1 Methods and Assumptions

Methods and assumptions used in this impact analysis are identified at the beginning of Chapter 4.

4.7.2.2 Analysis of Alternatives

Impacts Common to All Alternatives

Management of the two National Back Country Byways does not change substantially across alternatives and, therefore, all impacts are common to all alternatives.

The Seminoe/Alcova National Back Country Byway continues under the existing designation under all alternatives. Under all alternatives, interpretation and signage are concentrated along the travel route to enhance the public's understanding and appreciation of the area's natural history and current and historical uses of the surrounding lands. In addition, under Alternative B, kiosks are added. No substantial indirect impacts are anticipated.

The South Bighorns/Red Wall National Back Country Byway continues under the existing designation under all alternatives. Under all alternatives, interpretation and signage are concentrated along the travel route to enhance the public's understanding and appreciation of the area's natural history and current and historical uses of the surrounding lands. In addition, under Alternative B, kiosks are added. Inclusion of portions of the byway in the South Bighorns/Red Wall ACEC/MA affords the byway some added protections. This benefit occurs with alternatives B and C. The geographic area evaluated for impacts is limited to only the National Back Country Byways.

4.7.2.3 Conclusion

Management actions described in this section for all alternatives were used to determine the potential impacts to National Back Country Byways. Both National Back Country Byways would continue with no substantial differences under all alternatives.

4.7.3 National Historic Trails and Other Historic Trails

Four NHTs and Other Historic Trails traverse the planning area (Oregon, California, Mormon Pioneer, and Pony Express). Trail ruts, settings, landmarks, and associated sites are a physical presence found throughout the planning area. Other historic trails, not congressionally designated, include the Bozeman and Bridger trails. Refer to maps 67 through 69 for NHTs and Other Historic Trails.

NHTs and Other Historic Trails are fragile, nonrenewable evidence of recent human history and heritage on the landscape. They are public resources entrusted to the BLM for protection and interpretation, providing a context for present-day land use decisions. Moreover, NHTs and Other Historic Trails are a tangible link to our past, to one of the defining episodes of the American experience. Direct impacts to these resources typically result from actions that disturb the soil or alter characteristics of the surrounding environment that contribute to trail significance and introduce visual elements out of character with the property or that alter its setting, or result in neglect of the resource to the extent that it deteriorates or is destroyed. For example, surface-disturbing activities that impact trail ruts are considered an adverse

direct impact because the trail segments are nonrenewable. Conversely, actions that result in data collection and preservation of NHTs and Other Historic Trails can be considered beneficial impacts. Indirect impacts to NHTs and Other Historic Trails result from project-induced increases or decreases in activity in the planning area. The construction of a recreational facility may increase visitor use, which could result in indirect impacts to previously undisturbed trail segments. Recreation, in particular, is a complex issue, as actions taken to preserve historic values can have both beneficial and adverse impacts for heritage tourism and trail enthusiasts.

For all agency undertakings that could adversely impact NHTs and Other Historic Trails, the BLM complies with Section 106 of the NHPA prior to conducting the undertaking. Section 106 compliance typically includes inventory, evaluation, and consultation with the SHPO.

4.7.3.1 Methods and Assumptions

Methods and assumptions used in this analysis include the following:

- Protection of NHTs and Other Historic Trails and related sites occur in accordance with federal laws and BLM regulations and agreements, regardless of whether the trails are specifically identified in the RMP.
- Direct and indirect impacts can result from a variety of natural and human-caused events, such as those that physically alter, damage, or destroy all or part of the trail; improve access, bringing 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 setting; and neglect of the trail to the extent that it deteriorates or is destroyed.
- The intensity of surface disturbance by alternative as identified in Appendix M equates to levels of development and, in turn, increased access to public lands.
- The BLM looks favorably at opportunities to cooperate with private landowners to minimize or eliminate disturbance to NHTs and Other Historic Trails.
- Recognizing that historic trails often comprise numerous routes rather than a single trace, all protective zones begin at the outer edges of trails rather than at a centerline, which is difficult to define.
- Certain projects, due to size or topography, may require consideration of visual intrusions into the setting beyond the foreground or middle-ground zones to comply with Section 106 of the NHPA.

4.7.3.2 Analysis of Alternatives

Allowable uses and management actions that could impact NHTs and Other Historic Trails include changes in ownership, access, and proactive NHT and Other Historic Trails management actions. Any surface-disturbing activity, regardless of type, on or adjacent to NHTs and Other Historic Trails could cause adverse impacts to contributing segments of the trails.

Alternative A

Surface-disturbing Activities. Under Alternative A, surface-disturbing activities identified in Appendix M impact NHTs and Other Historic Trails. Under Alternative A, the projected short-term surface disturbance from BLM actions could result in the third-highest disturbance acreage, following alternatives E and D, respectively (refer to Table 4-1). The potential adverse impact to trails is somewhat limited, however, because compliance with Section 106 of the NHPA requires that some type of mitigation be applied to trail segments contributing to the overall importance prior to any disturbance. The relative

amount of surface disturbance projected for each alternative defines the level of potential impact to NHTs and Other Historic Trails.

The impacts from surface-disturbing activities under Alternative A are anticipated to be commensurate with the intensity of RFAs shown in Appendix M. Moreover, the impacts to NHTs and Other Historic Trails from surface disturbance projected for Alternative A are anticipated to be primarily adverse. However, normal compliance with Section 106 of the NHPA prior to the approval of an action serves to moderate the amount of actual disturbance. In those cases in which an accommodation cannot be made, consultation between the BLM and the SHPO takes place to develop and implement a treatment plan to mitigate adverse impacts to contributing segments. While this often results in project relocation, detailed recording and mapping or interpretation are some of the techniques used for mitigation, depending on the specific trail segment and the nature of the potential adverse impacts.

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 trail resources. For example, under Alternative A for soils, surface-disturbing activities may be modified, timing restrictions implemented, or surface disturbance in selected areas prohibited. However, fewer restrictions on surface-disturbing activities are provided for under Alternative A as compared to alternatives B, C, and E; therefore, additional protection for NHTs and Other Historic Trails under Alternative A is less than all other alternatives, except Alternative D.

Land Disposal and Acquisition. Disposal of BLM-administered surface land can result in both beneficial and adverse impact to NHTs and Other Historic Trails. The results of the survey required under Section 106 of the NHPA indicate a beneficial impact to cultural resources because of data that furthers understanding of trail resources in the planning area. If contributing segments were identified during the inventory, it could result in an adverse impact because once in private ownership, there are no protective measures for cultural resources. However, land-tenure adjustment is classed as an adverse impact (in terms of Section 106) for that reason. Trail segments contributing to the overall NRHP eligibility would need to be mitigated by application of a treatment plan developed through consultation between the BLM and the SHPO. Acquiring lands within the planning area could result in a beneficial impact to cultural resources in that additional sites may be obtained in the newly acquired lands.

Access. General development (e.g., recreational facilities and mineral development) and OHV use can provide access to remote trail segments, possibly leading to adverse impacts related to traffic, vandalism, and erosion.

For the purpose of this analysis, development activities are anticipated to be similar in intensity to the surface disturbance acres identified in Table 4-1. Based on this assumption, it is anticipated that the third-highest amount of development and increase in access occurs under Alternative A and results in indirect adverse impacts. Since adverse impacts to important trail segments must be mitigated prior to authorizing an action, the degree of adverse impact is lessened.

Increased visitor use through OHV use and improved access can have both beneficial and adverse impacts on trail resources. For example, trail segments are protected when there are access restrictions, but may be exposed to vandalism or other impacts if multiple uses increase, including exploring for extractive resources (e.g., mining) or an increase in recreational opportunities. However, lack of access also can adversely impact the use of NHTs and Other Historic Trails for activities such as heritage tourism.

OHV use on public lands, under all alternatives, indirectly impact NHTs and Other Historic Trails. The impacts of OHV use are primarily anticipated to be adverse, indirect, and to occur in the areas limited to existing roads and trails for OHV use. Alternative A projects the largest area (1,311,715 acres) as limited

to existing roads and trails for OHV use (Table 2-1). Although OHV use currently is restricted in some areas, and use is limited to existing and designated roads and trails, new trails are continuously created and become part of the "existing designation." The Oregon and Bozeman Trails are closed to OHV use.

Proactive NHT and Other Historic Trails Management Actions. Proactive management actions under Alternative A generally result in beneficial impacts to NHTs and Other Historic Trails. Under existing management, NSO is allowed within ¼ mile or the visual horizon (whichever is closer) of NHTs and Other Historic Trails. Since trails often comprise multiple traces, the ¼-mile zone extends from the outer edges of the overall trace.

NSO is allowed on Oregon Trail segments identified in Appendix W, and the BLM reassesses the need to include other segments as they may be identified and writes management plans for those potentially eligible to the NRHP. This management action results in a beneficial impact to NHTs and Other Historic Trails. With concurrence from a private landowner, the BLM helps mitigate or otherwise helps protect NHT and Other Historic Trail sites identified by the Historic Trails Management Plan (BLM 1986a), a beneficial impact to NHTs and Other Historic Trails.

According to the Interagency Agreement No. K910-A3-0013 with the NPS Fort Laramie National Historic Site, four parcels (the Fort Laramie "A" Segment, the Old Bedlam Segment, the tract adjacent to the south boundary, and the tract south of Old Bedlam) are available for exchange or for transfer to the NPS, resulting in a beneficial impact to these trail resources. The existing Fort Laramie withdrawal, which segregates from operations of the public land laws, including the mining and mineral leasing laws, continues, but no additional withdrawals are identified.

The Oregon Trail Road ROW Corridor, Segment A, currently is managed for use by all types and sizes of facilities. To the extent possible, the southern ½ mile of the corridor width is to be used for powerlines and overhead facilities, and the northern ½ mile is to be used for pipelines and other buried facilities. NSO is not permitted on parcels of the Bozeman Trail in Converse County (Appendix W); additional parcels are added as inventory and evaluation discloses suitable trail segments. These management actions result in a beneficial impact to the Bozeman Trail.

Alternative B

Surface-disturbing Activities. Under Alternative B, the projected short-term disturbance acreage (36,650 acres) from BLM actions is the lowest of any alternative (refer to Table 4-1). As in Alternative A, the net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to NHTs and Other Historic Trails from surface-disturbing activities under Alternative B are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M when they coincide with trails. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative B is anticipated to be less than Alternative A and the least relative to all other alternatives.

Relative to Alternative A and other alternatives, Alternative B incorporates the most restrictions on surface-disturbing activities. Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative B provide additional protection for NHTs and Other Historic Trails. For example, under Alternative B for soils NSO is permitted on highly erodible soils and long-term surface disturbance is limited, resulting in beneficial impacts to cultural resources.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface land under Alternative B are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative B, 109,210 acres of BLM-administered surface are identified for disposal by sale, approximately 5-percent more than proposed under Alternative A. Disposal of BLM-administered surface results in an adverse impact to NHTs and Other Historic Trails as described in Alternative A. Mitigation of adverse impacts as described in Alternative A reduces the actual amount of adverse impacts. Likewise, acquiring lands within the planning area results in a beneficial impact to NHTs and Other Historic Trails due to the protective measures offered under federal ownership. As discussed in Alternative A, public land containing NHTs and Other Historic Trails is not likely targeted for land-tenure adjustment.

Access. The indirect adverse impacts of access from development and OHV use under Alternative B are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative B proposes the least amount of development by alternative (as represented by surface disturbance numbers in Table 4-1) and provides the smallest area (909,651 acres) for OHV use limited to existing roads and trails, a 31-percent decrease from Alternative A (1,311,715 acres). These actions result in an indirect adverse impact to NHTs and Other Historic Trails, but a less adverse impact than under Alternative A.

Proactive NHTs and Other Historic Trails Management Actions. Under Alternative B, there is an NSO restriction for ¼ mile from the edges of the trail, or the visual horizon, whichever is closer. A CSU restriction is in place from ¼ mile up to a 5-mile foreground/middle ground viewshed of NHTs and Other Historic Trails. Under Alternative B, visual resources are managed as VRM Class II until inventories are completed. Trail segments that contribute to the overall eligibility and retain integrity of setting are managed as VRM Class II (see Glossary). Where integrity of setting is absent, the foreground/middle ground are managed as Class III. Proactive management actions under Alternative B generally result in beneficial impacts to NHTs and Other Historic Trails. Unlike Alternative A, federal minerals are withdrawn from locatable entries within a 3-mile viewshed of trails, resulting in a beneficial impact.

As in Alternative A, NSO is allowed on specific Oregon Trail segments identified in Appendix W that does not benefit the preservation or interpretation of the trail. The BLM reassesses the need to include other sites as they may be identified. Prohibiting disturbance on privately owned portions of the trails (listed in the 1985 RMP [BLM 1985a]) are pursued through agreements between the BLM and private landowners. These management actions result in beneficial impacts to the Oregon Trail.

BLM parcels adjacent to Fort Laramie NHS continue to be managed under the agreement with the Fort Laramie NHS. Areas with pristine segments are subject to increased VRM requirements. In addition, mineral withdrawals and transfers to the NPS are pursued for parcels described in the Memorandum of Understanding (MOU). The existing Fort Laramie withdrawal, which segregates from operations of the public land laws, including the mining and mineral leasing laws, continues and is enlarged by 149 acres. Under Alternative B, the BLM pursues transfers, exchanges, agreements, conservation easements, or other management agreements with private and public landowners to preserve historic and recreational values in a 13-mile corridor between Fort Laramie and Guernsey. These proactive management actions result in beneficial impacts to NHTs and Other Historic Trails. Compared to Alternative A, Alternative B offers greater protection to NHTs and Other Historic Trails.

No additional ROW facilities are allowed within the Oregon Trail Road ROW corridor, Segment A, resulting in beneficial impacts to NHTs and Other Historic Trails. NSO is permitted on parcels of the Bozeman Trail in Converse County (Appendix W), and additional parcels are added as inventory and evaluation disclose suitable trail segments. These management actions result in beneficial impacts to the Bozeman Trail.

Alternative C

Surface-disturbing Activities. Under Alternative C, the projected short-term disturbance acreage (58,689 acres) from BLM actions results in the fourth-highest disturbance acreage following alternatives E, D, and A, respectively (refer to Table 4-1). The net potential disturbance to historic properties is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to NHTs and Other Historic Trails resources from surface-disturbing activities under Alternative C are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative C is anticipated to be less than under Alternative A.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative C provide additional protection for cultural resources. For example, under Alternative C, surface disturbance on highly erosive soils is minimized to the extent practicable and NSO is allowed on slopes greater than 25 percent with highly erosive soils. These types of management actions result in beneficial impacts to cultural resources.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface under Alternative C are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative C, 241,364 acres of BLM-administered surface are identified for disposal by sale, approximately 223-percent more than proposed under Alternative A (103,725 acres). Disposal of BLM-administered surface results in an adverse impact to NHTs and Other Historic Trails as described in Alternative A. Likewise, acquiring lands within the planning area results in a beneficial impact to NHTs and Other Historic Trails due to the protective measures offered under federal ownership. Since NHTs and Other Historic Trails are of high value, it is unlikely that public lands bearing evidence of historic trails would be considered for land-tenure adjustment. Moreover, any lands involved in such an adjustment would be subject to normal Section 106 compliance before any action is taken (i.e., inventory, evaluation, consultation with SHPO if necessary, development, and implementation of approved treatment).

Access. The indirect adverse impacts of access from development and OHV use under Alternative C are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative C proposes a decrease in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1), and Alternative C designates the third highest acreage (along with Alternative E) to OHV use limited to existing roads and trails (1,162,113 acres), an 11-percent decrease from Alternative A (1,311,715 acres). These actions result in indirect adverse impacts to NHTs and Other Historic Trails. The impacts are similar in intensity to those identified in Alternative A.

Proactive NHT and Other Historic Trails Management Actions. Under Alternative C, a CSU restriction is in place to a 3-mile foreground viewshed of NHTs and Other Historic Trails. Under Alternative C, the foreground and middle ground of NHTs and Other Historic Trails are managed as VRM Class II until inventories are completed. Trail segments contributing to the overall eligibility and for which the setting retains integrity will be managed as VRM Class II. Where integrity of setting is absent, the foreground and middle ground of NHTs are managed as Class III. While proactive management actions under Alternative C generally result in beneficial impacts to NHTs and Other Historic Trails, the CSU restriction in Alternative C compared to the NSO restriction in Alternative A could result in an adverse impact to NHTs and Other Historic Trails within the ¼ mile or visual horizon protected in Alternative A. However, the CSU restriction between ¼- and the 3-mile foreground and

middle ground viewshed results in a beneficial impact to NHTs and Other Historic Trails. Unlike Alternative A, federal minerals are withdrawn within a ¼ mile of historic trails and prominent landforms within the 3-mile viewshed, resulting in beneficial impacts to NHTs and Other Historic Trails.

Under Alternative C, the impacts of the NSO allowed on specific Oregon Trail segments identified in Appendix W are the same as those identified in Alternative B. Impacts to Fort Laramie trail segments are the same as those identified in Alternative A. The withdrawal from mining and mineral leasing, as identified in Alternative B, is continued under Alternative C. Subsurface or low-profile surface facilities may be allowed within the Oregon Trail Road ROW Corridor, Segment A, resulting in beneficial impacts to NHTs and Other Historic Trails. These management actions provide a greater degree of protection than those identified in Alternative A. Impacts to the Bozeman Trail are similar to those identified in Alternative B. Alternative C provides fewer beneficial impacts than Alternative B, but more than alternatives A, D, or E.

Alternative D

Surface-disturbing Activities. Under Alternative D, the projected short-term disturbance acreage (63,649 acres) from BLM actions results in the highest disturbance acreage of all the alternatives (refer to Table 4-1). The net potential disturbance to NHTs and Other Historic Trails is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to trail resources from surface-disturbing activities under Alternative D are anticipated to be adverse, similar in type to Alternative A, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative D is anticipated to be more than under Alternative A. No surface-disturbing activity is permitted without prior compliance with Section 106 of the NHPA.

Fewer restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) are provided under Alternative D; therefore, additional protection for cultural resources under Alternative D is less than all other alternatives. These types of management actions result in beneficial impacts to cultural resources; however, to a lesser extent than under any other alternative.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface under Alternative D are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative D, 224,834 acres of BLM-administered surface land are identified for disposal by sale, approximately 217-percent more than proposed under Alternative A (103,725 acres). Disposal of BLM-administered surface results in adverse impacts to NHTs and Other Historic Trails as described in Alternative A. Likewise, acquiring lands within the planning area results in a beneficial impact to NHTs and Other Historic Trails due to the protective measures offered under federal ownership. As noted above, the high value of NHTs and Other Historic Trails prevents their inclusion in land-tenure adjustments.

Access. The indirect adverse impacts of access from development and OHV use under Alternative D are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative D proposes an increase in development compared to Alternative A (as represented by surface disturbance numbers in Table 4-1) and the highest level of development of all the alternatives. Alternative D designates the second-highest acreage to OHV use limited to existing roads and trails (1,292,630 acres), a 1-percent decrease from Alternative A (1,311,715 acres). These actions result in an indirect adverse impact to NHTs and Other Historic Trails. The adverse impacts under Alternative E are greater than those identified in Alternative A, as well as all other alternatives.

Proactive NHT and Other Historic Trails Management Actions. A CSU restriction is allowed within ¼ mile or the visual horizon (whichever is closer) of NHTs and Other Historic Trails, and visual resources in the foreground and middle ground are managed under the classes defined in the 2004 VRM inventory (see Glossary). These proactive measures result in beneficial impacts to NHTs and Other Historic Trails, but are less protective compared to alternatives B, C and E. As in Alternative A, federal minerals are not withdrawn. Compared to alternatives B, C, and E, this is an adverse impact to NHTs and Other Historic Trails.

Impacts of the NSO allowed on specific Oregon Trail segments, identified in Appendix W, are the same as those identified in Alternative B. No agreements between the BLM and private landowners are pursued, resulting in an adverse impact to trail segments. Overall, these management actions will continue to have beneficial impacts to the Oregon Trail.

The existing MOU with the Fort Laramie NHS will be allowed to expire and the BLM will not enter into agreements prohibiting surface disturbance on private trail segments; the withdrawal as identified in Alternative B will continue. Additional ROW facilities will be allowed on a case-by-case basis within the Oregon Trail Road ROW Corridor, Segment A. Impacts to the Bozeman Trail are similar to those identified in Alternative B. Impacts to NHTs and Other Historic Trails are greater under Alternative D than under the other alternatives.

Alternative E (Proposed Casper RMP)

Surface-disturbing Activities. Under Alternative E, the projected short-term disturbance acreage (61,274 acres) from BLM actions results in the second-highest disturbance acreage following Alternative D (refer to Table 4-1). As in all other alternatives, the net potential disturbance to NHTs and Other Historic Trails is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

The impacts to trail resources from surface-disturbing activities under Alternative E are anticipated to be adverse, as is the case for all alternatives, and commensurate with the locations and intensity of RFAs shown in Appendix M. However, the intensity of adverse impacts to cultural resources from surface-disturbing activities under Alternative E is anticipated to be more than under Alternative A. The net potential disturbance to NHTs and Other Historic Trails is lessened by the requirement to conduct inventories and properly deal with such properties prior to any disturbance.

Restrictions on surface-disturbing activities for the protection of other resources (e.g., soil, water, biological resources, special designations, and other MAs) under Alternative E provide additional protection for cultural resources. Using soils again, actions selected to minimize adverse effects to soils include relocating disturbance in areas of erodible soils and limiting total long-term disturbance. These types of management actions result in beneficial impacts to cultural resources.

Land Disposal and Acquisition. The types of impacts from disposal of BLM-administered surface under Alternative E are the same as those identified under Alternative A; however, the intensity varies by alternative. Under Alternative E, 224,834 acres of BLM-administered surface are identified for disposal by sale, approximately 217-percent more than proposed under Alternative A (103,725 acres). Disposal of BLM-administered surface results in adverse impacts to NHTs and Other Historic Trails as described in Alternative A. Likewise, acquiring lands within the planning area results in a beneficial impact to NHTs and Other Historic Trails due to the protective measures offered under federal ownership.

Access. The indirect adverse impacts of access from development and OHV use under Alternative E are the same as those identified under Alternative A; however, the intensity varies by alternative. Alternative E proposes an increase in development compared to Alternative A (as represented by surface-disturbance

numbers in Table 4-1), and Alternative E designates the third-highest acreage (along with Alternative D) to OHV use limited to existing roads and trails (1,162,244), an 11-percent decrease from Alternative A (1,311,715). These actions result in an indirect adverse impact to NHTs and Other Historic Trails; however, the impacts under Alternative E are similar in intensity to those identified in Alternative A.

Proactive NHT and Other Historic Trails Management Actions. Under Alternative E, where the historic setting does not contribute to the NRHP eligibility of a trail or trail segment, the existing physical features and associated sites are managed so that the trail trace and associated sites are protected from physical impacts; a CSU restriction is in place within ¼ mile or the visual horizon, whichever is closer; ROW crossings at previously undisturbed areas are at right angles to the trail; and visual resources are managed according to the VRM Class established for the area.

Under Alternative E, where the historic setting contributes to the NRHP eligibility of a trail or trail segment, existing physical features and associated sites are managed so the trail trace and associated sites are protected from physical impacts. A CSU restriction extends to the viewshed foreground (out to a maximum of 3 miles) or the visual horizon, whichever is closer, to ensure surface-disturbing activities avoid trail remains and the land immediately surrounding them. Beyond 3 miles, impacts are managed to comply with Section 106 of the NHPA. ROW crossings at previously undisturbed areas are at right angles to the trail, and mineral leasing continues with a CSU restriction. Fences and range improvements are permitted. The setting associated with these historic trails are managed to maintain the existing character of the landscape. The viewshed foreground is managed to VRM Class II (see Glossary) and mineral leasing continues with a CSU restriction. Regardless of the contributing or noncontributing nature of an associated setting, locatable minerals are withdrawn within ¼ mile of existing historic trail segments, and prominent landforms associated with the trail are withdrawn to locatable entry operations, including disposal. These management actions have beneficial impacts to NHTs and Other Historic Trails.

Impacts of the NSO allowed on specific Oregon Trail segments identified in Appendix W for Alternative E are the same as those identified in Alternative B.

Under Alternative E, the BLM continues to manage selected Oregon Trail segments (Appendix W) according to the interagency agreement with the NPS. The withdrawal continues as identified in Alternative B. Impacts from the Oregon Trail Road ROW Corridor, Segment A, are the same as those identified in Alternative C. These management actions provide a greater degree of protection than those identified in Alternative A. Impacts to the Bozeman Trail are similar to those identified in Alternative D.

4.7.3.3 Conclusion

Meaningful differences in land disposal and acquisition, access, and proactive management actions form the basis for the following conclusions. Impacts to NHTs and Other Historic Trails from the alternatives are anticipated to be similar in type, but different in intensity. Among the management alternatives, Alternative B provides a greater level of protection and preservation for NHTs and Other Historic Trails resources; alternatives C and E provide somewhat fewer protections; and alternatives A and D provide the fewest protections. Alternative A permits beneficial surface disturbance on NHTs and Other Historic Trails, but does not provide additional viewshed protection. Alternative E provides protection where a historic setting contributes to the NRHP eligibility of a trail or trail segment, and a lesser level of protection to settings that do not contribute to NRHP eligibility. Management of visual resources associated with NHTs and Other Historic Trails are at the Class II level until inventories are completed; noncontributing trail segments thus far identified are managed at Class III. Development projects could cross NHTs and Other Historic Trails at right angles in areas of existing disturbance. Under Alternative E, mineral leasing continues, but locatable minerals within ¼ mile of NHTs and Other Historic Trails are withdrawn. Fences and other range improvements are permitted if they cause no new disturbance and if

they can be correspond with an applicable VRM class. Cooperative management of public land tracts adjacent to Fort Laramie will continue, an existing minerals withdrawal will continue, and easements or other access rights will be pursued for the 13 miles of trail between Fort Laramie and Guernsey.

The ¼-mile buffer protecting NHTs and Other Historic Trails comprises 21,954 acres of BLM-administered surface and 238,614 acres of BLM-administered minerals. High-to-moderate conventional oil and gas potential areas comprise 6,724 acres and high-to-moderate CBNG acreage is 1,773 acres. No high-to-moderate potential has been identified for trona or phosphorus. Bentonite, gypsum, and limestone have comparable high-to-moderate potential acreage ranging from 1,132 acres for gypsum to 3,962 acres for bentonite. NSO restrictions associated with NHT and Other Historic Trails impact 3.1 percent of the high development potential for leasable minerals in alternatives A and B. Alternative B withdraws 924,153 acres of locatable minerals in the foreground and middle ground viewshed. In alternatives C and D, a CSU restriction is established for the trails corridors, but no acreage would be removed from lease, location, or disposal actions. Viewshed constraints apply; however, this would still remain a CSU restriction. Alternative E places CSU restrictions on approximately 21,954 acres of BLM-administered surface to protect the NHTs and Other Historic Trails setting and withdraws 238,614 acres of locatable minerals from ¼ mile to either side of the trail.

Other resources and programs are expected to benefit from trails alternatives that serve to reduce surface disturbance.

4.7.4 Wild and Scenic Rivers

Actions that could occur through implementing each alternative have the potential to impact WSR segments. As appropriate, impacts are described as beneficial or adverse. Of the WSR segments, only the North Platte River segment is an important recreational resource on BLM-administered lands.

4.7.4.1 Methods and Assumptions

The methods and assumptions used in this analysis include the following:

- Alternative A is an interim management alternative for which the BLM takes no action to change the eligibility status of the subject waterways.
- Alternative B assumes that all segments are designated suitable under the Wild and Scenic Rivers Act.
- Alternatives C, D, and E call for no designation.

4.7.4.2 Analysis of Alternatives

Impacts Common to All Alternatives

Management of the eligible segments change substantially across alternatives, but with the exception of the North Platte River, none has any significant recreational value or any substantial public interest. Suitability designation and interim management preserve the values that exist indefinitely, providing an opportunity for natural processes to determine the overall character of the waterways through the long term. Preservation protects riparian vegetation, protects their visual character, and prevents diversion of the water or any other changes that alter the wildland nature of the segments.

Alternative A

Alternative A indefinitely places the eligible segments in an interim management situation. The qualities that qualified them as eligible are afforded protection. Actions that alter their character are not allowed. The undeveloped nature of the stream segments are preserved.

Alternative B

This alternative designates the segments as components of the WSR System. Accordingly, the characteristics that caused them to qualify for consideration are preserved. Their outstanding remarkable valuesare protected.

Alternatives C, D, and E

Under these alternatives, none of the segments are designated under the Wild and Scenic Rivers Act. They would return to a multiple-use management status and immediately be available for development or other actions that would change their outstanding remarkable values. The wildland nature of the segments could be lost. This is not a major adverse impact because these segments are of minor importance to wildlands (Jonas Consulting 2002). Some, like the North Platte River segment, already may have protection under present management. There are no known threats, at least in the short term, so adverse impacts, if any, would occur in the long term.

4.7.4.3 Conclusion

Management actions described in this section for all alternatives were used to determine the potential impacts to WSRs. Alternatives A and B protect the segments under provisions of the Wild and Scenic Rivers Act, but for the remaining alternatives, that protection is not available because they would be found nonsuitable.

4.8 Socioeconomic Resources

The Socioeconomic Resources section describes the potential impacts to social and economic conditions, abandoned mine lands (AMLs), formerly used defense sites (FUDS), hazardous materials, and environmental justice, with respect to each alternative. Within each resource, impacts commons to all alternatives and the methods and assumptions used for the analyses are described.

4.8.1 Social Conditions

This section addresses the potential for the alternatives to have impacts on social conditions in the planning area, including direct, indirect, short-term, and long-term impacts. Appendix B identifies laws, regulations, policies, and guidance considered in the analysis of social conditions.

Potential impacts related 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 could impact social conditions indirectly. For example, a decision to prohibit future oil and gas exploration or leasing on federal mineral estate could adversely impact job opportunities in the planning area, which could 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). For the purpose of this analysis, short-term social impacts are defined as those that last for 5 years or less; long-term social impacts are defined as those that would last for more than 5 years.

4.8.1.1 Methods and Assumptions

Impacts to social conditions associated with each of the alternatives are compared to existing conditions and trends in the planning area to establish a context for the impacts. Social impacts are classified into three broad categories: (1) impacts on population, (2) impacts on housing and community services, and (3) impacts on 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, continue to drive population growth in the planning area.
- Any population change that could reasonably be associated with the alternatives will likely be due to changes in employment opportunities.
- Federal, state, and local taxes 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 the management actions of the BLM. Because the pace of development in the planning area is unknown, 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. Thus, actual social and economic impacts could differ if the rate of development changes.

4.8.1.2 Analysis of Alternatives

Impacts Common to All Alternatives

Any population change that could reasonably be associated with the alternatives will likely be due to changes in employment opportunities. Employment opportunities related to activities on BLM-administered land and federal mineral estate include jobs in exploration, development, and production of minerals, including oil and gas, coal, locatable minerals such as uranium, and salable minerals, such as sand and gravel; jobs in livestock production; jobs related to various recreational activities and OHVs; and other types of jobs that rely on land administered by the BLM, such as management of wildlife and plant species that use BLM-administered lands. The economic analysis provides quantitative estimates of employment in the planning area due to oil and gas, coal, grazing, and recreational activities on BLM-administered lands and real estate. These quantitative estimates are used to aid in the analysis of impacts on population.

As indicated in the Economic Conditions section later in this chapter, the BLM does not expect production of locatable or salable minerals to vary substantially by alternative. One implication is that employment opportunities associated with exploration, development, and production of locatable and salable minerals are not likely to vary substantially by alternative. This does not mean that these employment opportunities are unimportant.

In all alternatives, if the pace of development differs from the relatively constant rate assumed in this analysis, there could be short-term impacts on demand for housing and community services and on 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. It would likely be more difficult for smaller communities to absorb a sudden influx of new residents, or to continue to support existing infrastructure if out-migration suddenly increased.

Finally, in 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 analyses required by NEPA for certain future site-specific actions.

Alternative A

Impacts on Population

In Alternative A, activities on BLM-administered land and federal mineral estate related to oil and gas, coal, livestock grazing, and recreation continue to support an average of 3,050 full-time and part-time jobs per year, representing about 4.6 percent of total employment in the planning area as of 2003. It is important to note that this does not constitute an increase of 3,050 jobs per year over current employment; it more closely represents an estimate of the contribution of certain activities on BLM-administered lands and federal mineral estate to overall employment in the planning area.

As described in the analysis of impacts on economic conditions, most of these job opportunities are related to oil, gas, and coal. Most of the jobs are located in Converse and Natrona counties, especially in and near Casper due to that city's role as an oil and gas service center. Any increases in population due to employment opportunities in Converse and Natrona counties contribute to the recent steady increase of population in those two counties. Less-densely populated towns or unincorporated areas in the planning area could also experience population increases as a result of continued employment opportunities. Depending on the pace of development, which is largely determined by forces other than BLM management actions, there may be short-term increases in population, which these areas may be less able to absorb.

Impacts on Housing and Community Services

Changes in population could 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 county-level data are available) were 10 percent in Natrona, 17 percent in Converse, 14 percent in Goshen, and 20 percent in Platte County. These percentages represent about 3,000 vacant units in Natrona, 1,000 vacant units in Converse, 820 in Goshen, and about 900 in Platte County. The annual average number of jobs predicted under this alternative does not result in a substantial impact on the availability of housing. As noted in the section on 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 on demand for housing and community services, as well as on the supply of tax revenues from residences or businesses to support community services. It could be more difficult for smaller communities to absorb sudden changes of this nature.

Impacts on demand for community services are similar to those described for the housing stock. Increased job opportunities could support the recent steady population growth, which leads to increased demand for community services. 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 to mitigate short-term increases in demand for services, since tax revenues help to pay for community services.

Impacts on Custom, Culture, and Social Trends

Alternative A maintains existing conditions, lets other forces lead changes in the planning area, and allows social conditions to be directed by forces other than a substantive change in BLM management. Although there are specific interest groups with particular interests regarding specific land uses (e.g., wilderness advocates, oil and gas interests, ranchers), on the whole, 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 lands, including the development of mineral and energy resources, livestock grazing authorizations, opening of lands to recreation, and conservation of wildlife and native vegetation. This alternative continues BLM's current practice of allowing multiple uses. As indicated in the section on impacts common to all alternatives, under this alternative, as under all the alternatives, the BLM continues to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions.

Alternative B

Impacts on Population

Activities on BLM-administered land and federal mineral estate in this alternative related to oil and gas, coal, recreational, and livestock grazing support an average of 1,656 jobs per year, resulting in about 2.5 percent of total employment in the planning area as of 2003. This represents a sizable decrease in employment opportunities compared to the No Action Alternative. Most of the decrease in employment opportunities compared to Alternative A is in oil and gas (about 1,400 jobs per year). Recreational employment opportunities increase very slightly, by about 11 jobs per year. The decrease in oil- and gas-related employment could result in a slower rate of population growth in the planning area, particularly in Converse and Natrona counties, than that observed in recent years. However, as indicated in the Economic Conditions analysis, there is proportionately more oil and gas activity on state and private land, and differences in employment opportunities taking state and fee land into account represent about 1,000 jobs per year.

Impacts on population trends are most likely be felt in Casper because of that city's role as a service center for oil and gas activity, but could also be felt in less-densely populated towns or unincorporated areas in the planning area. These areas could experience population decreases or increases as a result of changing employment opportunities, depending on where drilling and production activity occurs. Depending on the pace of development, which is largely determined by forces other than BLM management actions, short-term increases or decreases in population may occur, which these areas may be less able to absorb.

Impacts on Housing and Community Services

Changes in population could change the demand for housing and community services, such as roads, schools, and police and fire protection, while changes in tax revenues due to mineral production could change the ability of communities to pay for community services. The annual average number of jobs predicted under this alternative may contribute to a slight decrease in demand for housing and community services compared to Alternative A, particularly in Casper. As noted in the section on impacts common to all alternatives, if development occurs more slowly or faster than the relatively steady pace assumed in the analysis, there could be short-term impacts on demand for housing and community services, as well as on 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.

Impacts on demand for community services are similar to those described for the housing stock; that is, there may be a slight decrease in demand for community services compared to Alternative A. In addition, some areas may experience declining tax revenues due to a decrease in oil and gas activity compared to Alternative A, which could impact a community's ability to fund and provide services. However, local and state tax revenues collected from energy production help mitigate short-term increases in demand for services, since tax revenues help to pay for community services. Production on private and state land is forecasted to constitute a larger share of overall production in this alternative, and state and local taxes are still collected from production on these lands. 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.

Impacts on Custom, Culture, and Social Trends

Alternative B provides for less economic development than Alternative A, but retains natural and rural conditions to a greater degree than Alternative A. Alternative B indirectly impacts the social well-being of communities in the planning area with restrictions on economic development via the use of resources. This alternative would continue the BLM's current strategy of allowing multiple uses, but with more emphasis on resource protection.

As indicated in the section on impacts common to all alternatives, the BLM continues to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions. Under Alternative B, the BLM provides these analyses with the explicit goal of mitigating impacts through collaborative management where possible. Also, under this alternative, the BLM attempts to minimize the conflicts associated with mineral extraction while stressing a balanced approach to diversify and enhance local economies, such as by stressing the development of renewable energy and recreational opportunities. Thus, under this alternative, impacts on custom, culture, and social trends tend to be reduced compared to Alternative A because of the BLM's increased emphasis on collaborative management and the minimization of conflicts associated with mineral extraction.

Alternative C

Impacts on Population

Oil, gas, coal, recreational, and livestock grazing activities on BLM-administered land and federal mineral estate support an average of 2,931 jobs per year, representing about 4.4 percent of total employment in the planning area as of 2003. This represents a small decrease in employment opportunities (by about 118 jobs per year) compared to Alternative A, all of which are in oil and gas. Recreational employment opportunities increase very slightly, while grazing-related employment opportunities remain the same. The decrease in oil- and gas-related employment impact Converse and Natrona counties and Casper in particular, but are probably too small to impact the overall population trend observed in recent years.

As in the other alternatives, there may be short-term population changes in less-densely populated communities in the planning area, depending on the pace of development (largely determined by forces other than BLM management actions). These areas could experience population decreases or increases as a result of changing employment opportunities, depending on where drilling and production activity occurs and at what pace.

Impacts on Housing and Community Services

The annual average number of jobs predicted under this alternative may contribute to a small decrease in demand for housing and community services compared to Alternative A, particularly in Casper. As noted in the section on impacts common to all alternatives, if development occurs more slowly or faster than the relatively steady pace assumed in the analysis, there could be short-term impacts on demand for housing and community services, as well as on 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 short-term increase in the pace of development, there could be 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 to mitigate short-term increases in demand for services, since tax revenues help to pay for community services.

Impacts on Custom, Culture, and Social Trends

Alternative C blends the characteristics of alternatives A and B; it continues the BLM's current strategy of allowing multiple uses, but with slightly more emphasis on resource protection. Compared to Alternative A, Alternative C provides somewhat more protection for natural and rural conditions.

As indicated in the section on impacts common to all alternatives, the BLM continues to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions. Under Alternative C, the BLM provides these analyses to promote a common understanding of impacts, but without explicit mitigation plans. Under this alternative, impacts on custom, culture, and social trends from future site-specific actions tend to be similar to those under Alternative A.

Alternative D

Impacts on Population

Oil, gas, coal, recreational, and livestock grazing activities on BLM-administered land and federal mineral estate continue to support an average of 3,023 jobs per year, representing about 4.6 percent of

total employment in the planning area as of 2003. This includes a very small decrease in oil and gas employment opportunities (about 21 jobs per year on average) and a very small decrease in recreational-related job opportunities (about 6 jobs per year on average) compared to Alternative A. Livestock grazing job-related opportunities are about the same as Alternative A. The impacts of this alternative on overall population, including geographic differences, generally would be the same as for Alternative A.

Impacts on Housing and Community Services

As in Alternative A, the annual average number of jobs predicted under this alternative is not likely to result in a substantial impact on the availability of housing. As noted in the section on impacts common to all alternatives, if development occurs more slowly or faster than the relatively steady pace assumed in the analysis, there could be short-term impacts on demand for housing and community services, as well as on the supply of tax revenues from residences or businesses to support community services. It is likely that it will be more difficult for smaller communities to absorb sudden changes of this nature. Impacts on demand for community services are similar to those described for Alternative A.

Impacts on Custom, Culture, and Social Trends

The impacts on custom, culture, and social trends associated with Alternative D are generally similar to those of Alternative A. However, eliminating SDW withdrawals in this alternative could lead to substantial impacts on livestock operators within the planning area who use the SDWs to transfer animals from one pasture to another. Depending on how operators respond to the revocation of withdrawals, this alternative could lead to a decline in cattle ranching in the planning area, which could, in turn, impact land use and culture, especially in Natrona and Converse counties (where more land is authorized for grazing).

As indicated in the section on impacts common to all alternatives, the BLM continues to incorporate socioeconomic considerations into the planning process and performs socioeconomic analyses as required for site-specific actions. Under Alternative D, the BLM provides quantitative analyses that have been developed for proposed site-specific actions without explicit mitigation plans, except for any that are required under NEPA. Under this alternative, impacts on custom, culture, and social trends from future site-specific actions tend to be similar to those under Alternative A.

Alternative E (Proposed Casper RMP)

Impacts on Population

Oil, gas, coal, recreational, and livestock grazing activities on BLM-administered land and federal mineral estate support an average of 3,044 jobs per year, representing about 4.6 percent of total employment in the planning area as of 2003. Most of these job opportunities are related to oil, gas, and coal, and are located in Converse and Natrona counties, especially in and near Casper due to the city's role as an oil and gas service center. Any increases in population due to employment opportunities in Converse and Natrona counties contribute to the recent steady increase of population in those two counties. As in Alternative A, less densely populated communities could also experience population increases as a result of continued employment opportunities. Depending on the pace of development, there may be short-term increases in population in these communities.

Impacts on Housing and Community Services

The annual average number of jobs predicted under this alternative could result in impacts on the availability of housing similar to those of Alternative A. As noted in the section on impacts common to all alternatives, if development occurs more slowly or faster than the relatively steady pace assumed in the analysis, there could be short-term impacts on demand for housing and community services, as well as

on the supply of tax revenues from residences or businesses to support community services. It could be more difficult for smaller communities to absorb sudden changes of this nature.

Impacts on demand for community services are similar to those described under Alternative A. Increased job opportunities could support the recent steady population growth, which could lead to an increased demand for community services. Depending on forces other than BLM management actions that impact the pace of development, there could be 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, since tax revenues help to pay for community services.

Impacts on Custom, Culture, and Social Trends

Alternative E maintains the BLM's policy of supporting multiple land uses, including developing mineral and energy resources, livestock grazing authorizations, recreational opportunities, and conservation of wildlife and native vegetation. Alternative E indirectly impacts the social well-being of communities in the planning area with minor restrictions on economic development in localized areas via the management of multiple resources on BLM-administered lands. Compared to Alternative A, Alternative E emphasizes greater resource protection, but still allows for development of natural resources.

As indicated in the section on impacts common to all alternatives, the BLM continues to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions. Under Alternative E, the BLM provides these analyses with the explicit goal of mitigating impacts through collaborative management, where possible. Also under this alternative, the BLM attempts to minimize the conflicts associated with mineral extraction while stressing a balanced approach to diversify and enhance local economies, such as by stressing the development of renewable energy and recreational opportunities. Thus, under Alternative E, impacts on custom, culture, and social trends tend to be reduced compared to Alternative A because of the BLM's increased emphasis on collaborative management and the minimization of conflicts associated with mineral extraction.

4.8.1.3 Conclusion

Social conditions are related primarily to economic conditions that may influence the growth or development of employment and income. The economic sectors in the planning area that are most likely to be directly impacted by BLM management actions are related to the service sector and resource development (oil, gas, and mining) activities. That is not to imply that grazing, ranching, and other agricultural activities are not impacted or unimportant. However, based on their economic contributions to the overall economy, changes in these sectors are expected to produce relatively minor economic impacts in the overall economy. Nonetheless, the agricultural sector in the planning area is quite influential in terms of community character and identity. Thus, land management decisions impacting the agricultural sector could have far-reaching impacts on the social structure in the planning area, even though the economic impact is not expected to be substantial.

Table 4-18 provides a summary of impacts on social conditions as discussed in this section for alternatives B through E compared to the No Action Alternative. Although the table attempts to summarize impacts and characterize them as low, medium, or high, it does not classify these impacts as beneficial or adverse. Social impacts seen as beneficial to some interest groups could be seen as adverse to other interest groups. For instance, increased emphasis on resource conservation in Alternative B results in a change from the current balance of uses, which could be seen as a beneficial impact by wilderness advocates, but as an adverse impact to those with oil and gas development interests. In the table, high impacts are those resulting in substantial changes to an existing condition in a way that

impacts a large number of people and (or) endures for a long period of time, low impacts are those felt by a limited number of people and for a limited period of time, and medium impacts are intermediate.

Table 4-18. Overall Impacts on Social Conditions in the Casper Planning Area Alternative Compared to the No Action Alternative

Impact	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Estimated Impact on Population	N/A	Medium Impact (potential reductions focused in oil/gas service areas)	Low Impact	Low Impact	Low Impact
Estimated Impact on Housing and Community Services	N/A	Medium Impact (due to potential population reductions)	Low Impact	Low Impact	Low Impact
Estimated Impact on Custom, Culture, and Social Trends	N/A	Low-to-Medium Impact (change from recent trends constitute a greater emphasis on resource conservation; increased emphasis on collaborative management and mitigating impacts of future site-specific actions)	Low Impact	Low-to-Medium Impact (includes revocation of stock driveways with adverse impacts on certain livestock producers)	Low Impact (increased emphasis on collaborative management and mitigating impacts of future site-specific actions)

Source: Based on the analysis of impacts to social conditions, as described in the text.
N/A Not applicable

4.8.2 Economic Conditions

This section addresses the potential for the alternatives to have impacts on economic conditions in the planning area, including direct, indirect, short-term, and long-term impacts. Appendix B identifies laws, executive orders, regulations, policies, and guidance considered in the analysis of economic conditions.

Potential impacts include changes in regional economic output, employment, and earnings, as well as in tax revenues for the local, state, and federal governments. In terms of economic modeling analysis, direct and indirect impacts are assumed to occur simultaneously, even though in reality, these impacts may take time to work their way through the economic sectors in the analysis area. For example, an action to permit gas exploration and production may result in the direct infusion of money into several economic sectors and indirect infusions into related sectors. 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, is likely to represent a multiyear period of production. Thus, 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 2020 based on the estimated annual direct impact of the alternatives. For the purpose of this analysis, short-term economic impacts are defined as those that last for 5 years or less, while long-term economic impacts are defined as those that last for more than 5 years.

4.8.2.1 Methods and Assumptions

The Impact Analysis for Planning model (IMPLAN) estimated economic impacts resulting 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 provides estimates of 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 may not be directly impacted by management actions, but are linked to industries directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries

directly impacted) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

For instance, an increase in oil and gas production implies more money is spent on the maintenance of existing oil and gas equipment and (or) new oil and gas equipment; this, in turn, implies more money is spent in sectors that provide inputs to oil and gas support services or equipment sectors. These production and consumption or "input-output" relationships allow IMPLAN to estimate the indirect and induced impacts based on changes in production that may result from an alternative. Appendix V provides technical assumptions and additional information about the IMPLAN model.

Methods and assumptions used in this analysis include the following:

- Employment, earnings, and output continue to be drivers of economic and population growth in the planning area.
- 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 analysis 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.
- Recreation-related expenditures by residents occur in the region, but do not represent new money coming into the study area; therefore, the analysis of economic impacts from recreation considers only recreation expenditures of nonresidents in the four-county planning area. To be more specific, there is a multiplier affect associated with nonresident recreation-related spending that inputs new money into the study region. By knowing the amount of additional nonresident recreational spending associated with each management alternative, the total economic impact can be estimated.
- The analysis of direct and indirect impacts associated with oil and gas activity considers only activities on BLM-administered surface and federal mineral estate. The percent of well drilling and production on BLM-administered surface and mineral estate is relatively constant across alternatives A, D, and E (69%) and Alternative C (67%), but is much lower for Alternative B (19%).
- Assuming the current rate of mining in the planning area continues, existing coal leases will provide sufficient reserves through 2030.
- For livestock grazing, the analysis reflects a "worst-case" assumption that all acres impacted by surface-disturbing actions (from all the sources listed in Appendix M) are lands currently authorized for grazing; thus, the number of acres available for grazing in 2020 is the number of acres currently available, minus acres that are impacted in the long term by surface-disturbing actions. In addition, the analysis of grazing reflects the assumption that surface-disturbing actions occurs at a constant rate over time.

The pace and timing of economic development in the planning area depends on many factors beyond the management actions of BLM, including national and international energy demands, supply, and prices; operator business strategies; production conditions within the planning area; and demand and supply for agricultural products. Because the pace of development in the planning area is unknown, this analysis assumes a relatively constant rate of development; therefore, actual impacts could differ (e.g., there could be boom- and bust-type short-term impacts that differ from long-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; more of the hay used for livestock feed is produced within the region compared with 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 (Taylor 2004).

4.8.2.2 Analysis of Alternatives

Impacts Common to All Alternatives

The focus of the following analysis is on the resource activities most likely to be impacted by land management decisions, including oil, gas, coal, livestock grazing, and recreational activities (including OHV use). The focus of the economic analysis of coal is on production from the Antelope Mine predicted to occur within Converse County. See the Mineral Resources – Coal section earlier in this chapter for impacts of the alternatives on the CDPA. Actions from resource programs or constraints (as described in the alternatives) that impact oil, gas, coal, livestock grazing, and recreational activities (e.g., surface-disturbing actions impacting the amount of land available for grazing) are included by implication. Also included by implication are restrictions on ROW and corridors; the BLM's RFD scenario for oil and gas, which provides estimated numbers of oil and gas wells and production, incorporates the restrictions on ROW and corridors. Restrictions on new ROW 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.

Economic impacts related to renewable and geothermal energy development are addressed qualitatively. For locatable and salable minerals, the BLM expects to meet market demand by authorizing mining so that the production of these minerals does not vary across the alternatives being considered. The market price of uranium has increased recently, and there has been an increase in stakings for uranium in the planning area. For more information on minerals, refer to the Mineral Resources – Locatable and Mineral Resources – Salable sections earlier in this chapter.

Changes in economic activity impact federal, state, and local tax revenues. While all sectors analyzed (oil and gas, coal, recreation, and livestock grazing) contribute to tax revenues, the analysis of tax revenue impacts focuses on oil and gas production because almost all the variation in economic activity across the alternatives is in the oil and gas sector.

The focus of the analysis is on regional earnings and output, employment, and tax revenue. The comparison region is also regional (the four-county planning area). Because the exact locations of additional well drilling and certain other surface-disturbing activities are not known at this time, it is difficult to predict impacts on specific grazing allotments or other specific parcels within the planning area. In the case of grazing allotments, the impacts of surface-disturbing actions are expected to occur over a relatively long time (20 years). Coupled with the relatively small impacts on grazing estimated to occur for all alternatives (as described for individual alternatives below), the implication is that impacts on individual allotments likely will be minor.

Alternative A

Impacts on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative A average $124.7 million per year between 2001 and 2020, and regional output averages $829.0 million per year, due to activities on BLM-

administered lands and federal mineral estate. The net present value of the stream of regional output, discounted at a 7-percent real discount rate (OMB 2002), is $8,404 million over 20 years. Table 4-19 shows sector-level breakouts for earnings and output. In Alternative A, about 50 percent of the earnings due to activities on BLM-administered estate are from oil and gas drilling and production, about 40 percent is from coal production, and the remaining 10 percent is from recreation and grazing. The relative shares of average annual output and net present value of output are similar.

Table 4-19. Average Annual Impacts on Earnings and Output by Sector and Alternative for the Casper Planning Area

Sector	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Impacts on Annual Average Earnings (millions of 2003 $)					
Oil and gas	$61.9	$8.3	$57.2	$61.1	$61.5
Coal	$50.5	$50.5	$50.5	$50.5	$50.5
Grazing	$3.6	$3.7	$3.6	$3.6	$3.6
Recreation	$8.6	$8.8	$8.7	$8.5	$8.6
Aggregate Impacts	$124.7	$71.2	$120.0	$123.8	$124.3
Impacts on Annual Average Output (millions of 2003 $)					
Oil and gas	$614.3	$113.9	$578.4	$609.4	$612.3
Coal	$172.0	$172.0	$172.0	$172.0	$172.0
Grazing	$12.2	$12.2	$12.2	$12.2	$12.2
Recreation	$30.5	$31.0	$30.7	$30.1	$30.5
Aggregate Impacts	$829.0	$329.1	$793.2	$823.6	$826.9
Impacts on Net Present Value of Output over 20 Years (millions of 2003 $)[1]					
Oil and gas	$6,191	$1,238	$5,860	$6,150	$6,176
Coal	$1,767	$1,767	$1,767	$1,767	$1,767
Grazing	$129	$129	$129	$129	$129
Recreation	$317	$320	$318	$314	$317
Aggregate Impacts	$8,404	$3,455	$8,075	$8,361	$8,388

Source: Calculated using the IMPLAN model, as described in the text.
[1]Net present value from 2001 to 2020, discounted at a 7-percent rate (OMB 2002)
IMPLAN Impact Analysis for Planning model

Impacts on Employment

From a methods standpoint, employment impacts should not be considered separately from output impacts because there is a close relationship between the two. Employment can be thought of as a function of the level of economic activity (sales and purchases) among and between sectors.

Based on the IMPLAN model, regional employment under Alternative A averages 3,050 jobs per year between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate (annual job equivalents (AJEs) may represent either full-time or part-time jobs). Table 4-20 provides information on how these jobs break out by sector.

Table 4-20. Average Annual Impacts on Employment by Sector and Alternative for the Casper Planning Area

Sector	Number of Jobs[1]				
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Oil and gas	1,621	215	1,498	1,600	1,612
Coal	695	695	695	695	695
Grazing	134	134	134	134	134
Recreation	600	611	604	594	603
Aggregate Impacts	3,050	1,656	2,931	3,023	3,044

Source: Calculated using the IMPLAN model, as described in the text.

[1]Number of jobs is in annual job equivalents (AJE), where one AJE represents 12 months of employment. For instance, one AJE could represent one job for 12 months, or two jobs for 6 months.

IMPLAN Impact Analysis for Planning model

AJE Annual Job Equivalents

Average annual earnings per job differ for each of these sectors. Based on the IMPLAN model, earnings per job (expressed in year 2003 dollars) would average as the following:

- $39,126 for jobs in oil and gas well drilling; $35,090 for jobs in well completion; and $38,666 for jobs in oil and gas production.
- Between $66,149 and $72,473 for jobs in coal production.
- $28,158 for jobs associated with cattle grazing and $12,975 for jobs associated with sheep grazing.
- Between $11,390 and $16,286 for recreation-related jobs.

Impacts on Tax Revenue

Projected tax revenues for Alternative A due to oil and gas production on federal surface averages $50.1 million per year for federal royalties, $24.0 million per year for state severance taxes, and $25.2 million per year for local ad valorem taxes. Because specific well locations are not known at this time, there are insufficient data to apportion the local tax receipts to individual counties. However, it is likely that local taxes are received primarily by Natrona and Converse counties, since that is where most of the oil and gas fields are located. Table 4-21 provides a summary of tax revenues from oil and gas production for the alternatives.

Table 4-21. Estimated Tax Revenues by Alternative for the Casper Planning Area

Tax Type	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Federal mineral royalties	$50.1	$10.2	$47.4	$49.8	$50.0
State severance taxes	$24.0	$4.9	$22.8	$23.9	$24.0
Local ad valorem production taxes	$25.2	$5.1	$23.9	$25.1	$25.2
Total	$99.4	$20.2	$94.1	$98.7	$99.1

Source: Calculated based on the IMPLAN model and state, federal, and local tax rates, as described in the text.

IMPLAN Impact Analysis for Planning model

Alternative B

Impacts on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative B average $71.2 million between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate—just over half the amount projected for Alternative A. As Table 4-19 shows, the difference is due entirely to the difference in oil and gas activity; earnings due to coal production are identical, and recreation and livestock grazing earnings are slightly higher under Alternative B than under Alternative A. Regional output averages $329.1 million per year, with a net present value of $3,455 million, due to activities on BLM-administered lands and federal mineral estate, just over half that in Alternative A (Table 4-19).

However, note that production from state and private lands is greater in Alternative B compared to Alternative A. As a result, the decline in federal production under Alternative B is partially offset by the increased production on state and private lands. The Cumulative Impacts section addresses this issue in more detail.

Alternative B is more restrictive in terms of allowing renewable and geothermal energy development compared to Alternative A. However, little or no commercial potential for geothermal energy development exists, so there are no substantive economic impacts associated with restrictions on geothermal development. The amount of wind-energy development in any alternative is mainly influenced by market conditions and development potential relative to other areas and cannot be predicted quantitatively at this time.

Impacts on Employment

Regional employment under Alternative B averages 1,656 jobs per year between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate, slightly over half the level predicted for Alternative A (Table 4-20). Average annual earnings per job in Alternative B are identical to those in Alternative A.

Impacts on Tax Revenue

Projected tax revenues from oil and gas production averages $10.2 million per year for federal royalties, $4.9 million per year for state severance taxes, and $5.1 million per year for local ad valorem tax receipts (Table 4-21). These figures represent a decrease of about 80 percent compared to Alternative A. As noted above, the decrease in production from BLM lands under this alternative are offset somewhat by higher production on state and private lands. If the production on state and private lands is taken into account, the decline in state and local tax revenues falls to about 26 percent when compared to Alternative A. Federal oil and gas royalties are still about 80-percent lower than in Alternative A because federal royalties apply only on federal surface.

Federal royalties do not apply on state or private mineral estate. The reduction in local tax receipts compared to Alternative A primarily impact Natrona and Converse counties.

Alternative C

Impacts on Regional Earnings and Output

Regional earnings under Alternative C average $120.0 million between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate—slightly less than the amount projected for Alternative A. As Table 4-19 shows, the difference in earnings versus Alternative A is due entirely to the difference in oil and gas activity; earnings due to coal production and livestock grazing are identical, and earnings from recreation are slightly higher under Alternative C than under Alternative A. Regional

output averages $793.2 million per year, with a net present value of $8,075 million over 20 years due to activities on BLM-administered lands and federal mineral estate (Table 4-19).

Impacts on Employment

Regional employment averages 2,931 jobs per year between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate (Table 4-20), slightly less than Alternative A. Average annual earnings per job are identical to those in Alternative A.

Impacts on Tax Revenue

Projected tax revenues from oil and gas production average $47.4 million per year for federal royalties, $22.8 million per year for state severance taxes, and $23.9 million per year for local ad valorem tax receipts (Table 4-21). These figures represent a decrease of about 5 percent compared to Alternative A. Local ad valorem tax receipts due to oil and gas production accrue primarily to Natrona and Converse counties because most oil and gas fields are in these counties.

Alternative D

Impacts on Regional Earnings and Output

Regional earnings under Alternative D average $123.8 million between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate—slightly less than for Alternative A. Compared to Alternative A, this alternative brings slightly less earnings due to oil and gas activity and recreation, but the same amount for coal and grazing (Table 4-19).

Regional output averages $823.6 million per year due to activities on BLM-administered lands and federal mineral estate. The net present value of the stream of output would be $8,361 million over 20 years (Table 4-19).

Alternative D also includes the revocation of land withdrawals for SDWs. Although this action does not impact the number of authorized AUMs, subsequent changes in land use may impact ranchers who drive their livestock between winter and summer ranges along the SDWs. If access to the SDWs is limited, ranchers would have to haul their livestock between seasonal ranges using trucks, which may reduce livestock production (and, therefore, earnings, output, and employment associated with livestock production) if the cost is prohibitive. For ranchers who use the SDWs, the economic impact of revoking the withdrawals for those driveways would be substantial. Due to uncertainty in how these ranchers would react to the revocations, the impact was not modeled using the IMPLAN economic model.

Impacts on Employment

Regional employment averages 3,023 jobs per year between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate—slightly less than the level predicted for Alternative A (Table 4-20). Average annual earnings per job are identical to those in Alternative A.

Impacts on Tax Revenue

Based on the analysis, projected tax revenues average $49.8 million per year for federal royalties, $23.9 million per year for state severance taxes, and $25.1 million per year for local ad valorem tax receipts (Table 4-21). These figures represent a small decrease (about 0.6%) compared to Alternative A. Most local tax receipts accrue to Natrona and Converse counties because most oil and gas fields are in these counties.

Alternative E (Proposed Casper RMP)

Impacts on Regional Earnings and Output

Regional earnings under Alternative E average $124.3 million between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate—slightly less than for Alternative A. This includes a slight decrease in oil and gas earnings, but approximately identical earnings in all other sectors analyzed (Table 4-19). Regional output averages $826.9 million per year, with a net present value of $8,388 million over 20 years due to activities on BLM-administered lands and federal mineral estate (Table 4-19).

Impacts on Employment

Regional employment averages 3,044 jobs per year between 2001 and 2020 due to activities on BLM-administered lands and federal mineral estate, which is almost exactly the same level as is predicted for Alternative A (Table 4-20). Average annual earnings per job are identical to those in Alternative A.

Impacts on Tax Revenue

Projected tax revenues average $50.0 million per year for federal royalties, $24.0 million per year for state severance taxes, and $25.2 million per year for local ad valorem tax receipts (Table 4-21). These figures represent a small decrease (about 0.3%) compared to Alternative A.

4.8.2.3 Conclusion

Overall, earnings, output, employment, and tax revenues due to activities on BLM-administered land and federal mineral estate are lowest under Alternative B, greatest under Alternative A, and intermediate under alternatives C, D, and E. Differences in projected oil and gas activity are the primary reason for the overall differences in earnings, jobs, and output.

The difference in earnings and employment projected to result from the different alternatives represents a small proportion of total earnings and employment in the socioeconomic analysis area in 2000. Note that the annual average earnings associated with activities on BLM-administered surface and mineral estate range from $71.2 million under Alternative B to $124.7 million under Alternative A. The difference, $53.5 million, represents just 1.6 percent of personal income in the planning area in 2003, based on total income of $3,347 million (BEA 2005; reported in the Economic Conditions section of Chapter 3). This represents a relatively minor portion of overall income. The difference in average annual labor earnings between alternatives E and A ($0.3 million) represents about 0.01 percent of total income in 2003; the difference between alternatives D and A ($0.9 million) represents about 0.03 percent of income in 2003; and the difference between alternatives C and A ($4.6 million) represents just 0.1 percent of total earnings in 2003.

The differences in employment also are small compared to total employment in the planning area. For example, the number of annual job equivalents associated with activities on BLM-administered lands and federal mineral estate ranges from 1,656 in Alternative B to 3,050 in Alternative A, a difference of 1,394. This difference represents about 2.1 percent of the total employment in the socioeconomic planning area in 2003 (66,145 people) (BEA 2005; reported in the Economic Conditions section of Chapter 3). The differences are much smaller between alternatives A and C (Alternative C results in a decline of 119 AJE, which is 0.2% of 66,145), alternatives A and D (Alternative D results in a decline of 27AJE, which is about 0.04% of 66,145), or alternatives A and E (Alternative E results in a decline of about 6AJE, which is about 0.01% of 66,145). Thus, although BLM management decisions impact the local economy, other activities not on BLM-administered land and federal mineral estate have also substantial influence on regional earnings, output, employment, and tax revenues.

4.8.3 Health and Safety

Health and safety, as discussed in this document, includes AMLs, FUDS, and hazardous materials and wastes. Each of these hazards is analyzed below in a separate section.

Health and Safety – Abandoned Mine Lands

To reduce the threat of physical and environmental impacts from AML sites, the Casper Field Office will remediate sites based on risk.

4.8.3.1 Methods and Assumptions

The methods and assumptions used in this impact analysis include the following:

- AML sites in the planning area are identified and characterized.
- "The BLM will set as its highest AML physical safety action priority the cleaning up of those AML sites situated at locations: (a) where a death or injury has occurred and the site has not already been addressed; or (b) situated on or in immediate with high visitor use" (BLM 2000d). Under the Clean Water Action Plan, AML sites adversely impacting watersheds are also a high priority. The BLM continues to support the Wyoming Department of Environmental Quality Abandoned Mine Lands (DEQAML) Division in reclaiming AML sites on public surface.

4.8.3.2 Analysis of Alternatives

Impacts Common to all Alternatives

The alternatives described in Chapter 2 are not expected to create new AML sites or increase risks at AML sites.

In cooperation with the DEQAML, the BLM will remediate AML sites posing a substantial risk to human health and the environment. Risk reduction also will occur through educating the public about the hazards associated with AMLs using publications, signage, websites, and other educational materials.

No projected adverse impacts to AML sites in the planning area exist.

4.8.3.3 Conclusion

No differences in impacts to AML sites occur among the alternatives. An active reclamation program is established to incorporate cleanup and reduce hazards and will remain in place for all alternatives.

Health and Safety – Airports and Formerly Used Defense Sites

Facilities within 50,000 feet of the Casper Airport or 10,000 feet of all other commercial and military airports and the presence of FUDS in the planning area are considered a direct adverse impact. Actions that create risks to the fly zone around airports or of FUDS to human health or that avoid, reduce, or prohibit FUDS management activities in the planning area, are considered adverse impacts. Conversely, beneficial impacts to airports and FUDS comprise activities that minimize, reduce, or prevent the creation of facilities near airports or impact of FUDS in the planning area.

4.8.3.4 Methods and Assumptions

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

- Cleanup at FUDS is the responsibility of the U.S. Army Corps of Engineers (USACE).
- The discovery of unexploded munitions will be responded to as an emergency response.

4.8.3.5 Analysis of Alternatives

Impacts Common to All Alternatives

Under all alternatives, facilities within 50,000 feet of the Casper Airport or 10,000 feet of all other commercial and military airports and the presence of FUDS in the planning area are considered a direct adverse impact. CSU restriction around commercial and military airports protecting aircraft fly zones. Under all alternatives, cleanup of FUDS remains the responsibility of the USACE. The BLM cooperates with all USACE cleanup activities, including providing personnel support, as necessary. No new FUDS exist, so the analysis focuses on risk reduction at existing FUDS. No substantive indirect impacts relate to risks at FUDS either. Refer to Map 70 for FUDS locations within the planning area.

Alternative A

Alternative A has a direct beneficial impact by reducing risks at FUDS through restricting use of the land and by requiring a safety plan.

Alternative B

Alternative B has a greater beneficial impact than Alternative A and the greatest beneficial impact of all alternatives on FUDS by reducing all risks through closing or restricting all lands listed as FUDS.

Alternative C

Alternative C has less beneficial impacts than Alternative B, but has greater beneficial impacts than Alternative A by reducing risks through closing or restricting use at FUDS until the risk is minimized.

Alternative D

Alternative D allows acceptable land uses and public access in FUDS. Alternative D has less beneficial impacts than Alternative B, but greater beneficial impacts than alternatives A, C, or E.

Alternative E (Proposed Casper RMP)

Alternative E has the least beneficial impacts on FUDS because it places the fewest restrictions on commercial use and no restrictions on public use.

4.8.3.6 Conclusion

Beneficial impacts to FUDS occur under all alternatives; however, Alternative B could have the greatest beneficial impacts and Alternative E could have the least beneficial impacts. Under all alternatives, FUDS remain the responsibility of the USACE.

Health and Safety – Hazardous Materials and Waste

With increased recreational and commercial use of public surface in the planning area comes an inherent risk associated with an increase in the amount of hazardous materials generated, used, transported, and stored.

4.8.3.7 Methods and Assumptions

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

- 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 and (or) waste generation occurs within the planning area.
- The BLM's 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 (or) the environment.

4.8.3.8 Analysis of Alternatives

Impacts Common to all Alternatives

The impacts to hazardous materials are the same among all alternatives. Implementing hazardous materials management activities will address human health and environmental risks from hazardous materials. Any authorized use of hazardous materials adheres to federal and state requirements to reduce or eliminate impacts. Hazardous materials in the planning area are managed to reduce risks to visitors and employees, to restore contaminated lands, and to carry out emergency-response activities, as per appropriate laws, policies, and regulations. Substantive indirect impacts related to risks from hazardous materials during remediation could exist.

4.8.3.9 Conclusion

Under all alternatives, the risks from hazardous materials and waste are the same. An active remediation program remains in place under all alternatives. Hazardous materials in the planning area are managed to reduce risk to people and the environment.

4.8.4 Environmental Justice

This section addresses the potential for the alternatives to have disproportionate adverse impacts on minority and low-income populations, including direct, indirect, short-term, and long-term impacts. Appendix B identifies laws, regulations, policies, and guidance considered in the analysis of disproportionate adverse impacts.

Because the analysis of disproportionate adverse impacts depends on what impacts are identified related to other resources, definitions of adverse impacts as they apply to environmental justice issues are closely related to the definitions of adverse impacts in other resource areas (e.g., social resources). For example, displacing 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 could be a reduction in social services to low-income individuals from decreased tax revenues as a result of decreased mineral production.

4.8.4.1 Methods and Assumptions

Since the analysis of disproportionate adverse impacts is based on other resource impacts, the assumptions for this analysis also are based on the assumptions of other resource areas as they relate to the identification and analysis of impacts. In addition, this analysis assumes that if demographic data show that there are concentrations of minority and low-income populations in the planning area, then the adverse impacts on other resources need to be identified and evaluated to determine if there could be disproportionate adverse impacts.

In accordance with the BLM and Council of 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 impacted area is meaningfully greater than the percentage in the general population. Since the minority population in each of the four counties that overlap the planning area is lower than the

statewide minority population, and the minority population in each of the four counties does not exceed 50 percent, none of these areas is considered to contain a resident minority population. Based on the BLM and CEQ guidance relating to identifying low-income populations, there are no low-income populations living in poverty in the planning area.

Although there are no Native American reservations in the planning area, the Wind River Indian Reservation is 30 miles west of the western boundary of the planning area. The Cedar Ridge site and other sites have cultural importance to members of tribes living in the area; the cultural importance of these sites is addressed in the Cultural Resources section of this chapter.

4.8.4.2 Analysis of Alternatives

Based on the definitions, methods, and assumptions described above, potential impacts of the alternatives are described below.

Impacts Common to All Alternatives

Based on demographic conditions in the planning area and the direct and indirect impacts of the alternatives, there are 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 or BLM IM 2002-164. While minority and low-income populations exist in the planning area, no particular BLM actions proposed in any of the alternatives are identified as causing disproportionate adverse impacts on these populations. The BLM has considered input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.4.3 Conclusion

The alternatives are identical with respect to potential impacts on minority and low-income populations. No particular BLM actions proposed in any of the alternatives could cause disproportionate adverse impacts on minority or low-income populations. The BLM has considered input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.5 Tribal Treaty Rights

Impacts to tribal treaty rights and trust responsibilities include, but are not limited to, limitations on access to tribal hunting, fishing, or resource collection areas reserved by treaty, economic issues, and other resource use and access issues. Impacts are identified in consultation with the appropriate tribal groups.

The Casper Field Office coordinates and consults regularly with appropriate American Indian groups to identify and consider their concerns in BLM land use planning and decisionmaking. Interested tribes review proposed land use planning decisions and other major BLM decisions for consistency with tribal land use and resource allocation plans; however, no treaty rights pertain directly to BLM-administered lands within the planning area.

Because no tribal treaty rights or trust responsibilities are known within or mandated by the Casper Field Office, management actions on the part of the BLM will have no impact on such rights. Each alternative has measures to protect cultural resources, including those related to traditional uses and practices. These are discussed and analyzed in the Cultural Resources section.

4.9 Cumulative Impacts

The 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).*

The following narrative describes the three components of this definition as they relate to this cumulative impact analysis: (1) incremental impacts of the RMP revision, (2) impacts from all past and present actions, and (3) reasonably foreseeable future actions.

The first component, incremental impacts of the action (i.e., RMP revision), is described for each resource under the eight resource topics in Sections 4.1 to 4.8 as direct, indirect, short-term, and long-term. The second component, impacts from all past and present actions, is encompassed within the description of baseline conditions presented in Chapter 3 – Affected Environment. In other words, the description of the current affected environment reflects past and present actions. The third component, reasonably foreseeable future actions, are identified in Table 4-22 and in Appendix M.

Table 4-22 identifies 19 projects anticipated to involve reasonably foreseeable future actions in or adjacent to the planning area. Sixteen of the projects in Table 4-22 are land use plans or other types of programmatic documents that provide a framework for subsequent site-specific actions. The breakdown of these 16 projects by agency includes 5 BLM RMPs, 1 BLM Programmatic Wind-Energy EIS, 2 USFS Land and RMPs, 2 USFWS Plans, 1 NPS General Management Plan, 4 County Land Use Plans, and 1 Wyoming State Transportation Plan. The remaining three projects include two site-specific projects and a BLM IM.

The analysis of cumulative impacts serves to place the projected incremental impacts from the RMP alternatives in the context of past, present, and future impacts. Combining the projected impacts of RMP alternatives with past, present, and future impacts necessarily involves projections and limited analyses. Analyses are limited primarily due to incomplete documentation of all past and present impacts on private and public lands; challenges of predicting potential impacts for reasonably foreseeable future actions; programmatic and strategic nature of RMP alternatives; unknown nature and pace of resource uses and technological changes that could occur; and changing circumstances related to agency priorities, policies, and the economy. These limitations are addressed through the methods and assumptions described in the following section.

Methods and Assumptions

It is neither practical nor required to exhaustively analyze all possible cumulative impacts. Instead, CEQ (1997) indicates the cumulative impact analysis should focus on meaningful impacts. The BLM identified key planning issues (see Chapter 1) to focus the analysis of environmental consequences in Sections 4.1 to 4.8 on meaningful impacts. During the analysis of environmental consequences, the key planning issues were further refined to seven cumulative issues for discussion in this section. Cumulative issues were identified based on scoping input, reasonably foreseeable future actions, professional judgment, purpose and need of the action, planning criteria, and consideration of context and intensity of potential impacts. Particular attention was given to potential impacts to public health and safety, controversy, uniqueness of resources, potential for violation of legal standards or laws, and potential impacts to legally protected resources. To focus the scope of cumulative impact analyses, cumulative issues were considered in the context of baseline conditions (Chapter 3), the incremental impacts of

individual resources in Sections 4.1 to 4.8, reasonably foreseeable future projects in Table 4-22, and the following factors as modified from CEQ 1997:

- Does the impacted resource have substantial value relative to legal protection and (or) ecological, cultural, economic, or social importance?
- Are reasonably foreseeable future actions anticipated to have environmental impacts similar to the incremental impacts identified for RMP alternatives?
- Have any recent or ongoing NEPA analyses of similar actions in the geographic area identified important adverse or beneficial cumulative impact issues?
- Has the impact to the resource been historically important, such that the importance of the resource is defined by past loss, past gain, or investments to restore resources?

The cumulative impact analysis was further bounded by timeframe, geographic area, and analytical assumptions. The timeframe or temporal limits of the cumulative impact analysis was defined as the anticipated life of the RMP. This timeframe corresponds to projections for the desired outcomes (goals and objectives) described for alternatives (Chapter 2). The geographic area or spatial limits of the cumulative impacts analysis was generally defined as the planning area; however, the impact analysis area was expanded for highly mobile resources, such as air quality, and for future actions adjacent to the planning area anticipated to have similar environmental impacts.

The majority of projects identified in Table 4-22 are ongoing and generally provide a management framework for site-specific actions implemented during the life of the various projects. Site-specific actions that have already occurred (past) or are ongoing (present) are not considered in this cumulative impacts analysis. Instead, these past and present actions are described in the baseline described in Chapter 3 – Affected Environment. Only those reasonably foreseeable future actions stemming from the 19 projects identified in Table 4-22 and Appendix M are considered in this cumulative impacts analysis (CEQ 2005).

Because most of the projects identified in Table 4-22 are programmatic and (or) strategic in nature, the precise intensity or location of anticipated impacts typically cannot be quantified. Therefore, the projects in Table 4-22 are primarily used to address the four factors identified above. For more quantitative analysis, the BLM projected the anticipated surface disturbance and air emissions from non-BLM RFAs for the entire planning area (Appendix M). The estimates of RFAs in Appendix M are based on historic and trend information, as well as the proportion of public to nonpublic land in the planning area. In addition to estimating RFAs for BLM and non-BLM actions, Appendix M also projects surface disturbance as short-term and long-term. Long-term surface disturbance denotes the disturbed area remaining following reclamation. Table 4-23 summarizes projected surface disturbance for BLM and non-BLM RFAs identified in Appendix M.

In general, trend analysis was used to assess cumulative impacts for identified issues in terms of ranges or changes in direction from baseline conditions. In lieu of quantitative data, projections regarding resource values were made when necessary. For example, approximately 5 percent of the soils in the entire planning area exhibit a high potential for water erosion and 4 percent of the soils have a high potential for wind erosion. These percentages were assumed to apply to both public and private lands across the planning area, regardless of ownership.

Table 4-22. Summary of Reasonably Foreseeable Future Actions

Present and Reasonably Foreseeable Future Actions and Management Plans	Programmatic Project	Air	Soil	Water	Minerals	Fire	Vegetation	Fish	Wildlife	Special Status Species	Heritage	Lands and Realty	Renewable Energy	Transportation	Off-Highway Vehicles	Livestock Grazing	Recreation	Visual Resource Management
Approved Resource Management Plan for Public Lands Administered by the Bureau of Land Management Buffalo Field Office Final EIS (BLM 2001a)	x	x	x	x	x	x	x	–	x	x	x	x	–	–	–	x	x	x
Lander Resource Management Plan Final EIS (BLM 1986b). *Lander Grazing Supplement 1986*	x	–	x	x	–	–	x	x	x	–	x	–	–	–	–	x	x	–
Newcastle Resource Management Plan EIS (BLM 2000b)	x	x	x	x	x	x	x	–	x	x	x	x	–	–	–	x	x	x
Rawlins Resource Management Plan and Draft EIS (BLM 2004d)	x	x	–	x	x	x	x	x	x	x	x	x	–	x	x	x	x	x
Washakie Resource Management Plan Draft EIS (BLM 1988a)	x	x	x	x	x	x	x	x	x	x	x	x	–	–	x	x	x	x
Final Programmatic EIS on Wind Energy Development on BLM-Administered Lands in the Western United States (BLM 2005d)	x	x	x	x	–	–	x	x	x	x	x	x	x	–	–	–	–	x
Medicine Bow National Forest Final EIS for the Revised Land and Resource Management Plan (USFS 2003a)	x	x	x	x	x	x	x	x	x	–	x	x	–	x	–	x	x	x
Land and Resource Management Plan for the Thunder Basin National Grassland; Medicine Bow-Routt National Forest; Rocky Mountain Region (USFS 2001a)	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Pathfinder Reservoir Area Management Plan (USBR 1982)	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Platte River Recovery Implementation Program Draft EIS (USBR and USFWS 2005)	x	–	–	x	–	–	–	x	x	x	x	x	x	–	x	–	x	–
Final EIS, General Management Plan, Development Concept Plan, Interpretive Prospectus for the Fort Laramie National Historic Site (BLM 1993)	x	x	x	x	–	x	x	–	x	x	x	x	–	x	–	–	–	x
Converse County Land Use Plan (CCPC 2003)	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Land Use Plan. Natrona County, Wyoming, Natrona County Planning and Zoning Commission (1998)	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Casper Mountain Plan, (CMSC) Casper Mountain Steering Committee and Natrona County Planning Department (1984)	x	–	x	x	x	x	x	–	x	x	x	x	–	x	x	–	x	–
Goshen County Land Use Plan, Oblinger-Smith Corporation (1977)	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 4-22. Summary of Reasonably Foreseeable Future Actions (Continued)

Present and Reasonably Foreseeable Future Actions and Management Plans	Programmatic Project	Air	Soil	Water	Minerals	Fire	Vegetation	Fish	Wildlife	Special Status Species	Heritage	Lands and Realty	Renewable Energy	Transportation	Off-Highway Vehicles	Livestock Grazing	Recreation	Visual Resource Management
Wyoming Department of Transportation Fiscal Year 2005 State Transportation Improvement Summary (WYDOT 2005)	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Final EIS and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (BLM 2003g)	–	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South Powder River Basin Coal Final EIS (BLM 2006c)	–	x	x	x	x	–	x	–	x	x	x	x	–	x	–	x	x	x
BLM Instruction Memorandum No. 2001-102, Grasshopper and Mormon Cricket Control Program Changes (BLM 2001e)	x	–	–	–	–	–	–	–	x	x	–	–	–	–	–	–	–	–

Note: Full citations for each project are in Chapter 5 – References.

X Adverse impact or beneficial impact
– No specific impacts identified for this resource
BLM Bureau of Land Management
CCPC Converse County Planning Commission
CMSC Casper Mountain Steering Committee
EIS Environmental Impact Statement
WYDOT Wyoming Department of Transportation
USFS U.S. Forest Service
USFWS U.S. Fish and Wildlife Service
USBR U.S. Bureau of Reclamation

Because BLM does not manage or regulate non-BLM actions, certain assumptions were made in estimating cumulative impacts for non-BLM actions. Assumptions used in calculating impacts from non-BLM actions within the planning area follow.

1. For cumulative impacts associated with non-BLM oil and gas activities, calculations were based on the following percent federal and nonfederal wells from Wyoming Reservoir Management Group's Oil and Gas RFD (BLM 2005c):
   - Baseline – 71 percent federal and 29 percent nonfederal
   - Alternative A – 69 percent federal and 31 percent nonfederal
   - Alternative B – 19 percent federal and 81 percent nonfederal
   - Alternative C – 67 percent federal and 33 percent nonfederal
   - Alternative D – 69 percent federal and 31 percent nonfederal
   - Alternative E – 69 percent federal and 31 percent nonfederal
2. For cumulative impacts associated with non-BLM coal development, calculations were based on actual mineral ownership within the CDPA: 92 percent BLM-administered minerals and 8 percent non-BLM-administered minerals.
3. For cumulative impacts associated with non-BLM other activities (excluding oil, gas, and coal) the amount and density of activities was assumed the same for BLM and non-BLM actions, regardless of land ownership. The calculation of cumulative impacts for non-BLM other mineral actions (i.e., non-oil and gas) is based on 55-percent BLM-minerals and 45-percent non-BLM minerals in the planning area. The calculation of cumulative impacts for non-BLM other activities (i.e., nonmineral) is based on 16-percent BLM-administered surface and 84-percent non-BLM-administered surface in the planning area.

4. The context and intensity of non-BLM activities are not anticipated to vary by alternative because these activities do not directly depend on management actions and allowable uses set forth in RMP alternatives.

Table 4-23. Cumulative Surface Disturbance from BLM and Non-BLM Reasonable Foreseeable Actions over the Life of the Plan in the Casper Planning Area

Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Total Acres Short-Term Disturbance from BLM Actions	59,990	36,650	58,689	63,649	61,274
Total Acres Reclaimed from BLM Actions	38,903	25,085	38,331	41,569	39,602
Total Acres Long-Term Disturbance from BLM Actions	**21,087**	**11,565**	**20,358**	**22,080**	**21,672**
Total Acres Short-Term Disturbance from Non-BLM Actions	189,649	189,649	189,649	189,649	189,649
Total Acres Reclaimed from Non-BLM Actions	149,224	149,224	149,224	149,224	149,224
Total Acres Long-Term Disturbance from Non-BLM Actions	**40,425**	**40,425**	**40,425**	**40,425**	**40,425**
Cumulative Long-Term Acres from Disturbance	**61,512**	**51,990**	**60,783**	**62,505**	**62,097**

Source: Appendix M of this document, Table M-1
BLM Bureau of Land Management

Cumulative Impacts

Eleven of the projects identified in Table 4-22 documented their anticipated impacts in an EIS. Review of the EISs and associated plans for the 19 projects revealed that most reasonably foreseeable future actions from the projects could be expected to produce environmental impacts similar to the incremental impacts anticipated for the RMP alternatives. For example, when implemented, most projects in Table 4-22 are anticipated to involve surface-disturbing activities or will allow removal of vegetation and soil disturbance, similar to actions anticipated for RMP alternatives. Therefore, cumulative impacts, such as soil erosion, spread of INPS, and habitat fragmentation, are anticipated to be commensurate with the amount of surface disturbance projected within the planning area.

Some resources (i.e., cultural, special status species, air quality) that could be impacted by reasonably foreseeable future actions have substantial value relative to legal protection and (or) ecological, cultural, economic, or social importance. Exceedance of legal standards or thresholds protecting these resources is not anticipated from the cumulative impact of BLM and non-BLM actions; however, the programmatic nature of most RFAs prohibits precise prediction of cumulative impacts. Subsequent environmental impact analysis in implementation plans include more precise site- and project-specific information.

The following cumulative impacts discussion is organized according to the seven cumulative issues identified by the BLM to focus the cumulative impact analysis. Each issue is discussed in terms of the potential cumulative impact of BLM actions anticipated through implementing the revised plan and non-BLM actions anticipated to occur during the life of the plan.

Cumulative Issue 1 – The cumulative impact of surface-disturbing activities and the associated potential invasion and spread of INPS

The INPS section in this chapter describes how surface-disturbing activities and the disturbance of soil contribute to the spread of INPS. The Soil section describes potential impacts to soil from surface-disturbing activities and other activities that remove vegetation and disturb soil. RFAs that disturb soil are also anticipated to create potential habitats for INPS. In general, the more soil disturbed over the life of the plan, the greater the cumulative impact anticipated relative to INPS. Surface disturbance from non-BLM actions is anticipated to be substantively greater than surface disturbance from BLM actions. For example, the Powder River Basin Oil and Gas Project, adjacent to the Casper planning area, addresses management of more than 95,000 acres of long-term surface disturbance in the Powder River Basin (BLM 2003g). While much of the area projected to be disturbed from BLM and non-BLM actions is anticipated to be reclaimed, the potential for the spread of INPS remains from both short- and long-term impacts (Table 4-23).

In addition to total acres of land disturbed, the type of disturbance is important to the spread of INPS. For example, construction, maintenance, existence, and operation of linear features (e.g., water courses, roads, trails, ROW, and corridors) in the planning area could have a substantive impact on the spread of INPS. Water, wind, vehicles, livestock, humans, and wildlife inadvertently transport INPS along these linear features. Similar to surface disturbance, the greater the miles of linear features constructed, the greater the adverse cumulative impact from INPS would be.

Surface-disturbing activities are defined as the physical disturbance and movement or removal of the land surface and vegetation (see Glossary). In addition to surface-disturbing activities, other surface-use activities may remove vegetation and disturb soil. OHV use, fire suppression, recreational activities, and dispersed travel may remove vegetation and disturb the soil surface. Improper grazing by livestock and native ungulates can reduce vegetative cover, exposing more soil to erosion. Surface-disturbing activities and surface uses can contribute to the spread of INPS.

Table 4-24 categorizes projected disturbance in the planning area for BLM and non-BLM actions by soils with high water and high wind-erosion potentials. Management actions associated with each alternative (see Chapter 2) afford some degree of reclamation following surface disturbance and some degree of protection of highly erodible soils or soils occurring on slopes exceeding 25 percent for BLM-managed lands. However, because of how they are formulated, these protective measures are anticipated to be more effective under some alternatives (e.g., Alternative B) and less effective under other alternatives (e.g., Alternative D). These protective measures may not apply to lands under state and fee (i.e., private) ownership. Moreover, protective measures may be applied unevenly across the planning area and enforcement and monitoring of protective measures depend on land ownership and funding. Some private lands are subject to local protective measures; however, the nature and extent of these measures are expected to vary for private lands within the planning area. For example, the Casper Mountain Land Use Plan (Worthington et al. 2004) limits mineral development and recreational uses on steep slopes that provide some measure of protection to erosive soils. In addition, the Natrona County Land Use Plan ensures that future development will not adversely impact adjacent land uses. However, similar restrictions are not identified for all non-BLM RFAs.

Similar to the impact analysis described in the INPS section, Tables 4-23 and 4-24 support the conclusion that cumulative surface disturbance acreage is anticipated to be the most under Alternative D and the least under Alternative B for the entire planning area. Likewise, due to management actions and restrictions, INPS spread associated with nonsurface-disturbing activities (i.e., livestock and native ungulate grazing, OHV use, fire, recreational activities, and dispersed travel) are anticipated to be the most under Alternative D and the least under Alternative B for lands managed by the BLM. Considering BLM and

non-BLM actions, projected surface disturbance, nonsurface-disturbing activities, and management actions for the other three alternatives, the projected INPS cumulative impacts in the planning area are anticipated to be similar under alternatives A, C, and E.

Table 4-24. Cumulative Reasonable Foreseeable Actions for Surface Disturbance in the Casper Planning Area

Action	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E (Proposed RMP)	
Cumulative Disturbance										
Total Acres Short-Term Disturbance from BLM Actions	59,990		36,650		58,689		63,649		61,274	
Total Acres Reclaimed from BLM Actions	38,903		25,085		38,331		41,569		39,602	
Total Acres Long-Term Disturbance from BLM Actions	21,087		11,565		20,358		22,080		21,672	
Potential Impact to Highly Erosive Soils (acres) from BLM Actions	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**
	1,054	**843**	**0**	**0**	**1,018**	**814**	**1,104**	**883**	**1,084**	**867**
Total Acres Short-Term Disturbance from Non-BLM Actions	189,649		189,649		189,649		189,649		189,649	
Total Acres Reclaimed from Non-BLM Actions	149,224		149,224		149,224		149,224		149,224	
Total Acres Long-Term Disturbance from Non-BLM Actions	40,425		40,425		40,425		40,425		40,425	
Potential impact to Highly Erosive Soils (acres) from Non-BLM Actions	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**
	2,021	**1,617**	**2,021**	**1,617**	**2,021**	**1,617**	**2,021**	**1,617**	**2,021**	**1,617**
Cumulative Long-Term Acres of Disturbance	**61,512**		**51,990**		**60,783**		**62,505**		**62,097**	
Potential Impact to Highly Erosive Soils (acres) from All Actions	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**	**Water**	**Wind**
	3,075	**2,460**	**2,021**	**1,617**	**3,039**	**2,431**	**3,125**	**2,500**	**3,105**	**2,484**

Assumptions for non-BLM actions:

Calculations for non-BLM actions assume an equal amount of development will occur on BLM surface (16% = 1,361,225 acres) as non-BLM surface (84% = 7,160,122 acres), and on BLM-administered minerals (55% = 4,656,035 acres) as non-BLM-administered minerals (45% = 3,865,312 acres) over the life of the plan.

Calculations assume percentages of water (5%) and wind (4%) erosion apply to the entire planning area, regardless of ownership.

The above ratios were used to calculate the acres of surface disturbance.

BLM Bureau of Land Management

Cooperation between the Natrona, Converse, Platte, and Goshen County Weed and Pest Control Districts and the BLM is anticipated to continue throughout the life of this plan; however, the long-term effectiveness of INPS control measures on all public and private lands in the planning area depends on continued cooperation, available funding, agency priorities, and the effectiveness and periodic assessment of weed-management activities in accordance with a comprehensive weed-management plan. Unchecked INPS could overwhelm attempts at control and substantially impact fire management and ecology, biological resources, livestock grazing (by reducing rangeland productivity and AUMs, and recreation (by impacting wildlife habitats and scenic quality) throughout the planning area.

Cumulative Issue 2 – The cumulative impact of management actions and constraints on oil and gas development

The unconstrained RFD projection over the life of the plan is 2,800 new wells (75-percent conventional wells and 25-percent CBNG wells) in the planning area (BLM 2005c). During the RMP alternative formulation process, management actions and allowable uses were identified for individual resource programs, which spatially and temporally constrained and, thus, impacted mineral development. Constraints included deferring leasing, CSU restrictions, TLS, and stipulations on COAs for application to drill. These constraints reduce the unconstrained estimated number of well locations, and, in general, increase development costs and reduce production in areas of federal oil and gas ownership.

The constraints identified above are not applied to nonfederal (state and fee minerals) wells. While other constraints may be applied to nonfederal wells, the impact of such constraints cannot be quantified for this analysis. The number of unconstrained baseline wells, constrained federal wells, and unconstrained nonfederal wells projected for each alternative over the life of the plan are summarized in Table 4-25.

The projected number of new nonfederal wells (685) is approximately 24 percent of the cumulative number of new wells (2,800) predicted for the planning area between 2001 and 2020. Restrictions placed on federal wells under the various alternatives reduce the number of new wells compared to the unconstrained baseline of 2,800 wells, as follows.

Percent reduction from baseline projected unconstrained new wells:

- Alternative A – 6 percent
- Alternative B – 63 percent
- Alternative C – 11 percent
- Alternative D – 7 percent
- Alternative E – 6 percent

The cumulative impact of federal and nonfederal wells on surface disturbance and INPS, special status species, cultural resources, and social and economic conditions are described under the appropriate cumulative issue in this section.

Table 4-25. Reasonable Foreseeable Development Well Number Projections

Well Type	Baseline	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Number of Projected New Federal Wells	1,988	1,823	190	1,664	1,800	1,813
Projected Number of Abandoned New Federal Wells	322	284	26	259	279	281
Projected Productive New Federal Wells	**1676**	**1,539**	**164**	**1,405**	**1,521**	**1,532**
Number of Projected New Nonfederal Wells	812	819	808	819	809	815
Projected Number of Abandoned New Nonfederal Wells	127	128	109	127	126	127
Projected Productive New Nonfederal Wells	**685**	**691**	**699**	**692**	**683**	**688**
Cumulative New Wells (Federal/Nonfederal)	2,800	2,642	998	2,483	2,609	2,628
Cumulative Abandoned New Wells (Federal/Nonfederal)	439	412	135	386	405	408
Cumulative Productive New Wells (Federal/Nonfederal)	**2,361**	**2,230**	**863**	**2,097**	**2,204**	**2,220**

Cumulative Issue 3 – The cumulative impact of water depletion on downstream special status species

Anticipated water depletions from BLM actions and the potential impacts to special status species are described in the Fish and Wildlife Resources – Fish, Special Status Species – Fish, and Water sections of this chapter. Water depletions from BLM actions are anticipated from development of oil and gas wells, fish and wildlife water sources, and livestock water sources. Water depletions from non-BLM actions also are anticipated from the development of oil and gas wells and livestock water sources, and are not expected to substantively vary by alternative. Developing of fish and wildlife water sources on private lands within the planning area not administered by BLM are not anticipated. Table 4-26 shows the projected average annual water depletion from BLM and non-BLM actions within the planning area.

Table 4-26. Projected Cumulative Annual Water Depletion from BLM and Non-BLM Actions over the Life of the Plan

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Projected Average Annual Depletion from BLM Actions (acre-feet)	79	2,014	1,054	272	270
Projected Average Annual Depletion from Non-BLM Actions (acre-feet)	462	462	462	462	462
Projected Cumulative Annual Depletion from BLM and Non-BLM Actions in the Planning Area (acre-feet)	541	2,476	1,516	734	732

BLM Bureau of Land Management

Table 4-26 does not include predictions of water depletions associated with urban development within the planning area. As population centers within the Platte River System grow and larger tracts of land are subdivided into smaller, more numerous residential properties, water depletions within the North Platte watershed are expected to increase irrespective of BLM-actions.

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 1996b). 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 life of the plan are anticipated to deplete more than 25 acre-feet of water in the Platte River System over the life of the plan (Table 4-26), but none of the proposed actions individually would exceed 25 acre-feet.

Regarding federal actions, USFWS (2002b) indicates that most of the more than 1,000 proposed federal actions within the Platte River System are anticipated to involve water depletions. The USFWS and USBR are currently addressing the issue of water depletion in the Platte River System through preparation of the Platte River Recovery Implementation Program EIS (USBR and USFWS 2005). The cumulative impact of water depletions within the Platte River System to special status species downstream in the Platte River is well documented (USBR and USFWS 2005) and expected to continue over the life of the plan.

Because projected water depletions from BLM actions are highest under Alternative B and because water depletions from non-BLM actions are not expected to vary by alternative, the greatest adverse cumulative water depletions are anticipated under Alternative B and the least adverse cumulative water depletions under Alternative A.

Cumulative Issue 4 – The cumulative impact of habitat fragmentation on wildlife and special status wildlife species

The condition of the planning area with respect to habitat fragmentation is described in the introduction of Biological Resources, Chapter 3. Potential impacts contributing to habitat fragmentation are described in the introduction of Biological Resources in this chapter. Potential impacts stemming from habitat fragmentation are described in appropriate biological resources sections (e.g., vegetation, wildlife) in this chapter.

A management action to address the challenge of habitat fragmentation is included in alternatives B, C, and E (see Chapter 2). In general, this management action closes blocks of BLM-administered land to oil and gas leasing, geophysical operation, mineral material disposal, and to wind and renewable energy development. Alternatives C and E propose a smaller area and include fewer restrictions relative to Alternative B. For example, restrictions proposed for alternatives C and E apply to fewer blocks and only to blocks of land containing big game crucial winter range or greater sage-grouse leks and habitats. The identified blocks of land currently have low development potential for coal, oil, and gas; public surface ownership exceeding 50 percent; and contiguous blocks of native vegetation exceeding 10,000 acres in size. The total area comprising the blocks of land for alternatives B, C, and E are shown in Table 4-27 by land administration. It is important to note that some of the areas identified within these blocks are not administered by BLM and, therefore, BLM does not manage land use in these areas.

Table 4-27. Contiguous Blocks of Native Habitat Identified in the Casper Planning Area To Avoid Habitat Fragmentation (acres)

Land Administration	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Acres of BLM-Administered Minerals Identified To Avoid Habitat Fragmentation	0	580,007	238,724	0	168,386
Acres of Non-BLM-Administered Minerals Identified To Avoid Habitat Fragmentation	0	80,491	40,581	0	24,159
Total Acres in the Planning Area Identified To Avoid Habitat Fragmentation	0	660,498	279,305	0	192,545

BLM Bureau of Land Management

The challenge of habitat fragmentation and associated impacts, primarily to biological resources, is anticipated to continue under all alternatives. Moreover, surface-disturbing activities, fire, spread of INPS, and activities that remove vegetation and disturb soil are anticipated to contribute to habitat fragmentation within the planning area, regardless of land ownership. Habitat fragmentation from non-BLM actions in the planning area is primarily anticipated from urban and energy development and associated infrastructure (e.g., roads), although the intensity of development on private lands is not expected to vary by alternative. The majority of habitat fragmentation is anticipated to occur proximate to population centers (e.g., Casper) and in the eastern half of the planning area, where land ownership is primarily state and private.

Supported by favorable economic conditions, population centers are expected to grow in both geographic area and population density over the life of the plan. The trend in western states of subdividing larger private parcels to support development of residential subdivisions and ranchettes (e.g., 35-acre parcels) is expected to continue and contribute to habitat fragmentation. As larger tracts of land adjacent to public lands are subdivided, the WUI and its associated issues (e.g., fragmentation, fire suppression, spread of INPS) are also expected to grow. As the WUI expands, some tracts of BLM-administered land may

become disconnected or isolated from other native habitats and ultimately adversely impact planning area biological diversity. The fences, roads, spread of INPS, fire suppression, and changes in land use associated with an expanding WUI all serve to fragment habitat. In addition, multiple land owners in the WUI, especially in the eastern planning area, are expected to result in varied management of resources and resource use impacting habitat fragmentation, including INPS spread, fire, wildlife, livestock grazing, OHV use, and development.

The greatest adverse cumulative habitat fragmentation impacts are anticipated under alternatives A and D because these alternatives do not include management actions anticipated to address habitat fragmentation. Alternatives A and D generally are anticipated to allow the most development with the least restrictions on BLM-administered lands. Based on the amount of BLM-administered land proposed for managing habitat fragmentation, Alternative B is anticipated to have the least adverse impact to habitat fragmentation, followed in order of increasing impact by alternatives C and E. Although, for this analysis, habitat fragmentation from non-BLM actions are assumed to not vary across alternatives, the magnitude of fragmentation from non-BLM actions on private lands is expected to be substantively greater than fragmentation on public lands. This conclusion is based on the fact that most land surface in the planning area is and will continue to be privately held and, therefore, subject to fewer restrictions and more development compared to public lands.

Cumulative Issue 5 – The cumulative impact of development activities on the historical setting of cultural resources (including National Historic Trails and Other Historic Trails)

The cumulative impact of development activities from BLM and non-BLM actions within the planning area is anticipated to adversely impact the context and historical setting of some cultural resources and NHTs and Other Historic Trails. No quantitative data are available for assessing cumulative impacts to the historical setting of cultural resources and NHTs and Other Historic Trails. Moreover, plan alternatives are not anticipated to result in measurable differences in impacts to historical settings from non-BLM actions.

In general, although cultural resources on public land enjoy legal protection, similar protection does not apply to cultural resources from private actions on private lands. Likewise, limited restrictions on public lands exist to protect the historical setting of cultural resources on public lands. For example, alternatives B and C propose an NSO buffer within 300 feet of select cultural resources. However, due to the mixture of public and private land ownership adjacent to other cultural resources, such as NHTs and Other Historic Trails, cumulative impacts to the historical setting are not regulated and expected to continue. For example, although the BLM may elect to prevent surface occupancy within a defined distance from NHTs and Other Historic Trails, no similar requirement applies to adjacent private lands. No basis exists for assuming any difference in cumulative impact of development activities on the historical setting of cultural resources and NHTs and Other Historic Trails.

Cumulative Issue 6 – The cumulative impact of management actions and projected development on the economy of local communities

Cumulative impacts to economic conditions most likely are related to oil and gas activity and ranching and livestock grazing. The impacts of oil and gas drilling and production described in the economic impact section of this chapter relate to activities only on BLM-administered surface and federal mineral estate within the planning area. However, oil and gas activity on private and state land is estimated to constitute 31 percent to 33 percent of oil and gas activity in alternatives A, C, D, and E, and 81 percent of activity in Alternative B. Thus, when oil and gas activity on state and private land is taken into account, the reduction in overall activity in Alternative B – and associated earnings, employment, output, and projected tax revenues – is proportionally smaller (compared to the reduction in activity on federal lands

only). Table 4-28 summarizes potential economic impacts due to estimated oil and gas activity on federal, state, and private lands.

Oil and gas development is driven primarily by variables outside of the BLM's control, including national and international energy prices, investment within the planning area, and business strategies of operators. In addition, oil and gas activity on state and private lands will be impacted by land management decisions of other agencies and individuals. Because the pace of development is unknown, actual cumulative impacts may differ from those projected in Table 4-28.

Because energy prices are the predominant force behind the pace of oil and gas development, some communities may experience boom and bust cycles as a result of fluctuations in energy prices. This can cause hardships to local populations because of the temporary increased demand for housing and community services. Infrastructure may be expanded during boom times, and loans or bonds to pay for expansion of infrastructure must still be repaid if the boom turns to a bust.

Table 4-28. Cumulative (including state and private) Impacts of Oil and Gas Development over the Life of the Plan in the Casper Planning Area[1]

Impact	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E (Proposed RMP)
Annual Average Earnings	$89.7	$43.6	$85.4	$88.6	$89.2
Annual Average Output	$890.3	$599.6	$863.2	$883.1	$887.4
Net Present Value of Output	$8,973	$6,515	$8,746	$8,913	$8,950
Annual Average Employment[2]	2,349	1,131	2,236	2,319	2,336
Annual Average Federal Tax Revenues	$50.1	$10.2	$47.4	$49.8	$50.0
Annual Average State Tax Revenues	$34.8	$25.7	$34.0	$34.6	$34.7
Annual Average Local Tax Revenues	$36.6	$27.0	$35.7	$36.3	$36.5

Source: Calculated using the IMPLAN model, as described in the text.

[1]All dollar values are in millions of year 2003 dollars and represent annual averages, except for the net present value of output, which is discounted at a 7-percent real discount rate, as recommended in OMB 2002.

[2]Employment is in AJEs and represents an annual average.

Increasing energy development, such as the recent expansion in natural gas drilling and production, is likely to have substantive social impacts in Casper because of the concentration of oil and gas service companies in that city. However, since Casper is a relatively large city with a diversified economic base, it likely has the capacity to absorb the potential economic growth and resulting increase in population. In addition, increased oil and gas development will bring increased mineral tax revenues, especially for Natrona and Converse counties, which could mitigate the increased demand for community services and infrastructure that more development would bring.

A potential for cumulative economic impacts related to livestock grazing and ranching also exists. Cattle and sheep ranchers in the planning area face increasing pressure from local land developers and market trends. The potential loss of BLM land currently available for grazing, in addition to pre-existing economic pressures, could result in some adverse economic impacts to some ranchers. For example, short-term loss of land available for grazing could occur as a result of the BLM's policy of deferring grazing for 2 years following fire. Although not mandated by policy, some period of short-term deferment also is anticipated to occur on private rangeland following fire. The cumulative impact of INPS spread, and an associated reduction in forage on public and private lands in the planning area could also adversely impact livestock grazing.

The cumulative impacts of BLM management actions is not anticipated to have long-term adverse impacts on livestock grazing on public lands, since the projected availability of federal AUMs is generally constant over the life of the plan. Non-BLM actions that remove private lands from livestock grazing (such as development and urbanization) could result in adverse cumulative economic and social impacts related to livestock grazing. However, given that impacts on grazing lands occur gradually over the life of this plan and would be spread over the planning area, adverse economic impacts on individual ranchers is not anticipated. On the other hand, even if economic impacts on ranchers are not substantial, the social impacts could be more significant because of the importance of ranching to the custom, culture, and history of communities in the planning area.

Cumulative Issue 7 – The cumulative impact of air quality on public health and welfare within the planning area and protected Class I areas outside the planning area

Base year and anticipated annual air emissions for the life of the plan are organized by project scenario and resource as shown in Tables 4-29 to 4-34 at the end of this chapter. These tables identify each anticipated emission category for (1) projected BLM actions, (2) projected non-BLM actions, and (3) the cumulative total of these actions.

BLM and non-BLM RFAs are anticipated to increase emissions in the planning area over the life of the plan. For the planning area, the 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-managed lands because it is assumed that the density of activities are the same in both areas. This conclusion also assumes that nearby operations on both BLM and non-BLM-managed lands would not combine to result in greater impacts on a local scale. Because of proposed development restrictions on BLM-managed land, adverse cumulative impacts to air quality are anticipated to be the least under Alternative B. Cumulative projected emissions under alternatives A, C, D, and E are similar; all are projected to be greater than under Alternative B. Cumulative emissions within the planning area are not anticipated to result in air quality impacts that exceed national or state ambient air quality standards because the emission sources likely will be widely separated. Potential impacts to PSD increments, visibility, and atmospheric deposition in distant Class I NWAs, may be substantial.

4.10 Irreversible and Irretrievable Commitment of Resources

Section 1502.16 of CEQ regulations requires 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 resources refers to decisions impacting the use of nonrenewable resources. For example, extraction and processing of sand and gravel as part of an aggregate mining operation is considered an irreversible commitment of salable minerals because once the minerals are extracted and processed, they cannot be renewed in the ground within a reasonable timeframe. An irretrievable commitment of resources refers to decisions resulting in the loss of production or use of a resource. For example, a decision not to treat woodlands encroaching into adjacent grassland habitat results in the irretrievable loss of forage production from the grassland community. This action is not irreversible, because once a treatment is applied, the forage production of the grassland is restored.

The decision to select one of the five alternatives described in this Proposed RMP/Final EIS does not constitute an irreversible or irretrievable commitment of resources because the decision does not authorize on-the-ground activities. Instead, decisions made in the selected plan serve to guide future actions and subsequent site-specific decisions. Following the signing of the Record of Decision (ROD) for the RMP, subsequent implementation plans (activity- or project-specific) will be developed and implemented by the BLM. Implementing decisions requires appropriate project-specific planning, NEPA analysis, and BLM's final approval authorizing on-the-ground activities to proceed.

Assuming that BLM selects one of the action alternatives and that subsequent implementation decisions authorize activity- or project-specific plans, irreversible and irretrievable commitment of resources could occur to select resources. No irreversible or irretrievable commitment of resources are anticipated for air quality, geologic resources, fire management and ecology, vegetation, fish and wildlife, special status species, visual resources, lands and realty, renewable energy, ROW and corridors, transportation, OHV use, recreation, special designations, other MAs, and socioeconomic resources.

Physical, Biological, and Heritage Resources

Soil. Surface-disturbing activities, nonmechanized activities, and natural processes cause soil erosion in the planning area. Soil formation requires thousands of years to replenish. Eroded soil and lost productivity cannot be recovered. The loss of topsoil from soil erosion results in an irretrievable loss of soil productivity.

Water. Depletion of water to the Platte River from BLM actions in the North Platte watershed may result in an irretrievable commitment of water that would otherwise have contributed to the Platte River System. The production of water from oil and gas wells in the planning area may be an irretrievable commitment of groundwater depending on its use once it reaches the surface.

Coal. Removal of coal from the ground is considered an irreversible commitment of these resources.

Fluid Minerals. Removal of oil and gas from the ground is considered an irreversible commitment of these resources.

Locatable Minerals. Removal of locatable minerals from the ground is considered an irreversible commitment of these resources.

Mineral Materials. Removal of mineral materials from the planning area is considered an irreversible commitment of these resources.

Nonenergy Leasables. Removal of nonenergy leasables from the ground is considered an irreversible commitment of these resources.

Resource Uses

Forest Products. Any decision to prohibit silviculture treatments is an irretrievable commitment of the wood fiber produced. As trees grow older, ultimately die, and decompose, the wood fiber that was not treated is irretrievably lost.

Livestock Grazing. Forage utilized by livestock is unavailable for utilization by wildlife. Conversely, any decision to prohibit livestock grazing is an irretrievable commitment of the forage produced. As grasses and forbs grow older, ultimately die, and decompose, the forage that is not utilized is irretrievably lost for production of wildlife or livestock.

4.11 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the residual impacts of implementing management actions or allowable uses after BMPs and mitigation measures are applied.

The decision to select one of the five alternatives described in this Proposed RMP and Final EIS would not result in unavoidable adverse impacts because the decision does not authorize on-the-ground activities. Instead, decisions made in the selected plan serve to guide future actions and subsequent site-specific decisions. Following signing of the ROD for the RMP, subsequent plans (activity- or project-specific) will be developed and implemented by BLM. Implementation decisions require appropriate project-specific planning and NEPA analysis and constitute BLM's final approval authorizing on-the-ground activities to proceed.

Assuming that BLM selects one of the action alternatives and that subsequent implementation decisions authorize activity- or project-specific plans, unavoidable adverse impacts could occur to select resources.

Surface-disturbing activities (e.g., construction of well pads and roads, pits and reservoirs, pipelines and powerlines, mining, and vegetation treatments), OHV use, fire management and ecology, some recreational activities, and operation and maintenance of existing facilities and infrastructure in the planning area will cause fugitive dust, exhaust emissions, and smoke, thereby adversely impacting air quality.

Surface-disturbing activities, OHV use, fire management and ecology, some recreational activities, uncontrolled animal concentrations, and operation and maintenance of existing facilities and infrastructure in the planning area may cause soil erosion and soil compaction. These same activities, in combination with precipitation events, also may result in runoff and sedimentation to existing surface waters. Additional unavoidable adverse impacts from these activities include transport and spread of INPS in the planning area. INPS will continue to spread via the wind, in water courses, and by attaching to livestock, wildlife, humans, and vehicles. The presence of INPS in the planning area is considered an unavoidable impact.

Surface-disturbing activities and the development of mineral, energy, and other facilities in the planning area are expected to cause the unavoidable degradation, loss, and fragmentation of habitats. OHV use, fire management and ecology, some recreational activities, concentrated livestock grazing, and operation and maintenance of existing facilities and infrastructure in the planning area may contribute to the unavoidable degradation, loss, and fragmentation of habitats.

Protection of some resource values (e.g., wildlife, special status species, cultural, and paleontological resources) will adversely impact the use of other resources, such as minerals and renewable energy. Conversely, use of minerals and renewable energy are expected to adversely impact the distribution of some wildlife, special status species, and vegetative communities.

Surface-disturbing activities and development from BLM actions unavoidably will change the landscape, scenic quality, and setting in the planning area. Non-BLM actions on lands adjacent to BLM-administered lands also will change the landscape and setting. Fire, insect and disease damage, and development also are expected to temporarily impact the scenic quality of the planning area. Surface-disturbing activities, OHV use, vandalism, and natural processes (e.g., fire and erosion) may adversely impact cultural and paleontological resources in the planning area.

Table 4-29. Cumulative Annual Emissions for BLM Activities Within the Casper Planning Area – Baseline Year 2001

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
CBNG Development/Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Natural Gas Development/Production	85.30	34.84	120.14	34.46	14.07	48.53	430.68	175.91	606.59	6.05	2.47	8.52
Oil Development/Production	63.59	25.98	89.57	20.75	8.48	29.23	448.74	183.29	632.03	59.37	24.25	83.62
Locatable Minerals	151.06	123.59	274.65	21.11	17.27	38.38	19.34	15.82	35.16	2.02	1.65	3.68
Salable Minerals	295.25	241.57	536.82	38.08	31.16	69.23	18.57	15.19	33.77	0.46	0.38	0.84
Coal Mine	479.82	41.72	521.54	112.39	9.77	122.16	373.18	32.45	405.63	13.99	1.22	15.21
Resource Roads	1.37	7.18	8.55	0.15	0.81	0.96	0.16	0.85	1.01	0.00	0.02	0.02
ROW Corridors	19.82	104.05	123.87	4.74	24.87	29.60	15.99	83.95	99.94	1.72	9.05	10.78
Livestock/Grazing	11.44	60.06	71.50	1.77	9.31	11.09	1.19	6.22	7.41	0.04	0.19	0.23
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest and Woodlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vegetation Management	1.16	6.08	7.24	0.19	0.98	1.16	0.29	1.50	1.79	0.01	0.04	0.05
OHVs	7.00	36.75	43.75	7.00	36.75	43.75	2.94	15.44	18.38	0.00	0.00	0.00
Total	**1,115.80**	**681.82**	**1,797.62**	**240.64**	**153.46**	**394.10**	**1,311.06**	**530.62**	**1,841.69**	**83.67**	**39.27**	**122.94**

	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
CBNG Development/Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Natural Gas Development/Production	394.17	161.00	555.17	2,639.21	1,077.99	3,717.20	282.27	115.29	397.56
Oil Development/Production	112.78	46.07	158.85	14.65	5.98	20.63	1.47	0.60	2.06
Locatable Minerals	49.34	40.37	89.72	7.18	5.88	13.06	0.72	0.59	1.31
Salable Minerals	9.31	7.62	16.93	1.69	1.38	3.07	0.17	0.14	0.31
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.05	0.27	0.33	0.01	0.07	0.08	0.00	0.01	0.01

Table 4-29. Cumulative Annual Emissions for BLM Activities Within the Casper Planning Area – Baseline Year 2001

	Emissions (Tons per Year)								
	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
ROW Corridors	22.27	116.91	139.18	5.40	28.38	33.78	0.54	2.84	3.38
Livestock/Grazing	0.56	2.95	3.51	0.13	0.70	0.83	0.01	0.07	0.08
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest and Woodlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vegetation Management	0.14	0.73	0.87	0.03	0.15	0.18	0.00	0.02	0.02
OHVs	427.44	2,244.07	2,671.51	229.98	1,207.42	1,437.40	23.00	120.74	143.74
Total	**1,016.07**	**2,619.98**	**3,636.05**	**2,898.30**	**2,327.94**	**5,226.24**	**308.18**	**240.29**	**548.46**

BLM Bureau of Land Management
CBNG coalbed natural gas
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
OHVs off-highway vehicles
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
ROW rights-of-way
SO_x sulfur oxides
VOC volatile organic compound

Table 4-30. Cumulative Annual Emissions Associated with Alternative A

Project Scenario/Resource	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011												
CBNG Development/Production	48.77	21.91	70.68	15.18	6.82	21.99	60.25	27.07	87.32	0.47	0.21	0.67
Natural Gas Development/Production	91.56	41.13	132.69	35.24	15.83	51.07	432.54	194.33	626.87	5.90	2.65	8.55
Oil Development/Production	65.25	29.32	94.57	20.03	9.00	29.03	413.82	185.92	599.73	54.73	24.59	79.32
Locatable Minerals	150.89	123.45	274.34	20.94	17.13	38.08	16.64	13.61	30.25	1.92	1.57	3.50
Salable Minerals	294.92	241.30	536.21	37.74	30.88	68.62	13.17	10.78	23.95	0.26	0.22	0.48
Coal Mine	525.40	45.69	571.09	121.89	10.60	132.49	408.63	35.53	444.16	15.32	1.33	16.65
Resource Roads	1.36	7.16	8.52	0.15	0.78	0.93	0.08	0.41	0.49	0.00	0.00	0.00
ROW Corridors	19.56	102.69	122.25	4.48	23.51	27.99	12.01	63.07	75.08	1.57	8.23	9.80
Livestock/Grazing	11.40	59.87	71.27	1.74	9.12	10.85	0.62	3.27	3.89	0.02	0.08	0.09
Renewable Energy	88.54	464.86	553.40	13.37	70.17	83.54	1.72	9.03	10.76	0.06	0.32	0.39
Fire Management	24.76	129.98	154.74	0.78	4.08	4.86	0.68	3.56	4.24	0.04	0.19	0.23
Forest and Woodlands	22.33	117.22	139.55	3.39	17.80	21.19	0.25	1.31	1.56	0.02	0.12	0.14
Vegetation Management	1.15	6.01	7.16	0.17	0.91	1.08	0.02	0.08	0.10	0.00	0.01	0.01
OHVs	14.76	77.51	92.27	14.76	77.51	92.27	6.29	33.04	39.34	0.00	0.00	0.00
Project Year 2011 Total	**1,360.65**	**1,468.09**	**2,828.74**	**289.85**	**294.15**	**584.00**	**1,366.72**	**581.02**	**1,947.74**	**80.31**	**39.53**	**119.84**

Project Scenario/Resource	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011									
CBNG Development/Production	99.98	44.92	144.90	49.08	22.05	71.13	7.81	3.51	11.31
Natural Gas Development/Production	460.55	206.91	667.46	3,721.19	1,671.84	5,393.03	397.91	178.77	576.68
Oil Development/Production	104.12	46.78	150.90	13.55	6.09	19.64	1.36	0.61	1.96
Locatable Minerals	48.24	39.47	87.71	6.93	5.67	12.60	0.69	0.57	1.26
Salable Minerals	7.10	5.81	12.92	1.18	0.96	2.14	0.12	0.10	0.21
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 4-30. Cumulative Annual Emissions Associated with Alternative A

	Emissions (Tons per Year)								
	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011									
Resource Roads	0.02	0.09	0.10	0.01	0.03	0.04	0.00	0.00	0.00
ROW Corridors	20.49	107.58	128.07	4.97	26.11	31.08	0.50	2.61	3.11
Livestock/Grazing	0.34	1.79	2.13	0.07	0.36	0.43	0.01	0.04	0.04
Renewable Energy	1.18	6.20	7.38	0.24	1.27	1.51	0.02	0.13	0.15
Fire Management	1.58	8.28	9.85	0.61	3.19	3.80	0.06	0.32	0.38
Forest and Woodlands	1.28	6.70	7.97	0.42	2.20	2.61	0.04	0.22	0.26
Vegetation Management	0.05	0.27	0.32	0.01	0.04	0.04	0.00	0.00	0.00
OHVs	1,201.68	6,308.84	7,510.52	449.97	2,362.34	2,812.31	45.00	236.23	281.23
Project Year 2011 Total	**1,946.62**	**6,783.63**	**8,730.24**	**4,248.22**	**4,102.15**	**8,350.37**	**453.51**	**423.10**	**876.61**

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2020												
CBNG Development/Production	58.92	26.47	85.39	16.57	7.45	24.02	59.35	26.66	86.01	0.47	0.21	0.68
Natural Gas Development/Production	107.70	48.39	156.08	42.63	19.15	61.78	515.51	231.60	747.11	6.23	2.80	9.02
Oil Development/Production	69.42	31.19	100.61	20.62	9.26	29.88	414.89	186.40	601.29	54.86	24.65	79.51
Locatable Minerals	150.81	123.39	274.21	20.87	17.07	37.94	14.31	11.71	26.02	1.92	1.57	3.50
Salable Minerals	294.77	241.17	535.94	37.59	30.76	68.35	8.52	6.97	15.49	0.26	0.22	0.48
Coal Mine	601.69	52.32	654.01	139.59	12.14	151.73	467.97	40.69	508.66	17.55	1.53	19.07
Resource Roads	1.36	7.14	8.50	0.15	0.77	0.91	0.01	0.03	0.03	0.00	0.00	0.00
ROW Corridors	19.42	101.96	121.38	4.34	22.78	27.12	8.22	43.16	51.38	1.57	8.23	9.80
Livestock/Grazing	11.39	59.78	71.16	1.72	9.03	10.75	0.10	0.54	0.64	0.02	0.08	0.09
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	24.74	129.90	154.65	0.76	4.01	4.77	0.21	1.10	1.31	0.04	0.19	0.23
Forest and Woodlands	22.32	117.20	139.52	3.39	17.78	21.17	0.14	0.71	0.85	0.02	0.12	0.14

Table 4-30. Cumulative Annual Emissions Associated with Alternative A *(Continued)*

Project Scenario/Resource	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020												
Vegetation Management	1.14	6.01	7.16	0.17	0.91	1.08	0.01	0.05	0.06	0.00	0.01	0.01
OHVs	17.76	93.26	111.02	17.76	93.26	111.02	8.35	43.85	52.20	0.00	0.00	0.00
Project Year 2020 Total	**1,381.45**	**1,038.19**	**2,419.64**	**306.17**	**244.36**	**550.53**	**1,497.58**	**593.48**	**2,091.06**	**82.94**	**39.61**	**122.54**

Project Scenario/Resource	Emissions (Tons per Year)								
	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020									
CBNG Development/Production	99.90	44.88	144.78	48.97	22.00	70.97	7.79	3.50	11.29
Natural Gas Development/Production	590.55	265.32	855.87	4,295.78	1,929.99	6,225.76	460.74	207.00	667.74
Oil Development/Production	104.46	46.93	151.39	13.61	6.12	19.73	1.36	0.61	1.97
Locatable Minerals	47.73	39.05	86.78	6.84	5.60	12.44	0.68	0.56	1.24
Salable Minerals	6.08	4.97	11.05	1.01	0.82	1.83	0.10	0.08	0.18
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.00	0.00
ROW Corridors	19.68	103.31	122.99	4.85	25.47	30.32	0.49	2.55	3.03
Livestock/Grazing	0.21	1.09	1.29	0.06	0.30	0.35	0.01	0.03	0.04
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	1.33	6.97	8.29	0.43	2.26	2.69	0.04	0.23	0.27
Forest and Woodlands	1.06	5.56	6.61	0.21	1.13	1.34	0.02	0.11	0.13
Vegetation Management	0.05	0.27	0.32	0.01	0.03	0.04	0.00	0.00	0.00
OHVs	1,482.84	7,784.91	9,267.75	543.49	2,853.34	3,396.83	54.35	285.33	339.68
Project Year 2020 Total	**2,353.87**	**8,303.26**	**10,657.13**	**4,915.26**	**4,847.06**	**9,762.32**	**525.58**	**500.00**	**1,025.58**

BLM Bureau of Land Management
CBNG coalbed natural gas
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
OHV off-highway vehicles
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
ROW rights-of-way
SO_x sulfur oxides
VOC volatile organic compound

Table 4-31. Cumulative Annual Emissions Associated with Alternative B

Project Scenario/Resource	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011												
CBNG Development/Production	6.78	28.89	35.66	2.13	9.09	11.22	8.38	35.73	44.11	0.07	0.28	0.35
Natural Gas Development/Production	41.22	175.72	216.94	18.51	78.92	97.43	215.24	917.62	1,132.87	1.14	4.85	5.99
Oil Development/Production	40.42	172.32	212.74	6.62	28.22	34.84	43.43	185.13	228.55	5.65	24.10	29.75
Locatable Minerals	145.04	118.67	263.70	20.13	16.47	36.59	16.03	13.11	29.14	1.85	1.52	3.37
Salable Minerals	284.14	232.48	516.62	36.36	29.75	66.12	12.69	10.38	23.08	0.25	0.21	0.46
Coal Mine	525.40	45.69	571.09	121.89	10.60	132.49	408.63	35.53	444.16	15.32	1.33	16.65
Resource Roads	1.36	7.16	8.52	0.15	0.78	0.93	0.08	0.41	0.49	0.00	0.00	0.00
ROW Corridors	3.72	19.51	23.23	0.85	4.47	5.32	2.28	11.98	14.27	0.30	1.56	1.86
Livestock/Grazing	11.40	59.87	71.27	1.74	9.12	10.85	0.62	3.27	3.89	0.02	0.08	0.09
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	24.76	129.98	154.74	0.78	4.08	4.86	0.68	3.56	4.24	0.04	0.19	0.23
Forest and Woodlands	14.66	76.98	91.64	2.23	11.73	13.96	0.21	1.08	1.28	0.01	0.07	0.09
Vegetation Management	1.15	6.01	7.16	0.17	0.91	1.08	0.02	0.08	0.10	0.00	0.01	0.01
OHVs	14.76	77.51	92.27	14.76	77.51	92.27	6.29	33.04	39.34	0.00	0.00	0.00
Project Year 2011 Total	**1,114.81**	**1,150.78**	**2,265.58**	**226.33**	**281.64**	**507.97**	**714.58**	**1,250.94**	**1,965.51**	**24.65**	**34.21**	**58.87**

Project Scenario/Resource	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011									
CBNG Development/Production	13.79	58.79	72.58	6.76	28.83	35.59	1.08	4.58	5.66
Natural Gas Development/Production	309.98	1,321.49	1,631.47	589.57	2,513.42	3,102.99	68.13	290.44	358.56
Oil Development/Production	11.50	49.04	60.55	1.64	6.98	8.62	0.16	0.70	0.86
Locatable Minerals	46.48	38.03	84.50	6.68	5.46	12.14	0.67	0.55	1.21
Salable Minerals	6.84	5.60	12.44	1.14	0.93	2.06	0.11	0.09	0.21
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.02	0.09	0.10	0.01	0.03	0.04	0.00	0.00	0.00

Table 4-31. Cumulative Annual Emissions Associated with Alternative B (Continued)

Project Scenario/Resource	Emissions (Tons per Year)								
	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011									
ROW Corridors	3.89	20.44	24.33	0.94	4.96	5.91	0.09	0.50	0.59
Livestock/Grazing	0.34	1.79	2.13	0.07	0.36	0.43	0.01	0.04	0.04
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	1.58	8.28	9.85	0.61	3.19	3.80	0.06	0.32	0.38
Forest and Woodlands	1.18	6.19	7.36	0.39	2.06	2.45	0.04	0.21	0.24
Vegetation Management	0.05	0.27	0.32	0.01	0.04	0.04	0.00	0.00	0.00
OHVs	1,201.68	6,308.84	7,510.52	449.97	2,362.34	2,812.31	45.00	236.23	281.23
Project Year 2011 Total	**1,597.34**	**7,818.84**	**9,416.18**	**1,057.77**	**4,928.60**	**5,986.38**	**115.35**	**533.66**	**649.00**

Project Scenario/Resource	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020												
CBNG Development/Production	8.25	35.19	43.45	2.36	10.06	12.42	8.42	35.88	44.30	0.07	0.29	0.36
Natural Gas Development/Production	42.43	180.90	223.33	19.05	81.20	100.25	220.88	941.64	1,162.52	1.16	4.96	6.12
Oil Development/Production	40.77	173.79	214.56	6.67	28.43	35.10	43.51	185.51	229.03	5.66	24.15	29.81
Locatable Minerals	144.96	118.61	263.57	20.05	16.41	36.46	13.79	11.28	25.07	1.85	1.52	3.37
Salable Minerals	284.00	232.36	516.36	36.22	29.64	65.86	8.21	6.72	14.92	0.25	0.21	0.46
Coal Mine	601.69	52.32	654.01	139.59	12.14	151.73	467.97	40.69	508.66	17.55	1.53	19.07
Resource Roads	1.36	7.14	8.50	0.15	0.77	0.91	0.01	0.03	0.03	0.00	0.00	0.00
ROW Corridors	3.69	19.37	23.06	0.82	4.33	5.15	1.56	8.20	9.76	0.30	1.56	1.86
Livestock/Grazing	11.39	59.78	71.16	1.72	9.03	10.75	0.10	0.54	0.64	0.02	0.08	0.09
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	24.74	129.90	154.65	0.76	4.01	4.77	0.21	1.10	1.31	0.04	0.19	0.23
Forest and Woodlands	14.66	76.96	91.62	2.23	11.70	13.93	0.09	0.47	0.57	0.01	0.07	0.09
Vegetation Management	1.14	6.01	7.16	0.17	0.91	1.08	0.01	0.05	0.06	0.00	0.01	0.01
OHVs	17.76	93.26	111.02	17.76	93.26	111.02	8.35	43.85	52.20	0.00	0.00	0.00
Project Year 2020 Total	**1,196.86**	**1,185.60**	**2,382.45**	**247.56**	**301.88**	**549.44**	**773.10**	**1,275.96**	**2,049.06**	**26.91**	**34.56**	**61.48**

Table 4-31. Cumulative Annual Emissions Associated with Alternative B *(Continued)*

Project Scenario/Resource	Emissions (Tons per Year)								
	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020									
CBNG Development/Production	14.10	60.13	74.23	6.91	29.45	36.36	1.10	4.68	5.78
Natural Gas Development/Production	319.88	1,363.69	1,683.56	546.42	2,329.48	2,875.90	63.83	272.11	335.94
Oil Development/Production	11.53	49.16	60.70	1.64	7.00	8.64	0.16	0.70	0.86
Locatable Minerals	45.98	37.62	83.60	6.59	5.39	11.99	0.66	0.54	1.20
Salable Minerals	5.85	4.79	10.64	0.97	0.79	1.76	0.10	0.08	0.18
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.00	0.00
ROW Corridors	3.74	19.63	23.37	0.92	4.84	5.76	0.09	0.48	0.58
Livestock/Grazing	0.21	1.09	1.29	0.06	0.30	0.35	0.01	0.03	0.04
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	1.33	6.97	8.29	0.43	2.26	2.69	0.04	0.23	0.27
Forest and Woodlands	0.96	5.05	6.01	0.19	0.99	1.17	0.02	0.10	0.12
Vegetation Management	0.05	0.27	0.32	0.01	0.03	0.04	0.00	0.00	0.00
OHVs	1,482.84	7,784.91	9,267.75	543.49	2,853.34	3,396.83	54.35	285.33	339.68
Project Year 2020 Total	**1,886.48**	**9,333.30**	**11,219.78**	**1,107.63**	**5,233.89**	**6,341.52**	**120.36**	**564.29**	**684.65**

BLM Bureau of Land Management
CBNG coalbed natural gas
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
OHV off-highway vehicles
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
ROW rights-of-way
SO_x sulfur oxides
VOC volatile organic compound

Table 4-32. Cumulative Annual Emissions Associated with Alternative C

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011												
CBNG Development/Production	44.80	22.07	66.87	13.93	6.86	20.79	55.30	27.24	82.53	0.43	0.21	0.64
Natural Gas Development/Production	86.47	42.59	129.06	33.56	16.53	50.08	410.66	202.26	612.92	5.41	2.67	8.08
Oil Development/Production	62.74	30.90	93.64	18.65	9.19	27.84	375.75	185.07	560.82	49.69	24.47	74.16
Locatable Minerals	180.66	147.81	328.47	25.04	20.49	45.54	20.21	16.53	36.74	2.34	1.91	4.25
Salable Minerals	357.87	292.80	650.67	45.79	37.47	83.26	16.00	13.09	29.09	0.32	0.26	0.58
Coal Mine	525.40	45.69	571.09	121.89	10.60	132.49	408.63	35.53	444.16	15.32	1.33	16.65
Resource Roads	0.95	4.97	5.92	0.10	0.54	0.65	0.05	0.29	0.34	0.00	0.00	0.00
ROW Corridors	17.99	94.47	112.47	4.12	21.63	25.75	11.05	58.02	69.08	1.44	7.57	9.02
Livestock/Grazing	11.40	59.87	71.27	1.74	9.12	10.85	0.62	3.27	3.89	0.02	0.08	0.09
Renewable Energy	88.54	464.86	553.40	13.37	70.17	83.54	1.72	9.03	10.76	0.06	0.32	0.39
Fire Management	24.76	129.98	154.74	0.78	4.08	4.86	0.68	3.56	4.24	0.04	0.19	0.23
Forest and Woodlands	39.31	206.35	245.66	5.95	31.23	37.18	0.32	1.68	2.00	0.04	0.19	0.23
Vegetation Management	1.15	6.01	7.16	0.17	0.91	1.08	0.02	0.08	0.10	0.00	0.01	0.01
OHVs	14.76	77.51	92.27	14.76	77.51	92.27	6.29	33.04	39.34	0.00	0.00	0.00
Project Year 2011 Total	**1,456.79**	**1,625.87**	**3,082.67**	**299.86**	**316.33**	**616.19**	**1,307.30**	**588.70**	**1,896.00**	**75.10**	**39.23**	**114.33**

	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011									
CBNG Development/Production	91.63	45.13	136.76	44.97	22.15	67.12	7.15	3.52	10.67
Natural Gas Development/Production	445.62	219.48	665.11	3,447.82	1,698.18	5,146.01	369.10	181.80	550.90
Oil Development/Production	94.60	46.60	141.20	12.33	6.07	18.40	1.23	0.61	1.84
Locatable Minerals	58.59	47.94	106.52	8.41	6.88	15.30	0.84	0.69	1.53
Salable Minerals	8.63	7.06	15.69	1.43	1.17	2.60	0.14	0.12	0.26
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 4-32. Cumulative Annual Emissions Associated with Alternative C (Continued)

Project Scenario/Resource	Emissions (Tons per Year)								
	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011									
Resource Roads	0.01	0.06	0.07	0.00	0.02	0.03	0.00	0.00	0.00
ROW Corridors	18.85	98.97	117.82	4.58	24.02	28.59	0.46	2.40	2.86
Livestock/Grazing	0.34	1.79	2.13	0.07	0.36	0.43	0.01	0.04	0.04
Renewable Energy	1.18	6.20	7.38	0.24	1.27	1.51	0.02	0.13	0.15
Fire Management	1.58	8.28	9.85	0.61	3.19	3.80	0.06	0.32	0.38
Forest and Woodlands	1.44	7.57	9.02	0.46	2.41	2.87	0.05	0.24	0.29
Vegetation Management	0.05	0.27	0.32	0.01	0.04	0.04	0.00	0.00	0.00
OHVs	1,201.68	6,308.84	7,510.52	449.97	2,362.34	2,812.31	45.00	236.23	281.23
Project Year 2011 Total	**1,924.20**	**6,798.18**	**8,722.39**	**3,970.90**	**4,128.11**	**8,099.02**	**424.07**	**426.10**	**850.16**

Project Scenario/Resource	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020												
CBNG Development/Production	54.28	26.73	81.01	15.29	7.53	22.82	54.83	27.01	81.84	0.43	0.21	0.65
Natural Gas Development/Production	101.07	49.78	150.86	40.24	19.82	60.06	485.67	239.21	724.88	5.71	2.81	8.52
Oil Development/Production	66.50	32.75	99.25	19.19	9.45	28.64	376.72	185.55	562.27	49.80	24.53	74.34
Locatable Minerals	180.57	147.74	328.31	24.95	20.42	45.37	17.38	14.22	31.60	2.34	1.91	4.25
Salable Minerals	357.69	292.65	650.34	45.61	37.32	82.93	10.35	8.47	18.81	0.32	0.26	0.58
Coal Mine	601.69	52.32	654.01	139.59	12.14	151.73	467.97	40.69	508.66	17.55	1.53	19.07
Resource Roads	0.94	4.96	5.90	0.10	0.53	0.63	0.00	0.02	0.02	0.00	0.00	0.00
ROW Corridors	17.87	93.80	111.67	3.99	20.96	24.95	7.56	39.71	47.27	1.44	7.57	9.02
Livestock/Grazing	11.39	59.78	71.16	1.72	9.03	10.75	0.10	0.54	0.64	0.02	0.08	0.09
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	24.74	129.90	154.65	0.76	4.01	4.77	0.21	1.10	1.31	0.04	0.19	0.23

Table 4-32. Cumulative Annual Emissions Associated with Alternative C (Continued)

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2020												
Forest and Woodlands	39.30	206.33	245.63	5.95	31.21	37.16	0.20	1.08	1.28	0.04	0.19	0.23
Vegetation Management	1.14	6.01	7.16	0.17	0.91	1.08	0.01	0.05	0.06	0.00	0.01	0.01
OHVs	17.76	93.26	111.02	17.76	93.26	111.02	8.35	43.85	52.20	0.00	0.00	0.00
Project Year 2020 Total	**1,474.95**	**1,196.03**	**2,670.97**	**315.34**	**266.58**	**581.92**	**1,429.36**	**601.48**	**2,030.84**	**77.68**	**39.30**	**116.98**

	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2020									
CBNG Development/Production	92.27	45.45	137.72	45.23	22.28	67.51	7.19	3.54	10.73
Natural Gas Development/Production	563.27	277.43	840.70	3,941.88	1,941.52	5,883.40	423.25	208.47	631.72
Oil Development/Production	94.91	46.75	141.66	12.38	6.10	18.48	1.24	0.61	1.85
Locatable Minerals	57.96	47.43	105.39	8.31	6.80	15.11	0.83	0.68	1.51
Salable Minerals	7.38	6.04	13.42	1.22	1.00	2.22	0.12	0.10	0.22
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00
ROW Corridors	18.10	95.05	113.15	4.46	23.43	27.90	0.45	2.34	2.79
Livestock/Grazing	0.21	1.09	1.29	0.06	0.30	0.35	0.01	0.03	0.04
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	1.33	6.97	8.29	0.43	2.26	2.69	0.04	0.23	0.27
Forest and Woodlands	1.23	6.43	7.66	0.26	1.35	1.60	0.03	0.13	0.16
Vegetation Management	0.05	0.27	0.32	0.01	0.03	0.04	0.00	0.00	0.00
OHVs	1,482.84	7,784.91	9,267.75	543.49	2,853.34	3,396.83	54.35	285.33	339.68
Project Year 2020 Total	**2,319.55**	**8,317.80**	**10,637.35**	**4,557.73**	**4,858.41**	**9,416.14**	**487.51**	**501.47**	**988.98**

BLM Bureau of Land Management
CBNG coalbed natural gas
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
OHV off-highway vehicles
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
ROW rights-of-way
SO_x sulfur oxides
VOC volatile organic compound

Table 4-33. Cumulative Annual Emissions Associated with Alternative D

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011												
CBNG Development/Production	48.84	21.94	70.78	15.19	6.82	22.01	60.28	27.08	87.36	0.47	0.21	0.68
Natural Gas Development/Production	90.56	40.69	131.24	34.91	15.68	50.59	428.25	192.40	620.65	5.80	2.61	8.41
Oil Development/Production	64.76	29.09	93.85	19.76	8.88	28.63	406.32	182.55	588.87	53.74	24.14	77.88
Locatable Minerals	252.87	206.89	459.76	35.06	28.69	63.75	28.21	23.08	51.28	3.26	2.67	5.93
Salable Minerals	499.90	409.01	908.91	63.98	52.34	116.32	22.33	18.27	40.61	0.45	0.37	0.81
Coal Mine	525.40	45.69	571.09	121.89	10.60	132.49	408.63	35.53	444.16	15.32	1.33	16.65
Resource Roads	1.36	7.16	8.52	0.15	0.78	0.93	0.08	0.41	0.49	0.00	0.00	0.00
ROW Corridors	19.76	103.72	123.47	4.52	23.74	28.27	12.13	63.70	75.83	1.58	8.32	9.90
Livestock/Grazing	11.40	59.87	71.27	1.74	9.12	10.85	0.62	3.27	3.89	0.02	0.08	0.09
Renewable Energy	88.54	464.86	553.40	13.37	70.17	83.54	1.72	9.03	10.76	0.06	0.32	0.39
Fire Management	24.76	129.98	154.74	0.78	4.08	4.86	0.68	3.56	4.24	0.04	0.19	0.23
Forest and Woodlands	53.33	279.97	333.30	8.06	42.33	50.39	0.38	2.00	2.38	0.05	0.26	0.31
Vegetation Management	1.15	6.01	7.16	0.17	0.91	1.08	0.02	0.08	0.10	0.00	0.01	0.01
OHVs	14.76	77.51	92.27	14.76	77.51	92.27	6.29	33.04	39.34	0.00	0.00	0.00
Project Year 2011 Total	**1,697.38**	**1,882.38**	**3,579.76**	**334.33**	**351.66**	**685.99**	**1,375.94**	**594.02**	**1,969.95**	**80.79**	**40.50**	**121.29**

	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011									
CBNG Development/Production	99.99	44.92	144.91	49.08	22.05	71.14	7.81	3.51	11.31
Natural Gas Development/Production	457.67	205.62	663.28	3,666.07	1,647.07	5,313.14	392.10	176.16	568.26
Oil Development/Production	102.25	45.94	148.18	13.31	5.98	19.29	1.33	0.60	1.93
Locatable Minerals	81.79	66.92	148.70	11.75	9.61	21.36	1.17	0.96	2.14
Salable Minerals	12.04	9.85	21.90	2.00	1.63	3.63	0.20	0.16	0.36
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.02	0.09	0.10	0.01	0.03	0.04	0.00	0.00	0.00

Table 4-33. Cumulative Annual Emissions Associated with Alternative D (Continued)

	Emissions (Tons per Year)								
	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011									
ROW Corridors	20.70	108.65	129.35	5.02	26.37	31.39	0.50	2.64	3.14
Livestock/Grazing	0.34	1.79	2.13	0.07	0.36	0.43	0.01	0.04	0.04
Renewable Energy	1.18	6.20	7.38	0.24	1.27	1.51	0.02	0.13	0.15
Fire Management	1.58	8.28	9.85	0.61	3.19	3.80	0.06	0.32	0.38
Forest and Woodlands	1.60	8.39	9.98	0.50	2.61	3.10	0.05	0.26	0.31
Vegetation Management	0.05	0.27	0.32	0.01	0.04	0.04	0.00	0.00	0.00
OHVs	1,201.68	6,308.84	7,510.52	449.97	2,362.34	2,812.31	45.00	236.23	281.23
Project Year 2011 Total	**1,980.88**	**6,815.75**	**8,796.62**	**4,198.63**	**4,082.56**	**8,281.18**	**448.25**	**421.01**	**869.27**

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2020												
CBNG Development/Production	59.01	26.51	85.53	16.59	7.45	24.04	59.37	26.67	86.05	0.47	0.21	0.68
Natural Gas Development/Production	106.39	47.80	154.19	42.16	18.94	61.10	509.64	228.97	738.60	6.12	2.75	8.87
Oil Development/Production	68.85	30.93	99.78	20.34	9.14	29.47	407.38	183.03	590.41	53.87	24.20	78.07
Locatable Minerals	252.74	206.79	459.53	34.94	28.58	63.52	24.26	19.85	44.11	3.26	2.67	5.93
Salable Minerals	499.65	408.80	908.45	63.72	52.14	115.86	14.44	11.82	26.26	0.45	0.37	0.81
Coal Mine	601.69	52.32	654.01	139.59	12.14	151.73	467.97	40.69	508.66	17.55	1.53	19.07
Resource Roads	1.36	7.14	8.50	0.15	0.77	0.91	0.01	0.03	0.03	0.00	0.00	0.00
ROW Corridors	19.62	102.98	122.60	4.38	23.01	27.39	8.30	43.59	51.89	1.58	8.32	9.90
Livestock/Grazing	11.39	59.78	71.16	1.72	9.03	10.75	0.10	0.54	0.64	0.02	0.08	0.09
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	24.74	129.90	154.65	0.76	4.01	4.77	0.21	1.10	1.31	0.04	0.19	0.23
Forest and Woodlands	53.32	279.95	333.27	8.06	42.31	50.37	0.27	1.40	1.66	0.05	0.26	0.31
Vegetation Management	1.14	6.01	7.16	0.17	0.91	1.08	0.01	0.05	0.06	0.00	0.01	0.01
OHVs	17.76	93.26	111.02	17.76	93.26	111.02	8.35	43.85	52.20	0.00	0.00	0.00
Project Year 2020 Total	**1,717.67**	**1,452.18**	**3,169.85**	**350.34**	**301.67**	**652.02**	**1,500.31**	**601.58**	**2,101.89**	**83.40**	**40.58**	**123.97**

Table 4-33. Cumulative Annual Emissions Associated with Alternative D *(Continued)*

Project Scenario/Resource	Emissions (Tons per Year)								
	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020									
CBNG Development/Production	99.90	44.88	144.79	48.97	22.00	70.97	7.79	3.50	11.29
Natural Gas Development/Production	585.21	262.92	848.13	4,241.67	1,905.68	6,147.35	454.99	204.42	659.40
Oil Development/Production	102.58	46.09	148.67	13.37	6.01	19.38	1.34	0.60	1.94
Locatable Minerals	80.92	66.20	147.12	11.60	9.49	21.09	1.16	0.95	2.11
Salable Minerals	10.30	8.43	18.73	1.71	1.40	3.10	0.17	0.14	0.31
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.00	0.00
ROW Corridors	19.88	104.34	124.22	4.90	25.72	30.62	0.49	2.57	3.06
Livestock/Grazing	0.21	1.09	1.29	0.06	0.30	0.35	0.01	0.03	0.04
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	1.33	6.97	8.29	0.43	2.26	2.69	0.04	0.23	0.27
Forest and Woodlands	1.38	7.24	8.62	0.29	1.54	1.83	0.03	0.15	0.18
Vegetation Management	0.05	0.27	0.32	0.01	0.03	0.04	0.00	0.00	0.00
OHVs	1,482.84	7,784.91	9,267.75	543.49	2,853.34	3,396.83	54.35	285.33	339.68
Project Year 2020 Total	**2,384.59**	**8,333.35**	**10,717.94**	**4,866.50**	**4,827.78**	**9,694.28**	**520.36**	**497.92**	**1,018.29**

BLM Bureau of Land Management
CBNG coalbed natural gas
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
OHVs off-highway vehicles
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
ROW rights-of-way
SO_x sulfur oxides
VOC volatile organic compound

Table 4-34. Cumulative Annual Emissions Associated with Alternative E (Proposed Casper RMP)

	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011												
CBNG Development/Production	48.91	21.97	70.89	15.20	6.83	22.03	60.30	27.09	87.39	0.47	0.21	0.68
Natural Gas Development/Production	91.06	40.91	131.97	35.07	15.76	50.83	430.41	193.37	623.78	5.85	2.63	8.48
Oil Development/Production	65.03	29.21	94.24	19.90	8.94	28.85	410.40	184.38	594.78	54.28	24.39	78.66
Locatable Minerals	185.74	151.97	337.71	25.74	21.06	46.81	20.81	17.03	37.84	2.41	1.97	4.37
Salable Minerals	368.65	301.63	670.28	47.17	38.60	85.77	16.48	13.48	29.96	0.33	0.27	0.60
Coal Mine	525.40	45.69	571.09	121.89	10.60	132.49	408.63	35.53	444.16	15.32	1.33	16.65
Resource Roads	1.36	7.16	8.52	0.15	0.78	0.93	0.08	0.41	0.49	0.00	0.00	0.00
ROW Corridors	19.56	102.69	122.25	4.48	23.51	27.99	12.01	63.07	75.08	1.57	8.23	9.80
Livestock/Grazing	11.40	59.87	71.27	1.74	9.12	10.85	0.62	3.27	3.89	0.02	0.08	0.09
Renewable Energy	88.54	464.86	553.40	13.37	70.17	83.54	1.72	9.03	10.76	0.06	0.32	0.39
Fire Management	24.76	129.98	154.74	0.78	4.08	4.86	0.68	3.56	4.24	0.04	0.19	0.23
Forest and Woodlands	39.31	206.35	245.66	5.95	31.23	37.18	0.32	1.68	2.00	0.04	0.19	0.23
Vegetation Management	1.15	6.01	7.16	0.17	0.91	1.08	0.02	0.08	0.10	0.00	0.01	0.01
OHVs	14.76	77.51	92.27	14.76	77.51	92.27	6.29	33.04	39.34	0.00	0.00	0.00
Project Year 2011 Total	**1,485.63**	**1,645.80**	**3,131.44**	**306.38**	**319.10**	**625.49**	**1,368.78**	**585.04**	**1,953.82**	**80.38**	**39.83**	**120.20**

	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2011									
CBNG Development/Production	99.99	44.93	144.92	49.09	22.05	71.14	7.81	3.51	11.31
Natural Gas Development/Production	459.15	206.28	665.43	3,720.47	1,671.52	5,391.99	397.81	178.73	576.53
Oil Development/Production	103.27	46.40	149.66	13.44	6.04	19.48	1.34	0.60	1.95
Locatable Minerals	60.35	49.38	109.73	8.67	7.09	15.76	0.87	0.71	1.58
Salable Minerals	8.89	7.27	16.16	1.47	1.21	2.68	0.15	0.12	0.27
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.02	0.09	0.10	0.01	0.03	0.04	0.00	0.00	0.00

Table 4-34. Cumulative Annual Emissions Associated with Alternative E (Proposed Casper RMP) *(Continued)*

Project Scenario/Resource	Emissions (Tons per Year)								
	CO			VOC			HAP		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2011									
ROW Corridors	20.49	107.58	128.07	4.97	26.11	31.08	0.50	2.61	3.11
Livestock/Grazing	0.34	1.79	2.13	0.07	0.36	0.43	0.01	0.04	0.04
Renewable Energy	1.18	6.20	7.38	0.24	1.27	1.51	0.02	0.13	0.15
Fire Management	1.58	8.28	9.85	0.61	3.19	3.80	0.06	0.32	0.38
Forest and Woodlands	1.44	7.57	9.02	0.46	2.41	2.87	0.05	0.24	0.29
Vegetation Management	0.05	0.27	0.32	0.01	0.04	0.04	0.00	0.00	0.00
OHVs	1,201.68	6,308.84	7,510.52	449.97	2,362.34	2,812.31	45.00	236.23	281.23
Project Year 2011 Total	**1,958.43**	**6,794.87**	**8,753.30**	**4,249.48**	**4,103.66**	**8,353.14**	**453.61**	**423.24**	**876.85**

Project Scenario/Resource	Emissions (Tons per Year)											
	PM_{10}			$PM_{2.5}$			NO_x			SO_x		
	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative	BLM	Non-BLM	Cumulative
Project Year 2020												
CBNG Development/Production	59.12	26.56	85.67	16.61	7.46	24.07	59.42	26.70	86.12	0.47	0.21	0.68
Natural Gas Development/Production	107.05	48.09	155.14	42.40	19.05	61.44	512.58	230.29	742.87	6.17	2.77	8.95
Oil Development/Production	69.16	31.07	100.23	20.49	9.21	29.70	411.47	184.86	596.33	54.41	24.44	78.85
Locatable Minerals	185.65	151.89	337.54	25.65	20.99	46.64	17.90	14.65	32.55	2.41	1.97	4.37
Salable Minerals	368.47	301.47	669.94	46.99	38.44	85.43	10.66	8.72	19.38	0.33	0.27	0.60
Coal Mine	601.69	52.32	654.01	139.59	12.14	151.73	467.97	40.69	508.66	17.55	1.53	19.07
Resource Roads	1.36	7.14	8.50	0.15	0.77	0.91	0.01	0.03	0.03	0.00	0.00	0.00
ROW Corridors	19.42	101.96	121.38	4.34	22.78	27.12	8.22	43.16	51.38	1.57	8.23	9.80
Livestock/Grazing	11.39	59.78	71.16	1.72	9.03	10.75	0.10	0.54	0.64	0.02	0.08	0.09
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	24.74	129.90	154.65	0.76	4.01	4.77	0.21	1.10	1.31	0.04	0.19	0.23
Forest and Woodlands	39.30	206.33	245.63	5.95	31.21	37.16	0.20	1.08	1.28	0.04	0.19	0.23
Vegetation Management	1.14	6.01	7.16	0.17	0.91	1.08	0.01	0.05	0.06	0.00	0.01	0.01
OHVs	17.76	93.26	111.02	17.76	93.26	111.02	8.35	43.85	52.20	0.00	0.00	0.00
Project Year 2020 Total	**1,506.25**	**1,215.79**	**2,722.04**	**322.57**	**269.24**	**591.82**	**1,497.10**	**595.71**	**2,092.81**	**82.99**	**39.90**	**122.90**

Table 4-34. Cumulative Annual Emissions Associated with Alternative E (Proposed Casper RMP) *(Continued)*

	Emissions (Tons per Year)								
	CO			VOC			HAP		
Project Scenario/Resource	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**	**BLM**	**Non-BLM**	**Cumulative**
Project Year 2020									
CBNG Development/Production	99.96	44.91	144.87	49.00	22.01	71.01	7.79	3.50	11.29
Natural Gas Development/Production	587.92	264.14	852.05	4,261.08	1,914.40	6,175.47	457.06	205.35	662.41
Oil Development/Production	103.60	46.55	150.15	13.50	6.07	19.57	1.35	0.61	1.96
Locatable Minerals	59.71	48.85	108.57	8.56	7.00	15.56	0.86	0.70	1.56
Salable Minerals	7.60	6.22	13.82	1.26	1.03	2.29	0.13	0.10	0.23
Coal Mine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Resource Roads	0.00	0.01	0.01	0.00	0.01	0.02	0.00	0.00	0.00
ROW Corridors	19.68	103.31	122.99	4.85	25.47	30.32	0.49	2.55	3.03
Livestock/Grazing	0.21	1.09	1.29	0.06	0.30	0.35	0.01	0.03	0.04
Renewable Energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fire Management	1.33	6.97	8.29	0.43	2.26	2.69	0.04	0.23	0.27
Forest and Woodlands	1.23	6.43	7.66	0.26	1.35	1.60	0.03	0.13	0.16
Vegetation Management	0.05	0.27	0.32	0.01	0.03	0.04	0.00	0.00	0.00
OHVs	1,482.84	7,784.91	9,267.75	543.49	2,853.34	3,396.83	54.35	285.33	339.68
Project Year 2020 Total	**2,364.12**	**8,313.65**	**10,677.77**	**4,882.49**	**4,833.26**	**9,715.75**	**522.10**	**498.53**	**1,020.63**

BLM Bureau of Land Management
CBNG coalbed natural gas
CO carbon monoxide
HAP hazardous air pollutant
NO_x nitrogen oxides
OHVs off-highway vehicles
PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
ROW rights-of-way
SO_x sulfur oxides
VOC volatile organic compound