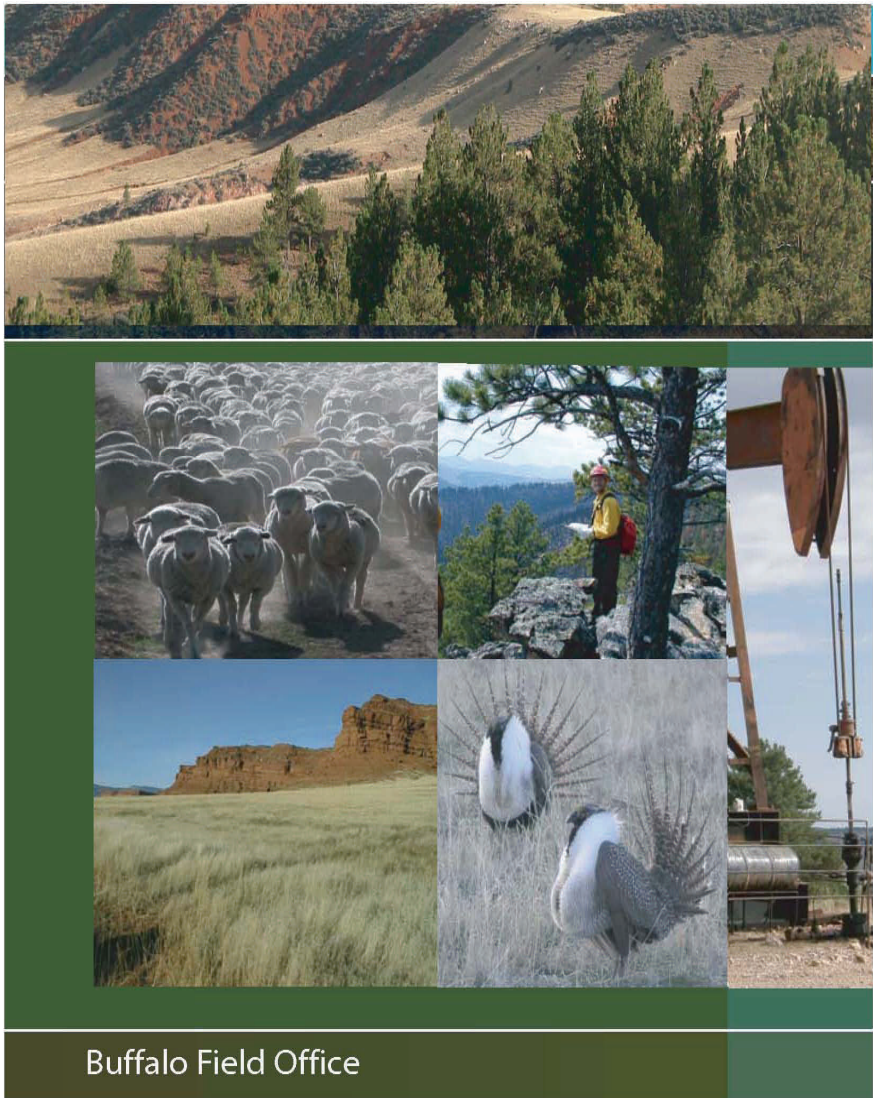
BLM

Draft Resource Management Plan and Environmental Impact Statement for the Buffalo Field Office Planning Area



Volume 2 of 3

Chapter 4

June 2013

Buffalo Field Office

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

BLM/WY/PL-13/020+1610

Volume 2 of 3

Draft Resource Management Plan and Environmental Impact Statement

for the

Buffalo Field Office Planning Area

Volume 2 of 3

Chapter 4

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

June 2013

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Chapter 4. Environmental Consequences

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Introduction

This chapter describes potential effects on the existing natural and social environmental conditions in the Bureau of Land Management (BLM) Buffalo, Wyoming, planning area (see Chapter 3) under the alternatives described in Chapter 2. BLM planning regulations and Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) implementing regulations at 40 Code of Federal Regulations (CFR) 1500–1508 require an analysis of these effects. This chapter describes potential effects under each alternative using the same order for resource topics as Chapters 2 and 3. Identical organization for the chapters allows readers to compare management actions (Chapter 2), existing environmental conditions (Chapter 3), and potential effects (Chapter 4) for the same resources.

The analysis of environmental consequences focuses on key planning issues (see Chapter 1) raised during the scoping process.

This chapter has 10 main sections:

- Physical Resources
- Mineral Resources
- Fire and Fuels Management
- Biological Resources
- Heritage and Visual Resources
- Land Resources
- Special Designations
- Socioeconomic Resources
- Irreversible or Irretrievable Commitment of Resources
- Unavoidable Adverse Impacts

The individual resource sections provide detailed analyses of effects under each alternative. The presentation order of these sections does not reflect their level of importance.

The subsection under each resource heading entitled Impacts Common to All Alternatives describes potential effects from management actions common to all alternatives. Effects included in this section are not repeated for individual alternatives. When effects would vary by alternative, they are addressed by alternative, and only potential effects under that alternative are described. If there would be no effects on given resource, that is stated within *Impacts Common to All Alternatives* section and there are no additional headings or discussion for that subject. Where potential effects from more than one management program would be very similar, they might be grouped under a single subheading (e.g., air quality and soil and water resources in the physical resources section).

During the effects analyses, each resource specialist considered management actions for other resources and programs areas. If no potential effects were identified by the resource specialist or by the public during scoping, the resources and programs are not further addressed. When management of a resource or program could affect the subject resource, those potential effects are described in detail.

Under all alternatives, the BLM would continue to comply with standard operating procedures resulting from federal laws, regulations, and policies. These standard operating procedures constitute day-to-day implementation of policy and management, and could result in certain projects being redesigned or eliminated from consideration, or could require mitigation measures

for potential adverse effects. Associated limitations or complications (e.g., increased processing times or costs) are not considered effects and are not further addressed in this chapter.

Sections at the end of this chapter describe irreversible or irretrievable commitments of resources and unavoidable adverse impacts.

Methods and Assumptions

This section describes methods and assumptions employed during the analyses, defines the types of effects projected throughout the impact sections, defines significance, categorizes effect levels, discusses the availability of data, and identifies several themes that relate to multiple resource classes.

Impact analyses and conclusions are based on interdisciplinary team knowledge of the resources and the planning area, information provided by BLM experts or experts from other agencies, and information in pertinent existing literature. Spatial analysis was performed using the Environmental Systems Research Institute, Inc. (ESRI) ArcGIS Desktop 10.0 computer software. The baseline used to determine potential effects is existing conditions as described in Chapter 3, Affected Environment. Analysis assumptions were developed to help guide the determination of effects. The Resource Management Plan and Environmental Impact Statement (RMP and EIS) provides a broad management framework; the analyses described in this chapter represent the best estimates of effects because exact locations of development or management often are not known. Effects are quantified to the extent practical based on available data. In the absence of quantitative data, best professional judgment was the basis for the analysis. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate.

Analysis Assumptions

Several assumptions were made to facilitate the analysis of potential effects. These assumptions set guidelines and provide reasonably foreseeable projected levels of development in the planning area during the planning period. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed under each alternative and described in Chapter 2. If there were no assumptions for a particular resource or program, the heading is not included in the resource section.

General Assumptions

- Key planning issues identified in Chapter 1 provide the focus for the scope of effects analyses in this chapter.
- Existing state and federal environmental legislation and regulatory programs would remain relatively unchanged and in effect (i.e., analyses are based on current, rather than projected future regulations).
- To the extent possible and within legal and regulatory parameters, BLM management and planning decisions will be consistent with the planning and management decisions of other agencies, state and local governments, and Native American tribes with jurisdictions intermingled with the Buffalo planning area.
- The life of the RMP (planning period) is 20 years.
- Reasonably foreseeable action or activity (RFA) scenarios for all land and resource uses (including minerals) have been developed and presented based on historical, existing, and projected activity levels for all programs.

- The alternative ultimately implemented will comply with standard practices, best management practices (BMPs), guidelines for surface-disturbing activities, and mitigation guidelines (see Appendix J (p. 1743) and Appendix D (p. 1603)). In other words, the practices and guidelines included identified in Appendix J (p. 1743) and Appendix D (p. 1603) are considered a component of each alternative. Appendix J (p. 1743) lists standard practices used in the planning area to mitigate the adverse effects of surface-disturbing activities (the Wyoming BLM mitigation guidelines for surface-disturbing and disruptive activities).
- The analysis of effects focuses on the anticipated effects of management actions and allowable uses proposed under each alternative. The effects of past and present actions are encompassed in the description of existing conditions (Chapter 3, Affected Environment).
- Discussions of effects are based on best available data. Knowledge of the planning area and professional judgment, based on observations and analyses of conditions and responses in similar areas, are used to infer environmental effects when data are limited.
- Acreage figures and other numbers used in the analyses are approximate projections for comparison and analytical purposes only. Readers should not assume numbers reflect exact measurements or precise calculations.
- Climate change is occurring and could affect surface resources in the planning area.
- The exact locations of future surface-disturbing activities cannot be predicted at the RMP level. For analysis purposes, surface-disturbing activities are assumed to occur in vegetation types in proportion to their availability in the planning area. Affected acreages for vegetation types are not absolute, but provide a basis for relative comparison among alternatives.
- Measures to mitigate adverse effects will be applied as described in Chapter 2 and applicable appendices.
- Sufficient funding and personnel would be available to implement the alternatives described in Chapter 2.
- Appropriate maintenance would be performed to maintain the functional capability of all developments.
- Monitoring will be completed as indicated, along with any needed adjustments or revisions.
- The comparison of effects among resources is intended to provide an impartial assessment to inform the decision maker and the public.

Types of Effects

The analyses consider direct, indirect, and cumulative effects, consistent with direction at 40 CFR1502.16.

- *Direct effects* are caused by an action or by implementation of an alternative and occur at the same time and place as that action or implementation. For example, for the action of building a road, a direct adverse effect is surface disturbance. Surface disturbance is the effect of heavy equipment (the cause) removing existing vegetation, wildlife habitat, and topsoil as it grades the road location.
- *Indirect effects* also result from an action or implementation of an alternative, but usually occur later in time or removed in distance from the action or implementation. For the action of building a road, an indirect effect 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. This effect on stream-water quality would be considered indirect.
- *Cumulative effects* result from individually minor but collectively significant actions over time. A cumulative effect is the effect on the environment that results from the incremental

effect of the federal action when added to other past, present, and reasonably foreseeable future actions, federal and non-federal.

Actions anticipated during the planning period on all lands in the planning area, including private, State of Wyoming, and federal (U.S. Department of Defense and U.S. Department of Agriculture [USDA] Forest Service [USFS]) lands, have been considered in the analyses to the extent reasonable and practicable. Many public and private entities could make decisions about other actions in the planning area, although the locations, timing, and magnitude of these actions cannot be accurately predicted. Assumptions about actions outside of BLM jurisdiction considered in the cumulative effects analyses include:

- Mineral exploration and development will continue on state and private lands.
- Mineral exploration and development will remain minimal in the Bighorn National Forest.
- Use of communications sites will increase.

Irreversible commitments of resources result from actions that permanently change resources. Irretrievable commitments of resources result from actions that cause the permanent loss of resources. Residual effects are those that remain following the implementation of mitigation measures, and include effects for which there are no mitigation measures. Short-term uses versus long-term productivity refers to the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity of environmental resources.

Determination of Significance

Any type (e.g., direct, indirect, or cumulative) or combination of effects can be determined "significant." A determination of significant requires consideration of the context and intensity of the effect. This means that an action must be analyzed in several contexts—such as the immediate vicinity, affected interests, and locality. Both short-term and long-term effects are relevant. Intensity refers to the severity of the effect. This environmental analysis uses the terms "negligible," "minor," "moderate," and "major" to describe the significance of effects.

Determining significance is a complex process. The significance of an effect is dynamic and therefore could change during the planning period. Significance can be "actual" and supportable by fact, or "perceived" and perhaps not fully supportable even with rigorous study. For this environmental analysis, the approach to establishing significance was based on, but not limited to, legal requirements, public perception, monitoring data, and professional judgment.

Specific significance criteria are presented for each resource topic. The criteria provide thresholds beyond which effects would be considered significant. The discussion of each resource ends with a summary regarding the significance of effects.

Scale of Impacts

The following terms are used to define the extent of environmental consequences:

- Negligible – The effect on the resource would be barely detectable; less than one percent of the resource would be affected. This level of effect is considered to be not significant.
- Minor – The effect on the resource would be slight but detectable; there would be a small change in the resource. This could include effects on 1% to 5% of the resource. This level of effect is considered to be not significant.

- Moderate – The effect on the resource would be readily apparent; there would be a measurable change in the resource. This could include effects on between 5% and 10% of the resource. This level of effect is considered to be potentially significant.
- Major – The effect on the resource would be great; there would be a highly noticeable, long-term, or permanent measurable change in the resource. This could include effects on more than 10% of the resource. This level of effect is considered to be significant.

Availability of Data and Incomplete Information

The BLM used the best information available and pertinent to the decisions to be made through this RMP, and has expended considerable effort to acquire and convert resource data into a digital format for use in the plan. Data have been acquired from BLM sources and outside sources, such as the state.

Some information was not available for use in developing this plan, usually because there have been no inventories or inventories are not complete. Specific data not available include:

- Inventory and assessment of roads and trails
- Invasive plant species occurrence
- Definitive special status species occurrence (plant and animal)
- Certain wildlife data (definitive occurrence for many species)

Because these data are not available, effects cannot be appropriately quantified given the proposed management of certain resources. In these cases, potential effects are described in qualitative terms or, in some cases, stated as unknown. Subsequent project-level analyses will provide the opportunity to collect and examine site-specific inventory data necessary to determine the appropriate application of the RMP-level guidance. In addition, inventory efforts identified in Chapter 2 will continue to update and refine the information used to implement this plan.

Themes Relating to Multiple Resources

Split Estate

In split estate situations, different parties own the surface rights and subsurface rights (such as the rights to develop minerals) for a parcel of land. In these situations, mineral rights are considered the dominant estate, meaning they take precedence over other rights associated with the property, including those associated with owning the surface. However, the owner of the mineral estate must consider the interests of the surface estate owner. The fluid mineral rights lessee has the right to "use so much of the leased lands as is necessary to explore for, drill for, mine, extract, remove and dispose of all the leased resource" (43 CFR 3101.1-2).

During the early homesteading days, the federal government did not retain rights to the minerals or retained only the rights to coal (i.e., the Homestead Act or the Enlarged Homestead Act). However, concern grew regarding the need for strategic minerals to fuel the national economy. Later homestead acts, such as the Stockraising Homestead Act (SRHA) of 1916, granted land patents to private parties, but reserved the mineral rights to the federal government. The BLM must comply with the provisions of the laws under which the surface was patented. However, many of those laws do not identify the rights of the surface owner in split estate mineral development situations.

BLM involvement in split estate applies primarily to situations where the surface rights are in non-federal ownership and the rights to development of the mineral resources are publicly held and managed by the federal government. BLM authority in regards to split estate management

varies by mineral type. For example with coal, Section 714 of Surface Mining Control and Reclamation Act (SMCRA) gives qualified surface owners veto power over surface coal leasing on their property (43 CFR 3427). The remainder of this section is specific to fluid minerals as it is the predominant use within the planning area. The Energy Policy Act requires that the BLM consult with affected property owners, representatives of the oil and gas industry, and other interested parties as it performs permit reviews (BLM 2006e). BLM policy requires that the minerals operator to engage the surface owner in negotiations for the purpose of obtaining a surface use agreement. The surface owner is invited to attend all meetings the BLM has with the minerals operator and invited to identify.

During a permit review, the BLM recommends the same level of resource protection to the surface owner's lands that would be provided on federally owned surface (BLM 2007n). The BLM carefully considers the surface owner's views and the effects on the surface owner's uses of the land before determining mitigation requirements and approving operations. The BLM must fulfill the requirements of NEPA, the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), the Clean Water Act (CWA), and other applicable laws, policies, and decisions regarding surface resources. If the surface owner's wishes are contrary to the BLM recommendations, the BLM will generally adopt the surface owner's request unless the request is contrary to the BLM's planning decisions, non-discretionary laws, current policy, or would result in avoidable significant impacts.

Split estate is a common occurrence in the planning area; the BLM manages 782,102 acres of surface estate and 4,803,277 acres of mineral estate. Table 4.1, "Surface Estate and Associated BLM-Administered Fluid Mineral Estate in the Buffalo Field Office Planning Area" (p. 496) lists surface ownership in the planning area and the number of acres of corresponding BLM-administered mineral estate.

Table 4.1. Surface Estate and Associated BLM-Administered Fluid Mineral Estate in the Buffalo Field Office Planning Area

Surface Owner	Surface Land (acres)	BLM Fluid Mineral Estate (acres)
BLM	782,102	781,013
Department of Defense	4,166	4,166
Private	5,167,265	3,963,663
State of Wyoming	538,606	54,435
Source: BLM 2012f BLM Bureau of Land Management		

Surface Disturbance

Surface disturbance is the result of any action or activity that alters vegetation, surface and near-surface soil resources, or surface geologic features beyond natural site conditions and on a scale that affects the value of other public lands (BLM 2007i). Examples of surface-disturbing activities include operation of heavy equipment to construct well pads, roads, pits and reservoirs; installation of pipelines and powerlines; and the performance of several types of vegetative treatments (e.g., prescribed fire). Surface-disturbing activities can be authorized or prohibited.

Most land and resource uses (e.g., mineral development, fire, forest products sales, rights-of-way (ROW) actions, and renewable-energy development) can result in surface disturbance and have the potential to affect multiple resources (e.g., soils, water, vegetation, wildlife, cultural and paleontology resources, and recreation). Surface disturbance is defined here to avoid redundancy

in the individual resource sections. Table 4.2, "Total Projected Surface Disturbance from Reasonable Foreseeable Actions in the Buffalo Planning Area" (p. 497) summarizes the projected surface disturbance under each alternative during the anticipated duration of the planning period.

Table 4.2. Total Projected Surface Disturbance from Reasonable Foreseeable Actions in the Buffalo Planning Area

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Total acres disturbed from BLM actions	322,026	422,903	422,544	486,957
Total acres reclaimed from BLM actions	221,888	344,752	291,923	358,871
Total acres of long-term disturbance from BLM actions	100,138	78,152	130,621	128,086
Total acres disturbed from non-BLM actions	2,123,460	1,890,239	2,531,611	2,168,799
Total acres reclaimed from non-BLM actions	1,943,463	1,766,623	2,174,564	1,965,851
Total acres of long-term disturbance from non-BLM actions	179,998	123,617	357,048	202,949
Source: Stilwell et al. 2012; Appendix G (p. 1671) BLM Bureau of Land Management				

Disruptive Activities

Disruptive activities are uses of and activities on public land likely to alter the behavior of, displace, or cause excessive stress to existing animal or human populations, and that occur at a specific location or time. In this context, disruptive activity(ies) refers to actions that alter behavior or cause the displacement of individuals such that reproductive success is adversely affected, or an individual's physiological ability to cope with environmental stress is compromised. The term disruptive activities does not apply to the physical disturbance of the land surface, vegetation, or features. Examples of disruptive activities include noise, human foot or vehicle traffic, domestic livestock roundups, or other human presence, regardless of the activity. When the BLM restricts disruptive activities, sound above ambient levels, light greater than background levels, and the presence of people and their activities could be prohibited or limited. The term is commonly used in conjunction with protecting wildlife during crucial life stages (e.g., breeding, nesting, and birthing), although it can apply to any resource value on the public lands. This land use restriction is not intended to prohibit all activity or authorized uses.

4.1. Physical Resources

4.1.1. Air Quality

For the Buffalo planning area, air resources were evaluated to examine how potential BLM initiatives, decisions, and alternatives would affect air quality in the region ("region" includes the planning area and federal Class I areas within 100 miles). The actions associated with each alternative may affect future air quality within this region. Impacts to air quality include changes

of pollutants, visibility and atmospheric deposition. Beneficial impacts are those that decrease emissions, either from control measures or a reduction in activities that generate emissions. Direct impacts are the result of the proposed action and occur at the same time. Indirect impacts may also result from the proposed action, but would occur later in time and/or are further removed from the planning area. Indirect impacts may be assessed with the application of air quality modeling tools to help identify the impacts of emissions on regional air quality and may result in the identification and implementation of BMPs or other technologies that would reduce emissions. This section evaluates the potential impacts on air quality from specific activities authorized or performed by the BLM in the Buffalo planning area for each alternative by examining the expected levels of emissions associated with various activities in the planning area. No air quality modeling was performed as part of this analysis.

4.1.1.1. Methods and Assumptions

The air quality impact analysis for the Buffalo planning area used an emissions comparison approach that included the following:

- Identify actions and activities that generate air pollutant emissions.
- Prepare current base year (2005) equipment, production, and activity data.
- Estimate future equipment and activity for the selected future years (2015 and 2024).
- Calculate base year and future emissions associated with expected activity for each alternative based on equipment, emission factors, and activity data.
- Compare future year totals with base year for each of the alternatives to evaluate changes from the baseline and among the alternatives.

The Buffalo RMP presents a qualitative description of potential impacts, and includes emission inventories of BLM actions in the Buffalo planning area. Appendix M (p. 1827) provides a detailed description of the assumptions, activity data, emission factors, and general approach followed in estimating emissions for the various resource sectors and pollutants.

The following air pollutants were identified as being pollutants that could potentially be emitted directly (or in the case of ozone [O_3] produced in the atmosphere by photochemical processes), by management activities authorized, permitted, allowed or performed under this RMP. Emissions of each of these pollutants (except O_3) were estimated for each identified activity and addressed for each alternative in this analysis:

- Criteria pollutants (Carbon Monoxide [CO], Nitrogen Oxide [NO_X], Particulate Matter less than 2.5 microns in diameter [$PM_{2.5}$], Particulate Matter less than 10 microns in diameter [PM_{10}], Sulfur Dioxide [SO_2])
- Organics and toxics (Hazardous Air Pollutant [HAP] and Volatile Organic Compound [VOC])
- Greenhouse gases (Carbon Dioxide [CO_2], Methane [CH_4], N_2O)

Components of air quality that may be impacted include visibility, air pollutant concentrations, atmospheric deposition, and lake chemistry. Impacts on these components are affected by the magnitude and spatial and temporal distribution of the primary and precursor emissions and their interaction with local and regional meteorological conditions and topographic features. For this analysis, the changes in emissions for each of the alternatives was assessed to qualitatively determine if the resulting impacts would be significant enough to potentially violate the National Ambient Air Quality Standards (NAAQS) or the Wyoming Ambient Air Quality Standards (WAAQS), or possibly exceed screening levels of concern for visibility and atmospheric deposition. Air quality modeling can be used to simulate expected future air quality

concentrations and the effects on visibility and deposition, but at this stage of the planning process, sufficient project-specific data were not available for such an assessment. Future mineral development projects will be required to conduct a full NEPA analysis of the impacts of proposed projects including air quality. Because of the level of coal mining activity in the Powder River Basin (PRB), air quality modeling studies have been conducted to assess impacts for the region. The Chapter 3 Air Quality section provides a summary of air quality modeling projects that have been conducted or are ongoing.

The following list of emission generating activities were identified as those management activities authorized, permitted, allowed or performed under this RMP that could potentially emit identified air pollutants and could potentially cause impacts to air quality within the planning area and Class I areas within 100 miles (150 kilometers) of the planning area. Emissions of air pollutants were estimated for the baseline year (2005) and projected for two future years (2015 and 2024) for each identified resource activity and addressed for each alternative in this analysis.

- Leasable Fluid Minerals – Conventional Natural Gas Development
- Leasable Fluid Minerals – Coalbed Natural Gas Development
- Leasable Fluid Minerals – Oil Development
- Leasable Solid Minerals – Coal Mining
- Locatable Minerals – Bentonite Mining
- Locatable Minerals – Uranium Mining
- Salable Minerals – Sand, Gravel, and other Mineral Development
- Fire and Fuels Management – Prescribed Fire
- Forest Products
- Land Resources – Rights-of-Way and Corridors and Renewable Energy Projects
- Land Resources – Travel and Transportation Management
- Land Resources – Livestock Grazing Management

The Buffalo Field Office (BFO) resource specialists provided the construction, operations, developed acreage, and production activity data used to estimate emissions for resource emission sources. Other activity data were derived from the surface disturbance and RFA tables (Appendix G (p. 1671)). For conventional natural gas, coalbed natural gas (CBNG), and oil development, emissions were prepared for activities on federal mineral estate in the planning area. The estimation of emissions from coal mining activity relied on information contained in the Environmental Protection Agency's (EPA's) National Emission Inventory (NEI) (EPA 2011a) and the Final Mineral Occurrence and Development Potential Report (BLM 2009c) for the planning area. Because of this, the emission estimates for coal mining activities do not vary amongst the alternatives.

Emission factors used to estimate proposed emissions were obtained from (1) the EPA NONROAD2008a Emissions Model (EPA 2008); (2) Wyoming Department of Environmental Quality (DEQ) best available control technology (BACT) levels for natural gas-fired internal combustion engines; (3) the EPA MOBILE6.2.03 mobile emissions factor model for on-road motor vehicles (EPA 2003), (4) EPA AP-42 Compilation of Air Pollutant Emissions Factors (EPA 1995), (5) the American Petroleum Institute (API) Compendium of Greenhouse Gas Emissions Estimation Methodologies for Oil and Natural Gas Industry (American Petroleum Institute 2009); (6) EPA State Inventory Tool Module (EPA 2011c), and (7) the Western Governors Association Western Regional Air Partnership (WRAP) (Western Regional Air Partnership 2005). The Technical Support Document (TSD) for Air Quality (Appendix M (p. 1827)) includes detailed information regarding the data and assumptions used to estimate emissions for each project alternative and the emission totals for each activity per year.

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

- Air pollutant emissions presented in this analysis are useful for comparing the relative amounts of emissions for each alternative and may not represent actual future emissions. Emissions estimates are based on predictions of future mineral resource development scenarios rather than actual development projects.
- Stationary sources associated with oil and gas development will operate in accordance with Wyoming DEQ's *Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2* revised March 2010 (U.S. Secretary of the Interior 2010).
- Emissions from the following management actions were not estimated because the potential for development was considered low: phosphate mining, oil shale development, geothermal development, gemstones and other lapidary materials development.
- Emissions from the following management actions were not included because (1) the level of activity is not expected to change between alternatives, *and* (2) the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or (3) sufficient operational or production data were not available to quantify emissions: wild (unplanned) fires, invasive species and pest management, grassland and shrubland management, and activities related to heritage and visual resources, cultural resources, paleontology, recreation, socioeconomic resources, and fish and wildlife resources.
- Activity factors (or the quantification of activity for each resource provided by the Buffalo
- Field Office) are appropriate for the base year and future timeframes.
- EPA off-road emission standards were used to estimate emissions for non-road sources in project years 2005, 2015, 2024. This approach simulates the replacement of existing sources by new lower-emitting equipment with future EPA off-road emission standards.

Management under the alternatives will adhere to the Buffalo Air Resource Management Plan (Appendix N (p. 2069)). The purpose of the Air Resource Management Plan is to further clarify air quality goals, objectives, and management actions set forth in Chapter 2. This Plan describes air resources management and outlines specific requirements for proponents of projects that have the potential to generate air emissions and impact air resources within the planning area.

The BLM considered, but eliminated the application of air quality modeling tools to assess the impacts on air quality of the alternatives. In June 2011, the USDA, Department of the Interior, and the Environmental Protection Agency signed the *Memorandum of Understanding among the U.S. Department of Agriculture, U.S. Department of Interior, and U.S. Environmental Protection Agency Regarding Air Quality Analyses and Mitigation for Federal Oil and Gas Decisions Through the National Environmental Policy Act Process* (MOU). This MOU outlines an approach to the analysis of impacts to air quality and air quality related values, such as visibility in Class I and sensitive Class II areas, in connection with oil and gas development on federal lands, and identifies a path to protect air quality while allowing for oil and gas development on federally managed lands. This MOU specifically addresses oil and natural gas development projects, but not other projects or resources that contribute to air quality impacts in the planning area. Because the RMP is a broad level planning document that defines allocations and projects levels of development and other land uses in a general sense, it lacks much of the specificity of future emission sources and levels that are necessary to accurately simulate future air quality impacts. Air quality impact modeling is more appropriately analyzed in the implementation level (i.e., specific oil and gas field development projects) NEPA documents, and this type of modeling would be conducted under the guidelines of the MOU.

For this analysis a base year emission inventory was developed for 2005 based on available historical equipment counts, records of production and activity, and other information. In addition

to the base inventory, two future-year inventories (2015 and 2024) were prepared based on various alternative levels of activity, operations, and equipment usage for all of the activities associated with each of the managed resources. For all of the alternatives examined for the base and future years, coal mining and oil and natural gas (conventional and coalbed) development are the largest contributors to total air emissions compared to other managed activities in the planning area. For coal mining, the emissions are estimated based on emissions prepared by the State of Wyoming as contained in EPA National Emission Inventory (EPA 2011a) and production rate data and forecasts included in the Final Mineral Occurrence and Development Potential Report (BLM 2009c) for the Buffalo planning area. For oil and natural gas development, the emission estimates are based on reasonable foreseeable estimates of well counts, production and development rates, and existing technologies used in the field.

For the Buffalo planning area, activities associated with oil and natural gas development and coal mining result in the largest emissions for the majority of pollutants. Table 4.3, "Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005" (p. 501) presents a summary of estimated emissions (tons/year) for all resource activities for each pollutant for the base year 2005. The table presents emission estimates for oil and natural gas development sources on federal land and combined cumulative totals for these activities on federal and non-federal land within the planning area.

Table 4.3. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005

Resource	Criteria Pollutants					Organics & Toxics	
	PM10	PM2.5	NOx	SO2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**6,889**	**1,754**	**933**	**32**	**3,441**	**1,059**	**179**
TOTAL - Cumulative	**7,757**	**1,853**	**1,194**	**35**	**3,580**	**1,538**	**273**
Leasable Fluid Minerals – Natural Gas Development – Federal	28	5	96	0	48	216	33
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	402	44	72	1	42	152	38
Leasable Fluid Minerals – Oil Development – Federal	38	4	4	0	4	0	0
Total Fluid Minerals Develop-ment – Fed-eral	**469**	**53**	**172**	**1**	**94**	**368**	**69**

Resource	Criteria Pollutants					Organics & Toxics	
	PM10	PM2.5	NOx	SO2	CO	VOC	HAPs
Leasable Fluid Minerals – Natural Gas Development – All	53	10	181	0	92	413	62
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	1,204	134	243	3	133	433	102
Leasable Fluid Minerals – Oil Development – All	79	8	9	0	9	1	0
Total Fluid Minerals Develop-ment – All	**1,336**	**152**	**433**	**4**	**234**	**846**	**164**
Leasable Minerals – Coal	4,621	1,426	509	19	1,222	---	---
Locatable Minerals – Bentonite Mining	828	96	8	0	7	1	0
Locatable Minerals – Uranium Mining	38	5	26	1	10	2	41
Salable Minerals – Sand, Gravel, and other Minerals	763	89	172	4	80	13	1
Total Non-Oil and Gas Minerals	**6,250**	**1,616**	**715**	**24**	**1,319**	**16**	**42**
Fire and Fuels Management	73	60	20	6	685	36	4
Forest Products	37	4	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	39	5	14	0	7	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM10	PM2.5	NOx	SO2	CO	VOC	HAPs
Land Resources – Travel and Transportation Management	18	17	11	2	1,331	638	64
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

4.1.1.2. Impacts Common to All Alternatives

The Wyoming DEQ has the authority to implement emission controls for sources requiring air permits under Wyoming Air Quality Standards and Regulations and to ensure that these sources do 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 would 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.

Because of the amount of existing and planned resource development activity, emissions of NO_X, VOC, and CO from coal mining and oil and natural gas development could impact air quality under each of the alternatives. These emissions are precursors to ozone (O_3) and fine particulates ($PM_{2.5}$) which are both secondary pollutants and ambient concentrations could increase and also affect visibility and atmospheric deposition. Emissions of primary coarse (PM_{10}) and fine ($PM_{2.5}$) particulates from these activities could also affect local and regional air quality by decreasing visibility and increasing deposition. Emissions for SO_2 from managed activities in the planning area are relatively small and are not expected to result in any major impacts. Except for the NO_X emissions from sand and gravel sources and the CO and VOC emissions from Travel and Transportation Management which could contribute to impacts on ambient O_3 and particulate concentrations, the emissions from all other resource emission source categories are relatively small and are not expected to contribute to any major adverse impacts on air quality in the planning area.

Management actions and resource uses under each of the alternatives may impact air quality related values (AQRVs) in the nearby federal Class I area of Wind Cave National Park and the Northern Cheyenne Indian Reservation, with potentially smaller impacts at the more distant Badlands Wilderness Area. Although minerals development and production (primarily coal mining), and oil and gas production would be the primary sources of emissions, other resource management actions that would produce combustive and/or fugitive dust emissions include sand and gravel development, and uranium and bentonite mining.

Prior to project approval, the BLM would conduct environmental analyses in compliance with NEPA. Appendix N (p. 2069) includes additional information on potential BMPs and mitigation measures that may be applied in the planning area. For major projects, such as the development of a large natural gas field or mineral development project (or any project that is likely to have an impact on air quality), the BLM may require proponents to demonstrate compliance with ambient air quality standards and other federal, state, and local air quality regulations. This demonstration may include air dispersion modeling, photochemical grid modeling, and the application of mitigation measures and control technologies prior to project authorization by the BLM.

4.1.1.3. Alternative A

Under Alternative A, resources would be managed under the existing RMP (BLM 1985c). Table 4.4, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2015" (p. 505) and Table 4.5, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2024" (p. 507) present the emission estimates for planned activities associated with the No Action Alternative (Alternative A) for 2015 and 2024, respectively. These tables provide emission estimates for the activities listed above and provide totals for activities on federal land and cumulative totals for all activities under the current management scenario. The tables also present percent difference changes in the emission totals compared to the 2005 base year totals. Figure 4.1, "Contributions of Each Category to PM_{10} Emissions under Alternative A for 2015" (p. 509) through Figure 4.7, "Contributions of Each Category to HAPs Emissions under Alternative A for 2015" (p. 515) present the relative contributions of the various activities to total emissions for Alternative A for 2015 for PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO, VOC, and HAP, respectively. The figures provide relative contributions from the major activity sectors: leasable fluid minerals (oil and natural gas), leasable solid minerals (coal), locatable minerals (bentonite & uranium), and salable minerals (sand & gravel), fire and fuels management, forest products, rights-of-way, travel and transportation management, and livestock grazing management. Because the relative contributions of emissions do not change significantly in 2024 or amongst the other alternatives, emission pie charts for 2024 and for all other alternatives are not shown.

As noted above, the major contributor to emissions of PM_{10} and $PM_{2.5}$ are from coal and bentonite mining. For NO_X, and SO_2, the largest contributors are from coal mining and oil development. For the planning area sources, equipment, and activities associated with the non-oil and natural gas mineral development include coal, bentonite, and uranium mining and sand and gravel operations. For CO, similar relative contributions are provided from coal mining, fire and fuels management, and travel and transportation management. For VOC emissions, contributions are primarily from the travel transportation management sector reflecting emissions from off-road engines and off-road vehicles (all-terrain vehicles, motorcycles, snowmobiles, etc.), followed by contributions from the oil and gas development sector. For HAP emissions, similar contributions are provided from the oil and gas, non-oil and gas, and travel and transportation management sectors/activities.

The current management scenario includes actions that either increase or decrease the development or use of certain resources and associated activities in 2015 and 2024 compared to the base year 2005, and this results in either increases and decreases in emissions for certain categories and pollutants. Specific increases in resource use include the number of federal and non-federal natural gas and oil wells in 2015 and 2024, compared to 2005. For example, there is a planned increase of nearly 40 natural gas wells and 168 oil wells under Alternative A. Specific decreases for Alternative A include a fewer number of CBNG wells developed and a slight

reduction in the total acreage used for forest products. For some resources, although there are slight increases in resource development numbers (e.g., number of wells, acreage, etc.) and activities, the emission factors for equipment expected to be used in the future are lower, reflecting cleaner engine and fuel technology, resulting in a net decrease in emissions.

Overall, compared to the 2005 base year, except for VOC and HAPs, emissions for all other pollutants are estimated to increase for Alternative A in 2015. Except for VOC and HAP emissions, emissions for all pollutants are expected to be relatively the same or slightly increase further in 2024. VOC and HAP emissions show a decrease in 2015 and further in 2024, likely reflecting the expected introduction of cleaner engine technology for off-road construction and maintenance engines and other equipment.

It is possible that increases in NO_X and $PM_{2.5}$ emissions could lead to increases in ambient O_3 concentrations and total fine particulates, and may possibly contribute to violations of the current NAAQS and WAAQS.

Table 4.4. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**8,913**	**2,271**	**1,778**	**137**	**4,852**	**997**	**119**
TOTAL – Cumulative	**9,512**	**2,373**	**2,838**	**236**	**5,160**	**1,374**	**176**
Percent Change over Base Year – Federal Lands Only	**29%**	**29%**	**91%**	**327%**	**41%**	**-6%**	**-34%**
Percent Change over Base Year – Cumulative	**23%**	**28%**	**138%**	**580%**	**44%**	**-11%**	**-36%**
Leasable Fluid Minerals – Natural Gas Development – Federal	47	10	152	1	68	262	39
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	223	24	40	0	23	66	12
Leasable Fluid Minerals – Oil Development – Federal	204	49	795	94	192	33	3

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Total Fluid Minerals Development – Federal	**474**	**83**	**987**	**95**	**283**	**362**	**55**
Leasable Fluid Minerals – Natural Gas Development – All	92	20	299	2	134	517	77
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	580	68	138	2	70	154	28
Leasable Fluid Minerals – Oil Development – All	401	97	1,610	190	388	67	7
Total Fluid Minerals Development – All	**1,073**	**185**	**2,046**	**194**	**592**	**739**	**112**
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	1,608	177	4	0	5	1	0
Locatable Minerals – Uranium Mining	45	6	25	1	10	2	0
Salable Minerals – Sand, Gravel, and other Minerals	835	95	65	3	33	8	1
Total Non-Oil and Gas Minerals	**8,188**	**2,038**	**724**	**27**	**1,556**	**11**	**1**
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest Products	35	4	0	0	2	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Land Resources – Rights-of-Way and Renewable Energy Projects	45	5	2	0	1	0	0
Land Resources – Travel and Transportation Management	17	15	22	2	1,559	548	55
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

Table 4.5. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative A – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM10	PM2.5	NOx	SO2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**9,258**	**2,380**	**1,778**	**138**	**4,916**	**806**	**96**
TOTAL – Cumulative	**9,775**	**2,474**	**2,844**	**237**	**5,226**	**1,195**	**155**
Percent Change over Base Year – Federal Lands Only	**34%**	**36%**	**91%**	**330%**	**43%**	**-24%**	**-46%**
Percent Change over Base Year – Cumulative	**26%**	**33%**	**138%**	**583%**	**46%**	**-22%**	**-43%**
Leasable Fluid Minerals – Natural Gas Development – Federal	52	11	170	1	78	302	45

Resource	Criteria Pollutants					Organics & Toxics	
	PM10	PM2.5	NOx	SO2	CO	VOC	HAPs
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	47	6	16	0	8	10	2
Leasable Fluid Minerals – Oil Development – Federal	230	51	796	94	192	33	3
Total Fluid Minerals Develop-ment – Fed-eral	**329**	**68**	**982**	**95**	**278**	**345**	**50**
Leasable Fluid Minerals – Natural Gas Development – All	102	22	340	2	155	606	90
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	285	37	97	2	43	61	12
Leasable Fluid Minerals – Oil Development – All	458	103	1,611	190	389	67	7
Total Fluid Minerals Develop-ment– All	**845**	**162**	**2,048**	**194**	**588**	**734**	**108**
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	1,608	177	2	0	5	1	0
Locatable Minerals – Uranium Mining	30	5	22	1	9	2	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM10	PM2.5	NOx	SO2	CO	VOC	HAPs
Salable Minerals – Sand, Gravel, and other Minerals	816	91	21	3	14	7	1
Total Non-Oil and Gas Minerals	**8,542**	**2,152**	**717**	**28**	**1,638**	**9**	**1**
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest Products	35	4	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	111	11	2	0	2	1	0
Land Resources – Travel and Transportation Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	80	8	4	0	86	4	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

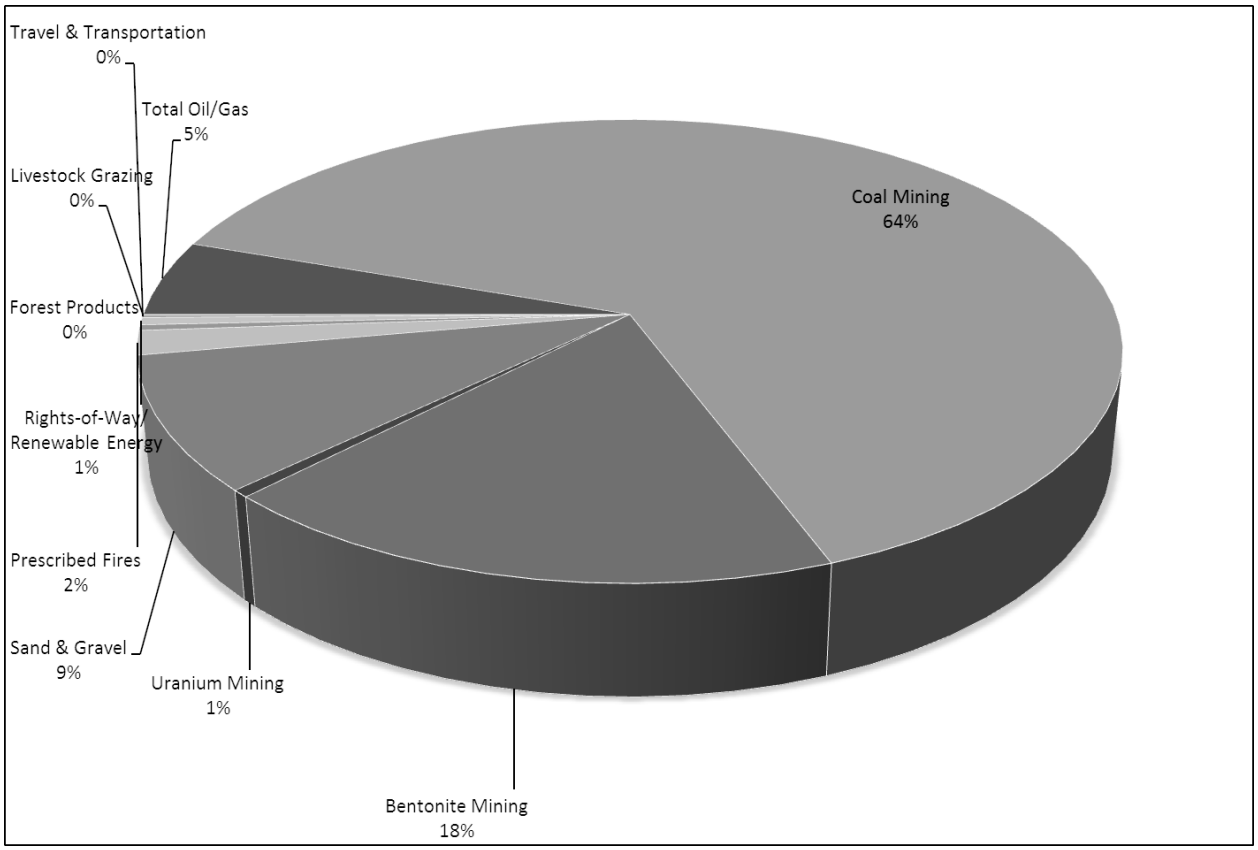

Figure 4.1. Contributions of Each Category to PM_{10} Emissions under Alternative A for 2015

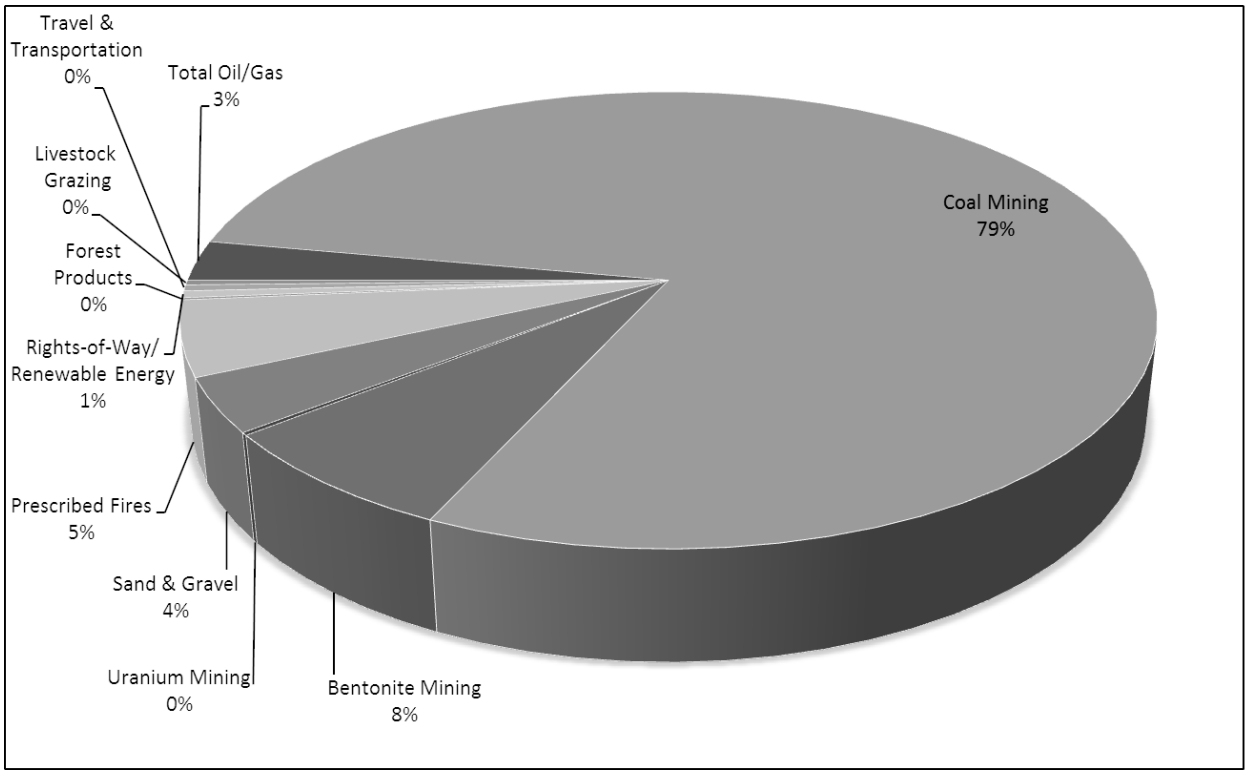

Figure 4.2. Contributions of Each Category to $PM_{2.5}$ Emissions under Alternative A for 2015

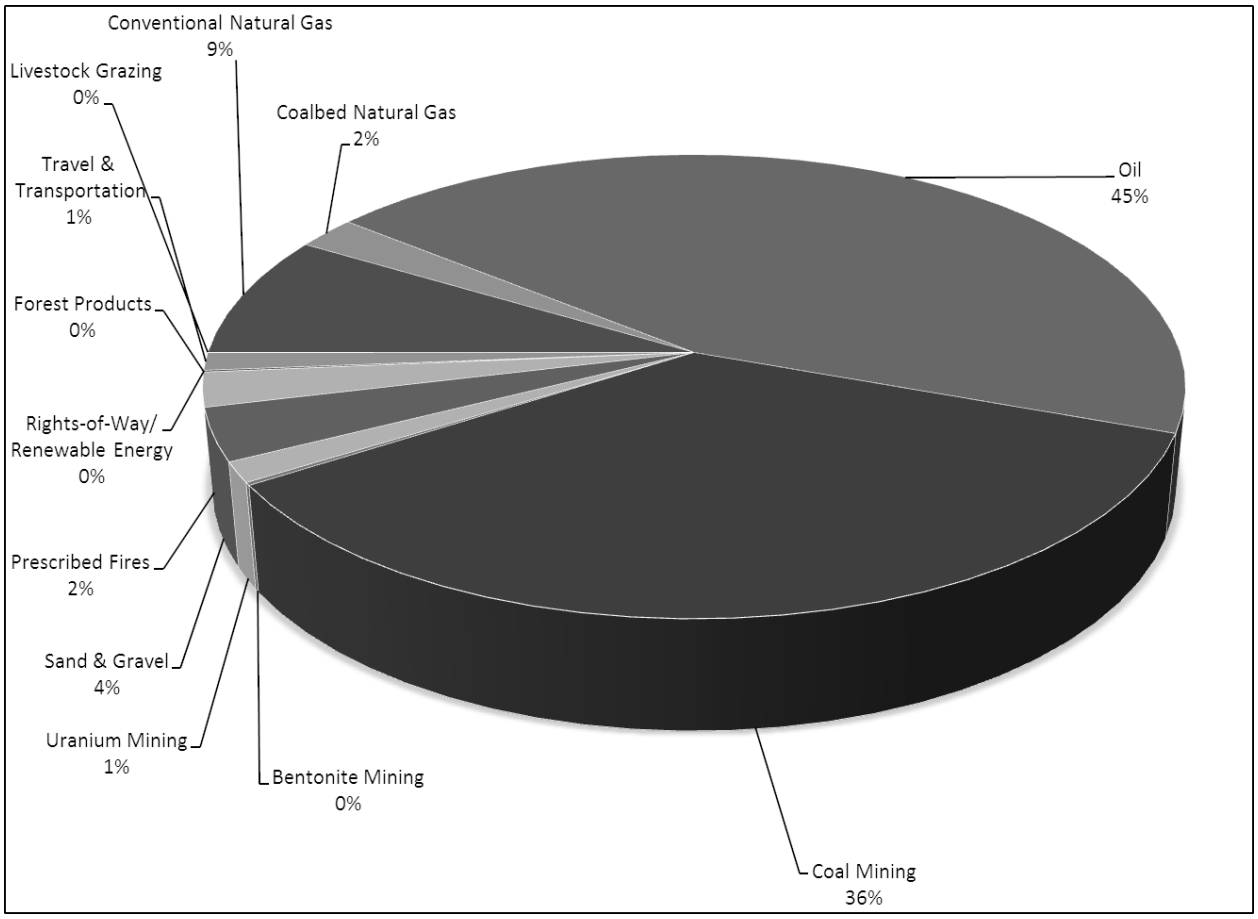

Figure 4.3. Contributions of Each Category to NO_x Emissions under Alternative A for 2015

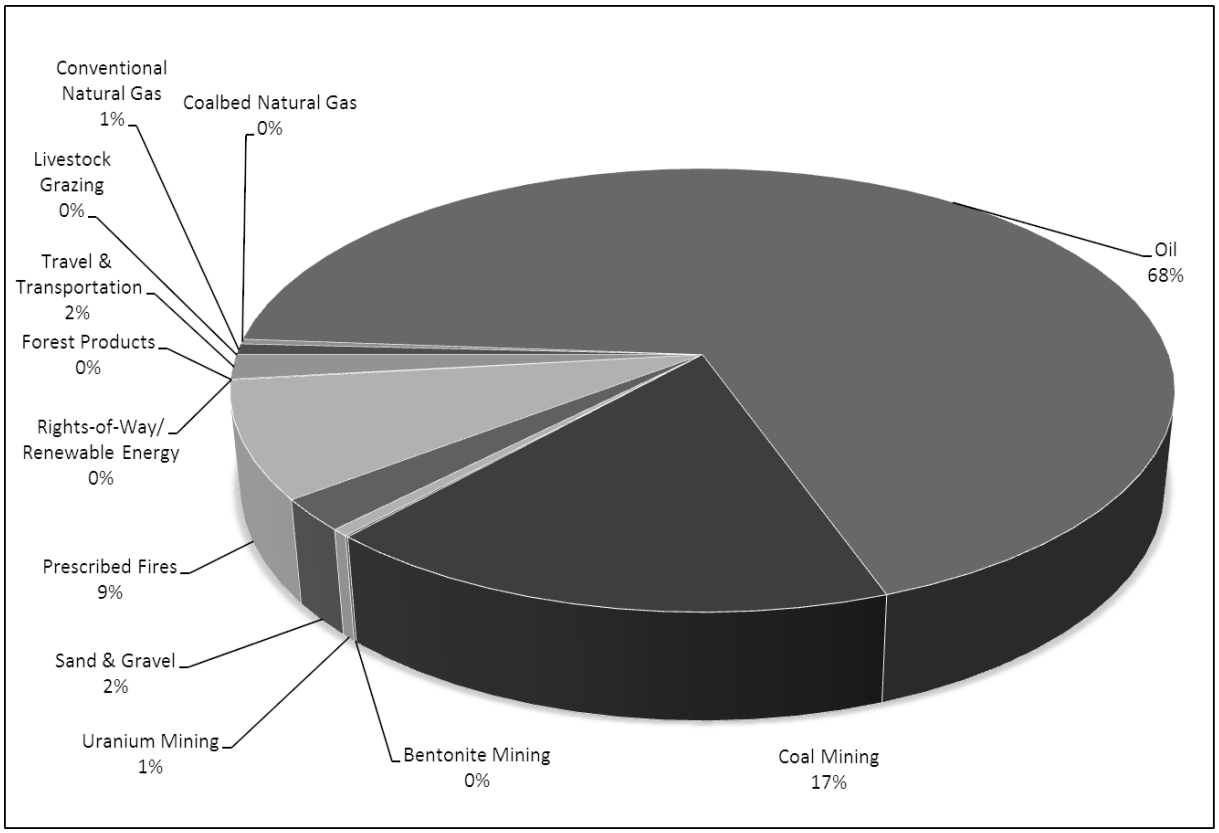

Figure 4.4. Contributions of Each Category to SO_2 Emissions under Alternative A for 2015

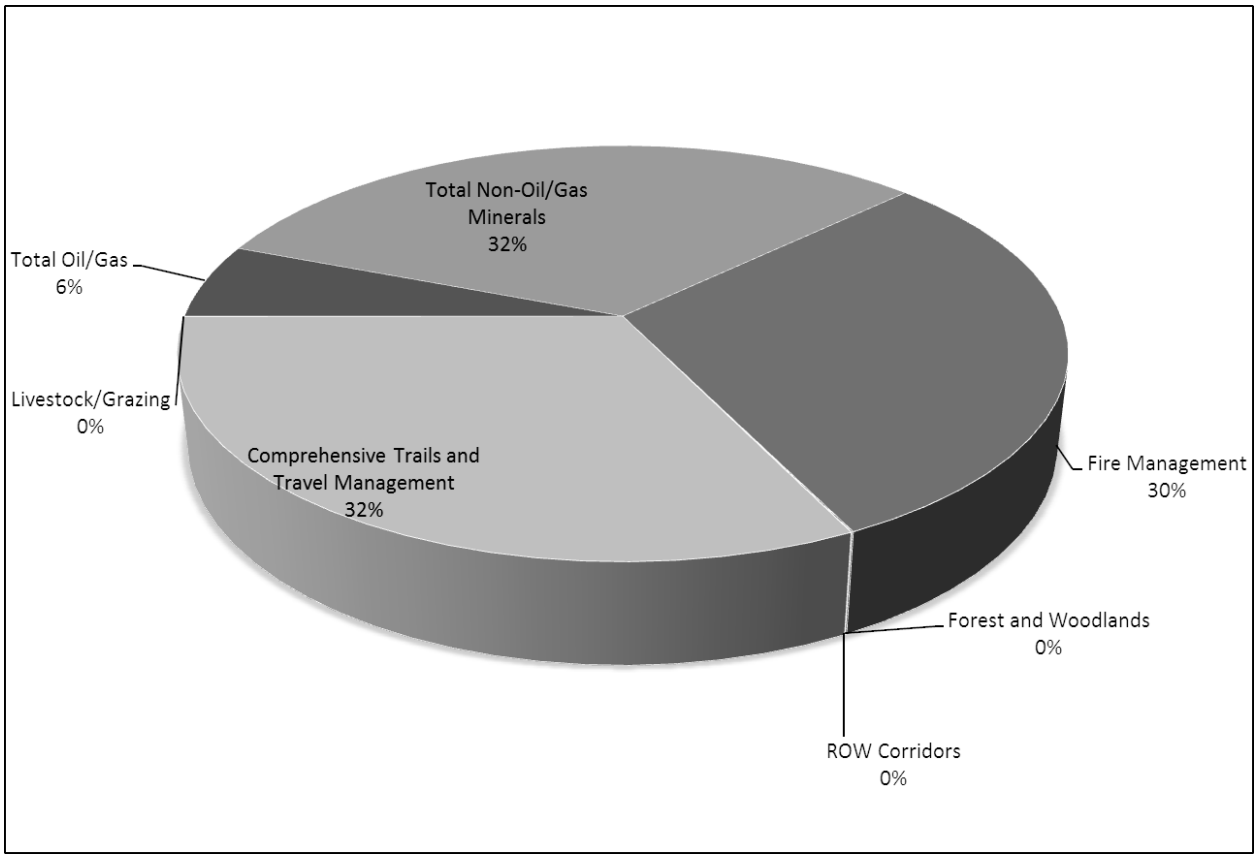

Figure 4.5. Contributions of Each Category to CO Emissions under Alternative A for 2015

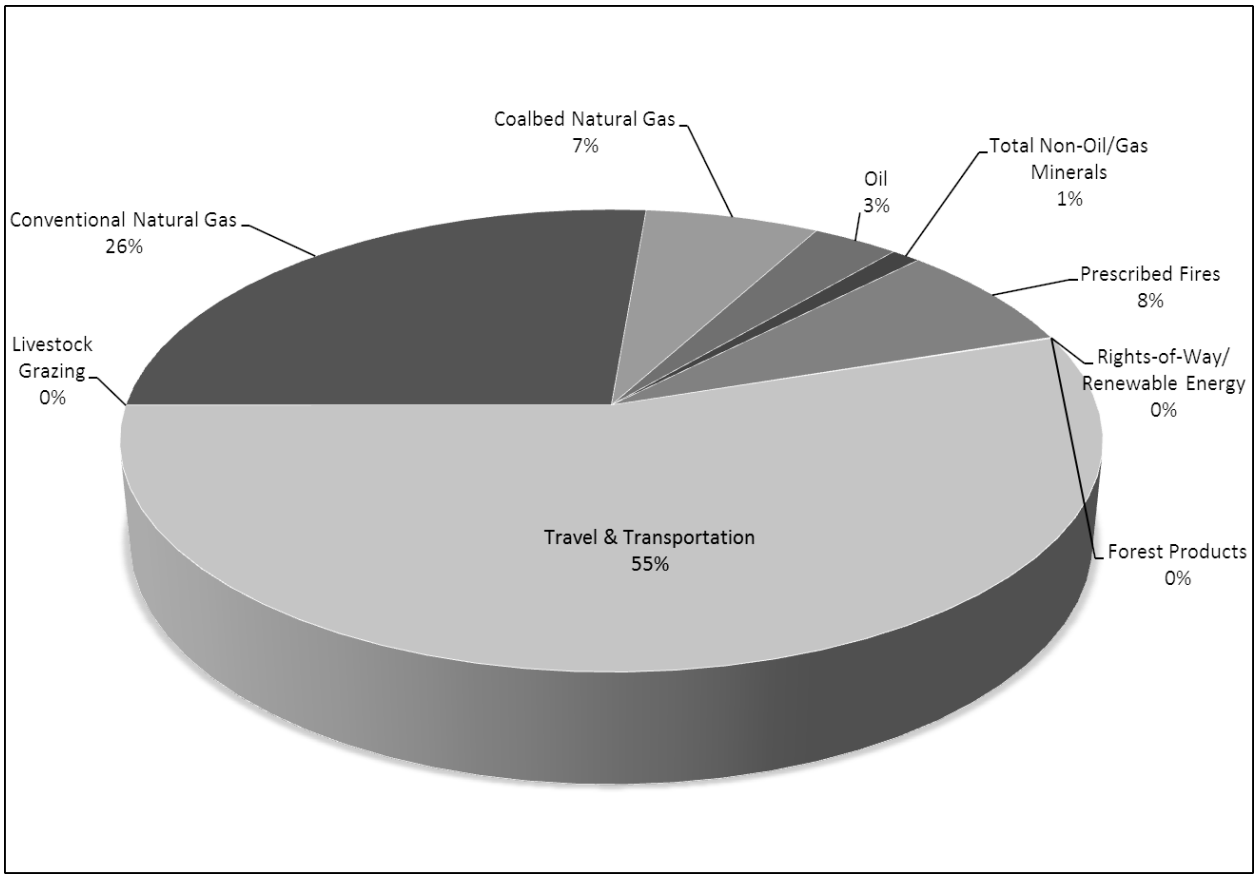

Figure 4.6. Contributions of Each Category to VOC Emissions under Alternative A for 2015

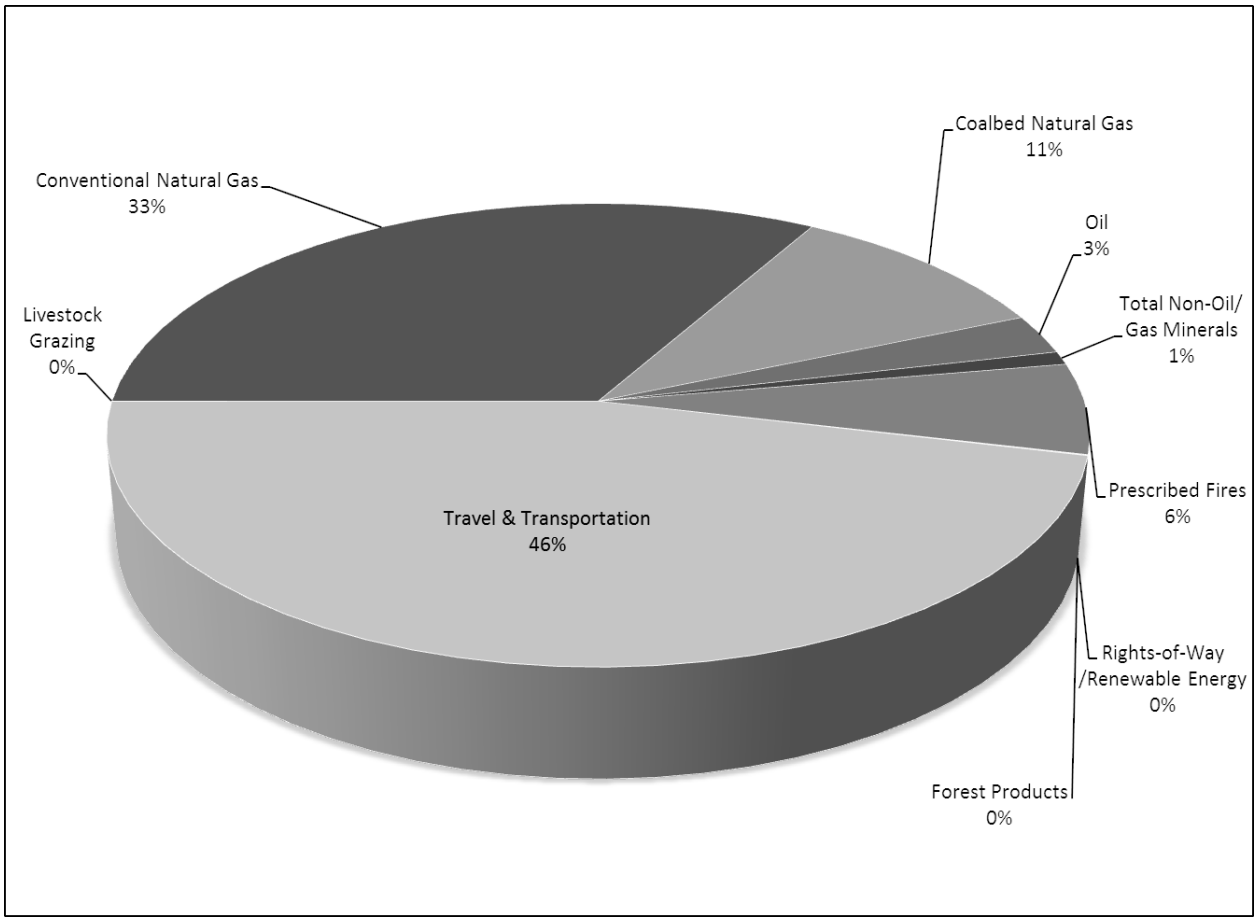

Figure 4.7. Contributions of Each Category to HAPs Emissions under Alternative A for 2015

4.1.1.4. Alternative B

Alternative B represents the most restrictive use of resources reflecting the highest degree of conservation for physical, biological, heritage, and visual resources. This alternative limits the amount of resource growth and development activities, including the number of oil and natural gas wells, and the acreage developed and used in mining and other surface disturbing activities. Because of this, the emissions for this alternative are the lowest of all alternatives. Table 4.6, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2015" (p. 517) and Table 4.7, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2024" (p. 519) present the emission estimates for planned activities associated with Alternative B for 2015 and 2024, respectively. The relative contributions of the various activities to total emissions for Alternative B for 2015 and 2024 for PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO, VOC, and HAP are similar to those presented for Alternative A in Figure 4.1, "Contributions of Each Category to PM_{10} Emissions under Alternative A for 2015" (p. 509) through Figure 4.7, "Contributions of Each Category to HAPs Emissions under Alternative A for 2015" (p. 515) above.

Compared to the 2005 base year, 2015 emissions are estimated to be similar or increase slightly for PM_{10}, $PM_{2.5}$, SO_2, and CO, and are expected to be relatively the same or slightly increase further in 2024. Emissions of NO_X, VOC, and HAP are expected to decrease in both 2015 and

2024 compared to 2005, likely reflecting restrictions on oil and gas development and the expected introduction of cleaner engine technology for off-road construction and maintenance engines and other equipment. Compared to 2005, emissions under this alternative are likely to contribute less to ambient O_3 concentrations and total fine particulates, and overall impacts on air quality are expected to be the least of all of the alternatives.

Table 4.6. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**7,200**	**1,966**	**813**	**31**	**3,514**	**807**	**95**
TOTAL – Cumulative	**7,820**	**2,070**	**1,874**	**130**	**3,824**	**1,190**	**153**
Percent Change over Base Year – Federal Lands Only	**5%**	**12%**	**-13%**	**3%**	**2%**	**-24%**	**-47%**
Percent Change over Base Year – Cumulative	**1%**	**12%**	**57%**	**275%**	**7%**	**-23%**	**-44%**
Leasable Fluid Minerals – Natural Gas Development – Federal	23	5	77	0	39	173	26
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	195	21	29	0	18	62	12
Leasable Fluid Minerals – Oil Development – Federal	105	11	7	0	4	1	0
Total Fluid Minerals Develop-ment – Fed-eral	**323**	**36**	**113**	**1**	**61**	**235**	**38**
Leasable Fluid Minerals – Natural Gas Development – All	68	14	223	1	104	426	64

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	574	66	129	2	67	157	29
Leasable Fluid Minerals – Oil Development – All	302	59	822	96	201	34	3
Total Fluid Minerals Develop-ment– All	**943**	**140**	**1,174**	**100**	**372**	**618**	**96**
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	804	89	2	0	3	0	0
Locatable Minerals – Uranium Mining	23	3	13	0	5	1	0
Salable Minerals – Sand, Gravel, and other Minerals	231	26	21	1	10	3	0
Total Non-Oil and Gas Minerals	**6,758**	**1,877**	**665**	**25**	**1,525**	**4**	**0**
Fire and Fuels Management	38	32	11	3	362	19	2
Forest Products	30	3	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	32	3	2	0	1	0	0
Land Re-sources – Travel and Transporta-tion Manage-ment	17	15	22	2	1,559	548	55

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

Table 4.7. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative B – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**7,355**	**2,056**	**800**	**32**	**3,487**	**524**	**59**
TOTAL – Cumulative	**7,871**	**2,150**	**1,865**	**131**	**3,796**	**912**	**117**
Percent Change over Base Year – Federal Lands Only	**7%**	**17%**	**-14%**	**0%**	**1%**	**-50%**	**-67%**
Percent Change over Base Year – Cumulative	**1%**	**16%**	**56%**	**278%**	**6%**	**-41%**	**-57%**
Leasable Fluid Minerals – Natural Gas Development – Federal	18	4	58	0	29	128	19
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	9	1	4	0	2	1	0
Leasable Fluid Minerals – Oil Development – Federal	79	8	6	0	4	0	0
Total Fluid Minerals Develop-ment – Fed-eral	**106**	**13**	**68**	**1**	**35**	**130**	**19**

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Leasable Fluid Minerals – Natural Gas Development – All	69	15	227	1	106	430	64
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	246	32	84	2	38	53	10
Leasable Fluid Minerals – Oil Development – All	307	60	822	96	201	34	3
Total Fluid Minerals Develop-ment– All	**622**	**106**	**1,133**	**99**	**345**	**518**	**78**
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	804	89	1	0	2	0	0
Locatable Minerals – Uranium Mining	15	2	11	0	5	1	0
Salable Minerals – Sand, Gravel, and other Minerals	229	25	7	1	4	2	0
Total Non-Oil and Gas Minerals	**7,136**	**1,995**	**691**	**26**	**1,621**	**3**	**0**
Fire and Fuels Management	38	32	11	3	362	19	2
Forest Products	30	3	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	32	3	1	0	1	0	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Land Resources – Travel and Transportation Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

4.1.1.5. Alternative C

Alternative C is the least restrictive alternative in terms of planned growth and development, number of wells/projects, etc. and the emissions for this alternative are the highest of all alternatives. Table 4.8, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2015" (p. 522) and Table 4.9, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2024" (p. 524) present the emission estimates for planned activities associated with Alternative C for 2015 and 2024, respectively. The relative contributions of the various activities to total emissions for Alternative C for 2015 and 2024 for PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO, VOC, and HAP are similar to those presented for Alternative A in Figure 4.1, "Contributions of Each Category to PM_{10} Emissions under Alternative A for 2015" (p. 509) through Figure 4.7, "Contributions of Each Category to HAPs Emissions under Alternative A for 2015" (p. 515) above.

Reflecting the least amount of constraint on the development and use of physical resources, Alternative C includes the allowance for additional oil and natural gas wells to be developed, increased activity in fire, fuel, and vegetation management activities, and overall increases in mining activity for leasable minerals. For example, resource development activities would be restricted in Wilderness Study Areas, but would be allowed in special recreation management areas (SRMAs). Compared to the 2005 base year, emissions are estimated to increase substantially in 2015 and 2024 for all pollutants except VOC and HAP. For 2024, emissions of VOC and HAP are expected to decrease compared to 2005. VOC emissions increase slightly in 2015 and then decrease in 2024 compared to 2005. HAP emissions show a decrease in 2015 and further in 2024. The longer term decreases in VOC and HAP likely reflect the expected introduction of cleaner engine technology for off-road construction and maintenance engines and other equipment. Compared to 2005, emissions under this alternative are likely to contribute to ambient O_3 concentrations and total fine particulates, and overall impacts on air quality are expected to be the most of all of the alternatives. The increases in NO_X and $PM_{2.5}$ emissions could lead to increases in ambient O_3 concentrations and total fine particulates, including degraded visibility and increased deposition, and may possibly contribute to violations of the current WAAQS and NAAQS.

Table 4.8. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**13,413**	**3,089**	**2,266**	**182**	**7,836**	**1,216**	**143**
TOTAL – Cumulative	**13,892**	**3,178**	**3,307**	**281**	**8,133**	**1,555**	**193**
Percent Change over Base Year – Federal Lands Only	**95%**	**76%**	**143%**	**468%**	**128%**	**15%**	**-20%**
Percent Change over Base Year – Cumulative	**79%**	**71%**	**177%**	**710%**	**127%**	**1%**	**-29%**
Leasable Fluid Minerals – Natural Gas Development – Federal	49	11	159	1	71	270	41
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	369	45	102	2	49	90	16
Leasable Fluid Minerals – Oil Development – Federal	213	52	865	102	208	36	4
Total Fluid Minerals Develop-ment – Fed-eral	**632**	**107**	**1,125**	**105**	**328**	**396**	**61**
Leasable Fluid Minerals – Natural Gas Development – All	94	20	305	2	137	526	79
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	607	76	181	4	84	140	25

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Leasable Fluid Minerals – Oil Development – All	410	100	1,680	198	404	70	7
Total Fluid Minerals Develop-ment– All	**1,111**	**196**	**2,166**	**204**	**625**	**735**	**111**
Leasable Solid Minerals – Coal	5,700	1,759	630	1,507	23	---	---
Locatable Minerals – Bentonite Mining	3,111	438	47	2	70	8	1
Locatable Minerals – Uranium Mining	80	11	44	1	18	4	0
Salable Minerals – Sand, Gravel, and other Minerals	3,027	339	261	13	0	32	3
Total Non-Oil and Gas Minerals	**11,917**	**2,547**	**983**	**39**	**1,596**	**44**	**4**
Fire and Fuels Management	453	379	128	35	4,343	225	23
Forest Products	194	19	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	196	20	8	0	4	1	0
Land Re-sources – Travel and Transporta-tion Manage-ment	17	15	22	2	1,559	548	55

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

Table 4.9. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative C – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**13,643**	**3,180**	**2,111**	**182**	**7,914**	**1,044**	**125**
TOTAL – Cumulative	**14,155**	**3,273**	**3,174**	**280**	**8,222**	**1,433**	**183**
Percent Change over Base Year – Federal Lands Only	**98%**	**81%**	**126%**	**467%**	**130%**	**-1%**	**-30%**
Percent Change over Base Year – Cumulative	**82%**	**77%**	**166%**	**709%**	**130%**	**-7%**	**-33%**
Leasable Fluid Minerals – Natural Gas Development – Federal	55	12	180	1	82	317	47
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	252	33	85	2	38	55	11
Leasable Fluid Minerals – Oil Development – Federal	243	55	866	102	209	36	4
Total Fluid Minerals Develop-ment – Fed-eral	**550**	**100**	**1,131**	**105**	**329**	**408**	**62**

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Leasable Fluid Minerals – Natural Gas Development – All	105	23	350	2	159	621	92
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	485	63	163	3	72	106	21
Leasable Fluid Minerals – Oil Development – All	471	107	1,682	198	406	70	7
Total Fluid Minerals Develop-ment– All	**1,062**	**192**	**2,195**	**204**	**638**	**797**	**120**
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	3,109	437	23	2	61	7	1
Locatable Minerals – Uranium Mining	52	8	38	1	16	4	0
Salable Minerals – Sand, Gravel, and other Minerals	2,986	327	85	11	0	27	3
Total Non-Oil and Gas Minerals	**12,235**	**2,651**	**819**	**39**	**1,688**	**38**	**4**
Fire and Fuels Management	453	379	128	35	4,343	225	23
Forest Products	194	20	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	196	20	3	0	2	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Land Resources – Travel and Transportation Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	3	0	0	0	86	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

4.1.1.6. Alternative D

Alternative D represents a balance between resource use and resource conservation and the level of planned activities associated with Alternative D lies between the least amount of activity in Alternative B and the greatest amount of activity associated with Alternative C. Table 4.10, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2015" (p. 527) and Table 4.11, "Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2024" (p. 529) present the emission estimates for planned activities associated with Alternative D (Preferred Alternative) for 2015 and 2024, respectively. The relative contributions of the various activities to total emissions for Alternative D for 2015 and 2024 for PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO, VOC, and HAP are similar to those presented for Alternative A in Figure 4.1, "Contributions of Each Category to PM_{10} Emissions under Alternative A for 2015" (p. 509) through Figure 4.7, "Contributions of Each Category to HAPs Emissions under Alternative A for 2015" (p. 515) above.

Compared to the 2005 base year, emissions are estimated to increase in 2015 and 2024 for all pollutants except VOC and HAP, which are expected to decrease slightly in 2015 and decrease further in 2024. As seen in the other alternatives, the longer term decreases in VOC and HAP likely reflect the expected introduction of cleaner engine and fuel technology for off-road construction and maintenance engines and other equipment.

Compared to 2005, emissions under this alternative are likely to contribute to ambient O_3 concentrations and total fine particulates, affecting visibility and atmospheric deposition, with the magnitude of impacts between those of Alternative B and Alternative C. The expected level of impacts may possibly contribute to violations of the current 8-hour average ozone standard.

Table 4.10. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2015

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**9,886**	**2,449**	**1,894**	**140**	**5,366**	**1,019**	**124**
TOTAL – Cumulative	**10,437**	**2,545**	**2,946**	**238**	**6,050**	**1,380**	**178**
Percent Change over Base Year – Federal Lands Only	44%	40%	103%	336%	56%	-4%	-31%
Percent Change over Base Year – Cumulative	35%	37%	147%	588%	69%	-10%	-35%
Leasable Fluid Minerals – Natural Gas Development – Federal	46	10	150	1	68	260	39
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	283	33	66	1	34	76	14
Leasable Fluid Minerals – Oil Development – Federal	201	47	771	91	610	32	3
Total Fluid Minerals Develop-ment – Fed-eral	**531**	**90**	**987**	**93**	**711**	**368**	**56**
Leasable Fluid Minerals – Natural Gas Development – All	91	20	296	2	133	515	77
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	592	71	157	3	76	148	27

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Leasable Fluid Minerals – Oil Development – All	398	96	1,586	187	1,186	66	7
Total Fluid Minerals Develop-ment– All	**1,081**	**187**	**2,039**	**192**	**1,395**	**729**	**111**
Leasable Solid Minerals – Coal	5,700	1,759	630	23	1,507	---	---
Locatable Minerals – Bentonite Mining	1,448	231	33	1	50	6	1
Locatable Minerals – Uranium Mining	68	10	38	1	16	4	4
Salable Minerals – Sand, Gravel, and other Minerals	1,572	176	134	7	67	17	1
Total Non-Oil and Gas Minerals	**8,789**	**2,176**	**836**	**32**	**1,640**	**26**	**5**
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest Products	85	9	0	0	2	1	0
Land Resources – Rights-of-Way and Renewable Energy Projects	311	32	7	0	4	1	0
Land Re-sources – Travel and Transporta-tion Manage-ment	17	15	22	2	1,559	548	55

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

Table 4.11. Estimated Annual Emissions (tons/year) for Activities within the Buffalo Planning Area – Alternative D – 2024

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
TOTAL – Federal Lands Only	**10,098**	**2,541**	**1,824**	**140**	**5,419**	**827**	**102**
TOTAL – Cumulative	**10,614**	**2,635**	**2,889**	**239**	**6,231**	**1,216**	**160**
Percent Change over Base Year – Federal Lands Only	**47%**	**45%**	**96%**	**336%**	**57%**	**-22%**	**-43%**
Percent Change over Base Year – Cumulative	**37%**	**42%**	**142%**	**588%**	**74%**	**-21%**	**-41%**
Leasable Fluid Minerals – Natural Gas Development – Federal	50	11	167	1	76	297	44
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	132	17	45	1	20	28	5
Leasable Fluid Minerals – Oil Development – Federal	225	50	772	91	709	32	3

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Total Fluid Minerals Development – Federal	**408**	**78**	**984**	**93**	**805**	**357**	**53**
Leasable Fluid Minerals – Natural Gas Development – All	101	22	337	2	154	600	89
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	369	48	125	3	56	80	16
Leasable Fluid Minerals – Oil Development – All	453	101	1,587	187	1,407	66	7
Total Fluid Minerals Development– All	**923**	**171**	**2,049**	**192**	**1,616**	**746**	**111**
Leasable Solid Minerals – Coal	6,088	1,879	672	25	1,610	---	---
Locatable Minerals – Bentonite Mining	1,448	230	17	1	43	5	0
Locatable Minerals – Uranium Mining	45	7	33	1	14	3	3
Salable Minerals – Sand, Gravel, and other Minerals	1,549	170	44	6	29	14	1
Total Non-Oil and Gas Minerals	**9,129**	**2,286**	**765**	**33**	**1,696**	**22**	**4**
Fire and Fuels Management	151	126	43	12	1,448	75	8
Forest Products	85	9	0	0	2	1	0

Resource	Criteria Pollutants					Organics & Toxics	
	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	HAPs
Land Resources – Rights-of-Way and Renewable Energy Projects	311	32	3	0	2	1	0
Land Resources – Travel and Transportation Management	11	10	30	3	1,463	371	37
Livestock Grazing Management	3	0	0	0	3	0	0

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

4.1.1.7. Cumulative Impacts

Analysis of Cumulative Impacts

Because no air quality modeling was conducted as part of this analysis, cumulative impacts to air quality over the life of the plan were analyzed for each alternative by comparing cumulative emissions with statewide emission totals. The 2005 Wyoming DEQ statewide emissions inventory for 42 different source categories was obtained from the EPA National Emissions Inventory (EPA 2005). Emissions from various resources reflecting BLM actions and activities, non-BLM activities (for oil, natural gas, and CBNG development), and the cumulative totals for the planning area are compared to Wyoming statewide emissions for all anthropogenic sources in Table 4.12, "Comparison of Emissions from BLM and Non-BLM Activities in the Buffalo Planning Area to Cumulative Annual Statewide Emissions for 2005" (p. 532) for 2005 and for each of the 2015 alternatives. Due to the uncertainty inherent in estimating emissions beyond 10 years or so in the future, comparisons are not made with the 2024 emission estimates. The totals for 2005 and each of the alternatives show that emissions from BLM-managed activities in the Buffalo planning area are 3% or less of statewide totals.

Emissions for BLM and non-BLM activities for natural gas, oil, and CBNG development were computed based on information provided by BLM. Information on non-federal activities was not provided for any of the other resources. Also, because of the way the emissions were calculated for Travel and Transportation Management (e.g., for public use of snowmobiles and ATVs, etc.), these activities were assumed to take place on federal and non-federal lands. As such, the emissions included under the non-BLM actions in Table 4.12, "Comparison of Emissions from BLM and Non-BLM Activities in the Buffalo Planning Area to Cumulative Annual Statewide

Emissions for 2005" (p. 532) represent those activities from non-federal oil, natural gas, and CBNG development only.

In examining the emission totals, it is evident that the concentrations of CO, NO_X, and SO_2 (and to a lesser extent $PM_{2.5}$ and PM_{10}) in the planning could potentially increase slightly in certain areas, but would not likely contribute to exceedances of the air quality standards. Through 2011, the peak O_3 concentration in the planning area was 82% of the 8-hour ozone standard, while peak 24-hour and annual $PM_{2.5}$ and peak 24-hour PM_{10} concentrations were less than 70% of the applicable standards. If the existing NAAQS for O_3 is lowered in the near future by EPA, this may become an important issue in the planning area. Because the emissions from BLM activities in the planning area are relatively small compared to state totals, the potential cumulative impacts on atmospheric deposition and lake acidification would likely not change significantly over the course of the plan. Likewise, total nitrogen and sulfur deposition would likely be the same and would not exceed levels of concern and impacts on visibility would likely be minimal over the life of the plan.

For specific future proposed large-scale development projects (i.e., development of a new natural gas field) in the planning area, the BLM will likely require a more refined assessment of incremental and cumulative impacts using appropriate air quality modeling tools. These tools are able to simulate both incremental and cumulative impacts of emissions from a variety of anthropogenic and biogenic sources contributing to observed air quality in the planning area including impacts on concentrations, deposition, and visibility. The BLM will continue to work with the EPA and the State of Wyoming to ensure that emissions from activities on BLM-administered land do not contribute to any violations of the applicable NAAQS or Wyoming ambient air quality standards.

Table 4.12. Comparison of Emissions from BLM and Non-BLM Activities in the Buffalo Planning Area to Cumulative Annual Statewide Emissions for 2005

Pollutant	Estimated BLM Emissions in the Buffalo Planning Area (tons per year)	Estimated Non-BLM Emissions in the Buffalo Planning Area (tons per year)	2005 Wyoming Statewide Emissions (tons per year)	Total (tons per year)	Percent Contribution of Activities within the Buffalo Planning Area Emissions to Statewide Emissions
Base Year - 2005					
PM_{10}	6,889	868	846,689	854,446	0.91
$PM_{2.5}$	1,754	99	133,849	135,702	1.37
NO_X	933	261	185,813	187,007	0.64
SO_2	32	3	122,389	122,424	0.03
CO	3,441	139	399,257	402,837	0.89
VOCs	1,059	479	79,575	81,113	1.90
Alternative A - 2015					
PM_{10}	8,913	599	846,689	856,201	1.11
$PM_{2.5}$	2,271	102	133,849	136,222	1.74
NO_X	1,778	1,059	185,813	188,651	1.50
SO_2	137	99	122,389	122,625	0.19
CO	4,852	308	399,257	404,417	1.28
VOCs	997	377	79,575	80,949	1.70
Alternative B - 2015					
PM_{10}	7,200	620	846,689	854,509	0.92

Pollutant	Estimated BLM Emissions in the Buffalo Planning Area (tons per year)	Estimated Non-BLM Emissions in the Buffalo Planning Area (tons per year)	2005 Wyoming Statewide Emissions (tons per year)	Total (tons per year)	Percent Contribution of Activities within the Buffalo Planning Area Emissions to Statewide Emissions
$PM_{2.5}$	1,966	104	133,849	135,919	1.52
NO_X	813	1,061	185,813	187,687	1.00
SO_2	31	99	122,389	122,519	0.11
CO	3,514	310	399,257	403,081	0.95
VOCs	807	383	79,575	80,765	1.47
Alternative C - 2015					
PM_{10}	13,413	479	846,689	860,581	1.61
$PM_{2.5}$	3,089	89	133,849	137,027	2.32
NO_X	2,266	1,041	185,813	189,120	1.75
SO_2	182	99	122,389	122,670	0.23
CO	7,836	297	399,257	407,390	2.00
VOCs	1,216	339	79,575	81,130	1.92
Alternative D - 2015					
PM_{10}	9,886	551	846,689	857,126	1.22
$PM_{2.5}$	2,449	97	133,849	136,394	1.87
NO_X	1,894	1,052	185,813	188,759	1.56
SO_2	140	99	122,389	122,627	0.19
CO	5,366	684	399,257	405,307	1.49
VOCs	1,019	361	79,575	80,955	1.70

4.1.1.8. Analysis of Greenhouse Gases

Concentrations of certain gases in the earth's atmosphere have been identified as being effective at trapping heat reflected off the earth's surface thereby creating a "greenhouse effect." As concentrations of these greenhouse gases (GHG) increase, the atmosphere warms, the composition of the atmosphere changes and global climate is affected. Concentrations of GHG have increased dramatically in the earth's atmosphere in the past century. Anthropogenic (man-made) sources and other human activities have been attributed by EPA and others to these increases particularly for CO_2, CH_4, N_2O, and fluorinated gases (DOI 2010).

The EPA has determined that six GHG are air pollutants and subject to regulation under the Clean Air Act: CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Of these GHG, CO_2, CH_4, N_2O are commonly emitted by the types of activities included in this analysis, while the remaining three GHG are emitted in extremely small quantities or are not emitted at all. Greenhouse gas emissions from management actions and activities were estimated for each alternative in this analysis for CO_2, CH_4, and N_2O.

As the major component of natural gas, CH_4 emissions from and oil and gas exploration, production, and transportation can be considerable. Emissions of CH_4 from the extraction of coal from surface mines can also be significant. Emissions of CO_2 and N_2O from fossil fuel combustion and fire can also be of concern. This analysis quantified emissions of CO_2, CH_4, and N_2O from the management actions and activities for each alternative for all of the resources listed above.

Each GHG component has been given a Global Warming Potential (GWP) number that takes into account the intensity of the substance's heat trapping effect and its longevity in the atmosphere

as compared to CO_2. This analysis used the EPA GWPs of 21 for CH_4, and 310 for N_2O. The estimated quantity emitted for each GHG was multiplied by its GWP and summed with the other GHG to obtain total GHG emitted in carbon dioxide equivalents (CO_2eq) in short tons. CO_2eq were then converted to million metric tonnes (MMt), the typical reporting unit for GHG emissions. Table 4.13, "Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for Activities within the Buffalo Planning Area" (p.)" shows the estimated annual emissions of the GHG for each alternative. Appendix M (p. 1827) includes additional details on the GHG emissions calculations.

Table 4.13. Estimated Annual Greenhouse Gas Emissions (tons per year) Summary for Activities within the Buffalo Planning Area

	Greenhouse Gases				
Scenario	**CO_2**	**CH_4**	**N_2O**	**CO_2 equivalents**	**CO_2 equivalents (million metric tons)**
Base Year – 2005					
Base Year	171,773	443,593	3	9,488,308	8.63
Forecast Year – 2015					
Alternative A	238,700	486,815	8	10,464,339	9.50
Alternative B	168,872	486,590	3	10,388,272	9.43
Alternative C	318,894	483,473	18	10,477,394	9.51
Alternative D	269,562	485,307	8	10,463,527	9.50
Forecast Year – 2024					
Alternative A	243,043	497,885	8	10,701,162	9.72
Alternative B	153,937	494,081	3	10,530,625	9.56
Alternative C	330,865	504,537	18	10,931,730	9.93
Alternative D	274,398	500,008	8	10,777,098	9.79

Source: Appendix M (p. 1827)

CO_2 carbon dioxide
CH_4 methane
N_2 O nitrous oxide

Alternative C shows the highest increases in GHG emissions due primarily to the higher projected oil and gas production activities. The total GHG emissions for all of the alternatives are fairly comparable because they are dominated by CH_4 emissions from surface coal mining operations in the PRB. Oil and gas production is the second major contributor to GHG emissions for all alternatives. The largest sources of GHG emissions within the oil and gas sector include CO_2 emissions from natural gas compressors and drill rig engines, and fugitive CH_4 emissions from wellhead equipment, pneumatic devices and tanks. The estimated GHG emissions are based on "worst case" estimates of production rates and operational characteristics and likely result in overestimated total GHG emissions. Considerable reductions in these estimated emissions may be realized at the time of actual development through control technologies such as electric compressor engines, "green completions," low or no bleed pneumatic devices, and capture and control of leaks and vents.

Table 4.14, "Buffalo Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions " (p. 535) shows the comparison of project related GHG emissions for each of the alternatives to a statewide inventory of GHG emissions that was completed in 2007. The inventory was compiled for the Wyoming DEQ by the Center for Climate Strategies and was based on actual emissions for 2005 and projected emissions for 2010 and 2020. GHG emissions estimated for each of the alternatives comprise approximately 13% of statewide GHG emissions.

This is driven mainly by CH_4 emissions associated with surface coal mining in the PRB. The total estimated GHG emissions for 2015 for Alternative D (Preferred Alternative) of 9.17 million metric tons (MMt) are approximately equal to 0.13% of the total U.S. 2008 GHG emissions of 6,956 MMt (EPA 2010). Assessing the impacts of GHG emissions on global climate change requires modeling on a global scale which is beyond the scope of this analysis. Potential impacts on climate change are influenced by GHG emission sources from around the globe and it is not possible to distinguish the impacts to global climate change from GHG emissions originating from the planning area.

Table 4.14. Buffalo Planning Area GHG Emissions as Percentage of Wyoming Statewide GHG Emissions

Buffalo Planning Area		Wyoming Statewide Inventory		Percent Contribution
Scenario	**Estimated GHG Emissions (MMt CO_2 equivalents)**	**Year**	**Estimated GHG Emissions (MMt CO_2 equivalents)**	**BFO GHGs to Wyoming GHGs**
Base Year -2005	8.63	Actual Estimated 2005	55.6	15.5%
Alternative A -2015	9.50	Projected 2020	69.4	13.7%
Alternative B -2015	9.43	Projected 2020	69.4	13.6%
Alternative C -2015	9.51	Projected 2020	69.4	13.7%
Alternative D -2015	9.50	Projected 2020	69.4	13.7%

Source: Center for Climate Strategies 2007

BFO Buffalo Field Office
CO_2 carbon dioxide
GHG greenhouse gas
MMt million metric tons

Table 4.15, "Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005" (p. 535) presents greenhouse gas emission estimations for the 2005 base year for all resource activities, and Table 4.16, "Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative A – 2015" (p. 537) through Table 4.23, "Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative D – 2024" (p. 545) present this information for each of the alternatives for 2015 and 2024. As noted above, the largest sources of CO_2 emissions are from activities associated with the development of leasable fluid minerals while the largest source of CH_4 emissions is from coal mining operations in the PRB.

Table 4.15. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Base Year 2005

Resource	Greenhouse Gases			
	CO_2	**CH_4**	**N_2O**	**CO_2 Equivalents**
TOTAL – Federal Lands Only	**91,489**	**400,025**	**3**	**8,492,899**
TOTAL – Cumulative	**171,773**	**443,593**	**3**	**9,488,308**
Leasable Fluid Minerals – Natural Gas Development – Federal	38,256	1,562	0	71,166

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	22,079	23,053	0	506,244
Leasable Fluid Minerals – Oil Development – Federal	1,036	0	0	1,043
Leasable Fluid Minerals – Federal	**61,371**	**24,615**	**1**	**578,452**
Leasable Fluid Minerals – Natural Gas Development – All	72,278	2,950	1	134,437
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	67,738	65,232	1	1,437,769
Leasable Fluid Minerals – Oil Development – All	1,640	0	0	1,655
Total Fluid Minerals Development – All	**141,655**	**68,183**	**1**	**1,573,861**
Leasable Minerals – Coal	---	374,975	---	7,874,484
Locatable Minerals – Bentonite Mining	1,101	0	0	1,102
Locatable Minerals – Uranium Mining	1,256	0	0	1,262
Salable Minerals – Sand, Gravel, and other Minerals	18,170	0	---	18,174
Total Non-Oil and Gas Minerals	**20,528**	**374,946**	**0**	**7,895,022**
Fire and Fuels Management	13	37	2	1,502
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	1,508	0	---	1,508
Land Resources – Travel and Transportation Management	7,965	8	---	8,132
Livestock Grazing Management	75	389	---	8,253
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.16. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative A – 2015

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**132,480**	**468,929**	**6**	**9,982,001**
TOTAL – Cumulative	**238,700**	**486,8155**	**8**	**10,464,339**
Leasable Fluid Minerals – Natural Gas Development – Federal	50,073	1,867	0	89,419
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	12,420	12,264	0	269,984
Leasable Fluid Minerals – Oil Development – Federal	36,232	610	1	49,371
Leasable Fluid Minerals – Federal	**98,726**	**14,740**	**2**	**408,774**
Leasable Fluid Minerals – Natural Gas Development – All	50,073	1,867	0	89,419
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	34,230	27,808	0	618,281
Leasable Fluid Minerals – Oil Development – All	72,883	1,186	2	98,462
Total Fluid Minerals Development – All	**204,945**	**32,626**	**3**	**891,112**
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	1,130	0	0	1,130
Locatable Minerals – Uranium Mining	1,734	0	0	1,740
Salable Minerals – Sand, Gravel, and other Minerals	18,435	0	---	18,437
Total Non-Oil and Gas Minerals	**21,299**	**453,714**	**0**	**9,549,295**
Fire and Fuels Management	9	79	5	3,157
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	543	0	---	543

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Land Resources – Travel and Transportation Management	11,799	7	---	11,952
Livestock Grazing Management	75	389	---	8,253
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.17. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative A – 2024

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**134,105**	**468,906**	**6**	**10,361,127**
TOTAL – Cumulative	**243,043**	**497,885**	**8**	**10,701,162**
Leasable Fluid Minerals – Natural Gas Development – Federal	57,505	2,170	1	103,240
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	2,992	1,474	0	33,955
Leasable Fluid Minerals – Oil Development – Federal	36,199	709	1	51,420
Leasable Fluid Minerals – Federal	**96,696**	**4,353**	**2**	**188,616**
Leasable Fluid Minerals – Natural Gas Development – All	114,450	4,309	1	205,266
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	18,334	9,616	0	220,302
Leasable Fluid Minerals – Oil Development – All	72,850	1,407	2	107,083
Total Fluid Minerals Development – All	**205,634**	**15,332**	**3**	**528,651**
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	1,130	0	0	1,130
Locatable Minerals – Uranium Mining	1,196	0	0	1,200

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Salable Minerals – Sand, Gravel, and other Minerals	18,439	0	---	18,441
Total Non-Oil and Gas Minerals	**20,764**	**481,282**	**0**	**10,127,677**
Fire and Fuels Management	9	79	5	3,157
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	1,658	0	---	1,658
Land Resources – Travel and Transportation Management	13,131	6	---	13,247
Livestock Grazing Management	1,818	1,187	---	26,724
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.18. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative B – 2015

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**61,654**	**467,395**	**2**	**9,877,448**
TOTAL – Cumulative	**168,872**	**486,590**	**3**	**10,388,272**
Leasable Fluid Minerals – Natural Gas Development – Federal	30,622	1,250	0	56,949
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	10,562	11,609	0	254,377
Leasable Fluid Minerals – Oil Development – Federal	834	407	0	9,378
Leasable Fluid Minerals – Federal	**42,018**	**13,265**	**0**	**320,705**
Leasable Fluid Minerals – Natural Gas Development – All	78,342	3,014	1	141,855
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	33,410	28,463	0	631,203

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Leasable Fluid Minerals – Oil Development – All	37,484	983	1	58,469
Total Fluid Minerals Development – All	**149,237**	**32,459**	**2**	**831,528**
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	563	0	0	564
Locatable Minerals – Uranium Mining	867	0	0	871
Salable Minerals – Sand, Gravel, and other Minerals	5,793	0	---	5,793
Total Non-Oil and Gas Minerals	**7,222**	**453,714**	**0**	**9,535,212**
Fire and Fuels Management	1	20	1	788
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	508	0	---	508
Land Resources – Travel and Transportation Management	11,799	7	---	11,952
Livestock Grazing Management	76	389	---	8,254
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.19. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative B – 2024

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**45,152**	**483,102**	**1**	**10,190,750**
TOTAL – Cumulative	**153,937**	**494,081**	**3**	**10,530,625**
Leasable Fluid Minerals – Natural Gas Development – Federal	22,966	936	0	42,694
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	562	165	0	4,032

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Leasable Fluid Minerals – Oil Development – Federal	868	305	0	7,276
Leasable Fluid Minerals – Federal	**24,396**	**1,406**	**0**	**54,002**
Leasable Fluid Minerals – Natural Gas Development – All	79,864	3,075	1	144,667
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	15,797	8,307	0	190,271
Leasable Fluid Minerals – Oil Development – All	37,519	1,003	1	58,939
Total Fluid Minerals Development – All	**133,181**	**12,385**	**2**	**393,877**
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	563	0	0	564
Locatable Minerals – Uranium Mining	598	0	0	601
Salable Minerals – Sand, Gravel, and other Minerals	5,794	0	---	5,974
Total Non-Oil and Gas Minerals	**6,955**	**481,281**	**0**	**10,113,865**
Fire and Fuels Management	1	20	1	788
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	564	0	---	564
Land Resources – Travel and Transportation Management	13,131	6	---	13,247
Livestock Grazing Management	76	389	---	8,254
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.20. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative C – 2015

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**219,212**	**472,733**	**16**	**10,151,662**
TOTAL – Cumulative	**318,894**	**483,473**	**18**	**10,477,394**
Leasable Fluid Minerals – Natural Gas Development – Federal	51,803	1,922	0	92,308
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	22,543	15,836	0	355,155
Leasable Fluid Minerals – Oil Development – Federal	39,382	628	1	52,929
Leasable Fluid Minerals – Federal	**113,727**	**18,386**	**2**	**500,391**
Leasable Fluid Minerals – Natural Gas Development – All	99,565	3,687	1	177,262
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	37,812	24,236	0	546,842
Leasable Fluid Minerals – Oil Development – All	76,032	1,204	2	102,020
Total Fluid Minerals Development – All	**213,409**	**29,126**	**3**	**826,124**
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	14,867	0	0	14,875
Locatable Minerals – Uranium Mining	3,036	0	0	3,046
Salable Minerals – Sand, Gravel, and other Minerals	73,556	0	---	73,565
Total Non-Oil and Gas Minerals	**91,459**	**453,715**	**0**	**9,619,470**
Fire and Fuels Management	27	236	14	9,470
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	2,094	0	---	2,094

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Land Resources – Travel and Transportation Management	11,800	7	---	11,953
Livestock Grazing Management	76	389	---	8,254
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.21. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative C – 2024

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**222,222**	**493,557**	**16**	**10,591,989**
TOTAL – Cumulative	**330,865**	**504,537**	**18**	**10,931,730**
Leasable Fluid Minerals – Natural Gas Development – Federal	60,577	2,280	1	108,629
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	16,237	8,620	0	197,282
Leasable Fluid Minerals – Oil Development – Federal	39,342	745	1	55,348
Leasable Fluid Minerals – Federal	**116,156**	**11,645**	**2**	**361,258**
Leasable Fluid Minerals – Natural Gas Development – All	117,526	4,419	1	210,659
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	31,280	16,761	0	383,330
Leasable Fluid Minerals – Oil Development – All	75,993	1,443	2	107,011
Total Fluid Minerals Development – All	**224,800**	**22,624**	**4**	**700,999**
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	14,876	0	0	14,876
Locatable Minerals – Uranium Mining	2,094	0	0	2,101

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Salable Minerals – Sand, Gravel, and other Minerals	73,571	0	---	73,578
Total Non-Oil and Gas Minerals	**90,534**	**481,282**	**0**	**10,197,461**
Fire and Fuels Management	279	236	14	9,470
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	2,267	0	---	2,268
Land Resources – Travel and Transportation Management	13,132	6	---	13,248
Livestock Grazing Management	76	389	---	8,254
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.22. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative D – 2015

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**165,993**	**470,390**	**6**	**10,046,180**
TOTAL – Cumulative	**269,562**	**485,307**	**8**	**10,463,5227**
Leasable Fluid Minerals – Natural Gas Development – Federal	49,492	1,849	0	88,454
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	16,622	13,748	0	305,362
Leasable Fluid Minerals – Oil Development – Federal	35,163	604	1	48,166
Leasable Fluid Minerals – Federal	**101,277**	**16,200**	**2**	**441,982**
Leasable Fluid Minerals – Natural Gas Development – All	97,255	3,613	1	173,408
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	35,777	26,324	0	588,663

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Leasable Fluid Minerals – Oil Development – All	71,814	1,180	2	97,257
Total Fluid Minerals Development – All	**204,846**	**31,117**	**3**	**859,329**
Leasable Minerals – Coal	---	453,714	---	9,527,984
Locatable Minerals – Bentonite Mining	10,533	0	0	10,539
Locatable Minerals – Uranium Mining	2,605	0	0	2,614
Salable Minerals – Sand, Gravel, and other Minerals	37,789	0	---	37,794
Total Non-Oil and Gas Minerals	**50,928**	**453,714**	**0**	**9,578,931**
Fire and Fuels Management	9	79	5	3,157
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	1,871	0	---	1,871
Land Resources – Travel and Transportation Management	11,800	7	---	11,953
Livestock Grazing Management	78	389	---	8,257
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

Table 4.23. Estimated Annual Emissions (tons/year) for Activities in the Buffalo Planning Area – Alternative D – 2024

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
TOTAL – Federal Lands Only	**165,519**	**489,029**	**6**	**10,437,122**
TOTAL – Cumulative	**274,398**	**500,008**	**8**	**10,777,098**
Leasable Fluid Minerals – Natural Gas Development – Federal	56,479	2,134	1	101,448
Leasable Fluid Minerals – Coalbed Natural Gas Development – Federal	8,492	4,442	0	101,800

Resource	Greenhouse Gases			
	CO_2	CH_4	N_2O	CO_2 Equivalents
Leasable Fluid Minerals – Oil Development – Federal	35,132	697	1	50,093
Leasable Fluid Minerals – Federal	**100,102**	**7,273**	**2**	**253,341**
Leasable Fluid Minerals – Natural Gas Development – All	113,427	4,273	1	203,477
Leasable Fluid Minerals – Coalbed Natural Gas Development – All	23,770	12,584	0	288,084
Leasable Fluid Minerals – Oil Development – All	71,783	1,395	2	101,756
Total Fluid Minerals Development – All	**208,981**	**18,252**	**3**	**593,317**
Leasable Minerals – Coal	---	481,281	---	10,106,906
Locatable Minerals – Bentonite Mining	10,534	0	0	10,540
Locatable Minerals – Uranium Mining	1,798	0	0	1,804
Salable Minerals – Sand, Gravel, and other Minerals	37,797	0	---	37,801
Total Non-Oil and Gas Minerals	**50,130**	**481,282**	**0**	**10,157,051**
Fire and Fuels Management	9	79	5	3,157
Forest Products	29	0	---	29
Land Resources – Rights-of-Way and Renewable Energy Projects	2,039	0	---	2,039
Land Resources – Travel and Transportation Management	13,132	6	---	13,248
Livestock Grazing Management	78	389	---	8,257
CO_2 carbon dioxide CH_4 methane N_2O nitrous oxide				

4.1.1.9. Conclusions

For this analysis, emissions were estimated for the proposed management actions in each alternative for five criteria pollutants (PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO), VOCs, HAPs, and the following GHGs: CO_2, CH_4, and N_2O. Emissions were estimated for the base year (2005) while emissions for all alternatives were estimated for 2015 and 2024, the latter two years reflecting short-term and long-term estimates, respectively. Table 4.24, "Estimated Annual Emissions

Summary (tons/year) for Activities within the Buffalo Planning Area ” (p. 547) presents emission totals by pollutant for each of the alternatives. This information is displayed graphically in Figure 4.8, “Emission Estimates for 2015 from Activities within the Buffalo Planning Area” (p. 547) and Figure 4.9, “Emission Estimates for 2024 from Activities within the Buffalo Planning Area” (p. 548).

Estimated emissions for the years 2015 and 2024 were compared to base year emissions to determine the expected future change in emission levels for each alternative. For the majority of the pollutants examined, emissions are estimated to increase compared to base year levels for all alternatives except Alternative B, which shows either similar values in the future years or decreases in emissions compared to 2005. The increases in emissions for all other alternatives reflect expected projected increases primarily in oil and natural gas development and other mineral development activity in the area.

An examination of emissions from all activities shows that the Alternative B estimates would be the lowest of the alternatives because this alternative includes the greatest constraints on resource development and use, especially for oil, natural gas, and mineral development. Because of this, Alternative B would result in the least amount of impacts to air quality resources. Compared to 2005 totals, Alternative B shows increases in PM_{10}, $PM_{2.5}$, NO_X, CO, and SO_2 emissions in both future years, and a slight decrease in VOC and HAPs emissions. The largest estimated increases in emissions are expected from Alternative C because this alternative reflects the least amount of constraints on natural resource development and the greatest amount of development and resource use. As such, Alternative C is expected to result in the highest impacts on air quality resources in the planning area.

Table 4.24. Estimated Annual Emissions Summary (tons/year) for Activities within the Buffalo Planning Area

	Criteria Pollutants					Toxics & Organics	
Scenario	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**SO_2**	**CO**	**VOC**	**HAPs**
Base Year – 2005							
Base Year	7,757	1,853	1,194	35	3,580	1,538	273
Forecast Year – 2015							
Alternative A	9,512	2,373	2,838	236	5,160	1,374	176
Alternative B	7,820	2,070	1,874	130	3,824	1,190	153
Alternative C	13,892	3,178	3,307	281	8,133	1,555	193
Alternative D	10,437	2,545	2,946	238	6,050	1,380	178
Forecast Year – 2024							
Alternative A	9,775	2,474	2,844	237	5,226	1,195	155
Alternative B	7,871	2,150	1,865	131	3,796	912	117
Alternative C	14,155	3,273	3,174	280	8,222	1,433	183
Alternative D	10,614	2,635	2,889	239	6,231	1,216	160

Source: Appendix M (p. 1827)

PM_{10} particulate matter less than 10 microns in diameter
$PM_{2.5}$ particulate matter less than 2.5 microns in diameter
NO_X nitrogen oxides
SO_2 sulfur dioxide
CO carbon monoxide
VOC volatile organic compound
HAPs hazardous air pollutants

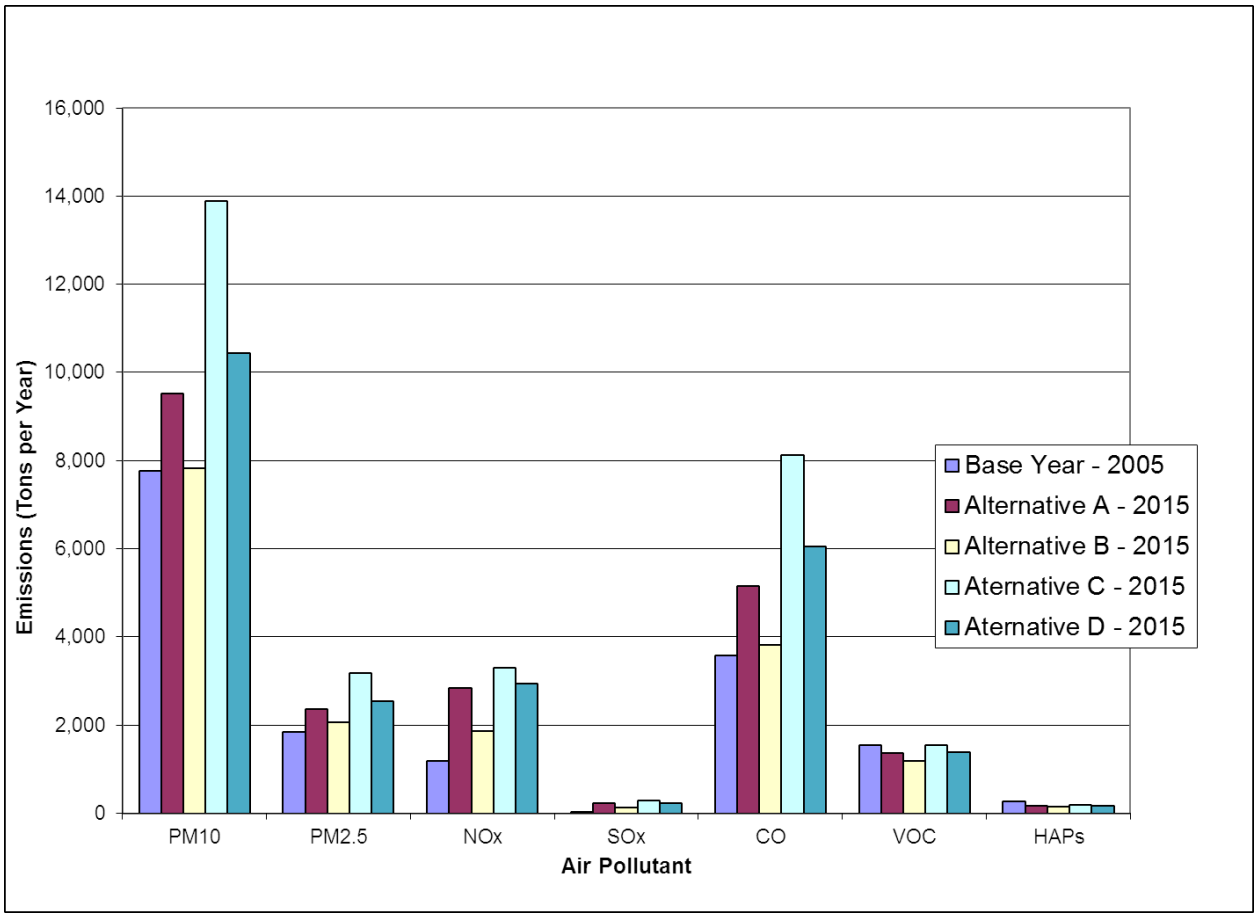

Figure 4.8. Emission Estimates for 2015 from Activities within the Buffalo Planning Area

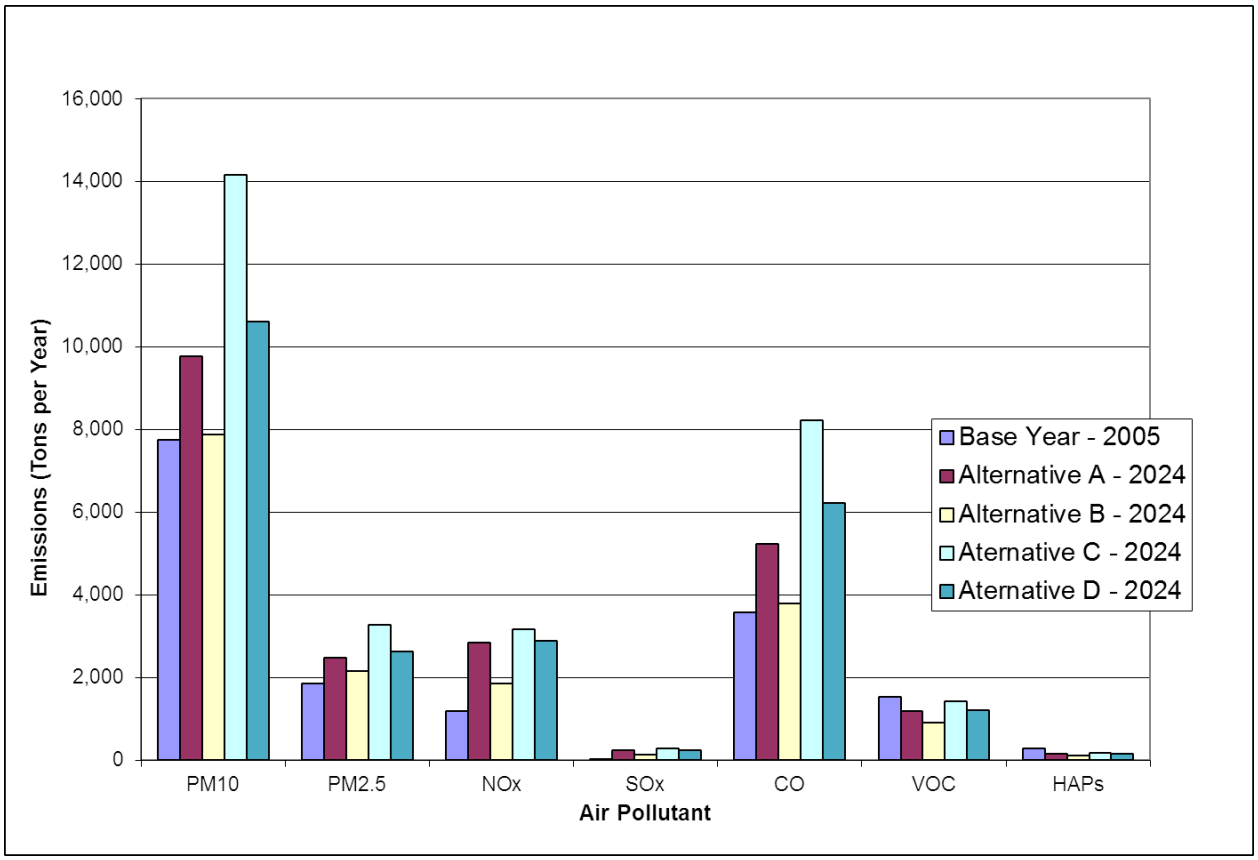

Figure 4.9. Emission Estimates for 2024 from Activities within the Buffalo Planning Area

Table 4.25, "Summary of Impacts to Air Quality Resources" (p. 549) provides a summary of the expected impacts on Air Quality from the other resources in the planning area. As noted above, energy development activities of leasable fluid and solid minerals include sources and equipment that contribute the majority of emissions in the planning area, while a number of other resources have negligible or no impacts on Air Quality within the area.

Table 4.25. Summary of Impacts to Air Quality Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Minor adverse	Minor beneficial	Minor adverse	Minor adverse
Water Resources	No effect	No effect	No effect	No effect
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Fluids	Minor adverse	Negligible adverse	Minor adverse	Minor adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Unplanned Fire (Wildfire)	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Planned Fire (Prescribed Fire)	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	No effect	No effect	No effect	No effect
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Wildlife	No effect	No effect	No effect	No effect
Special Status Species – Plants	No effect	No effect	No effect	No effect
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	No effect	No effect	No effect	No effect
Heritage and Visual Resources				
Cultural Resources	No effect	No effect	No effect	No effect
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Minor adverse	Minor beneficial	Minor adverse	Minor adverse
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Minor adverse	Minor adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Rights-of-Way and Corridors	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Travel and Transportation Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Recreation	No effect	No effect	No effect	No effect
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	Minor adverse	Minor beneficial	Minor adverse	Minor adverse
Special Designations				
Areas of Critical Environmental Concern	No effect	Minor beneficial	No effect	Minor beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.1.2. Geological Resources

As discussed in Chapter 3, none of the geological features occurring on public lands in the planning area are considered unique enough to warrant special management or conservation measures. Therefore, the geological resources of the planning area consist of mineral resources. See the *Mineral Resources* section, and the subsections under that for information regarding anticipated impacts to the three main mineral classifications (Locatables, Leasables, and Salables). See the *Paleontological Resources* section for anticipated impacts to the Dry Creek Petrified Tree Environmental Education Area (EEA) (containing public lands with exposed portions of petrified trees), and the *Cave and Karst Resources* section for anticipated impacts to cave and karst resources. See the *Health and Safety* section for anticipated impacts to various geological and natural hazards occurring in the planning area.

4.1.3. Soil

This section describes potential effects on soils in the planning area from BLM management of resources and resource uses under the alternatives. The *Soil* section of Chapter 3 describes existing soil conditions. 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. Conversely, actions that avoid or minimize soil compaction or erosion, stabilize soil, or increase soil productivity are considered beneficial.

4.1.3.1. Methods and Assumptions

For purposes of this broad-scale analysis, the primary indicator of adverse effects on soil resources is the amount of surface disturbance from management decisions for soils and other resources, particularly surface disturbance on soils with a severe erosion hazard, soils with limited reclamation potential, soils with low reclamation suitability, and steep slopes. This chapter cumulatively refers to these areas as sensitive soils. The analysis of effects on soil resources is based on the factors contributing to site degradation and their inherent risks. The types of projected effects on soils under the alternatives are similar; however, the potential amount of acres disturbed is anticipated to vary by specific allowable uses and management actions associated with individual alternatives, as described below. The projected amount of surface disturbance in the planning area is identified in the *Reasonable Foreseeable Development and Reasonable Foreseeable Action Scenarios* (see Appendix G (p. 1671)).

Short-term adverse effects on soils would result during initial surface disturbance before revegetation is completed, or before practices are implemented or structures installed to minimize erosion. There would be long-term adverse effects due to accelerated erosion in locations where bare soils were allowed to remain exposed to water and wind. Other long-term adverse

effects would be due in part to changes in vegetative communities, and the loss of productivity in areas where facilities and structures remove or greatly alter the soil profile, restricting the reestablishment of vegetation.

Assumptions

- Spatial analysis was conducted using the Natural Resource Conservation Service (NRCS) Soil Data Viewer ArcGIS Extension and the Environmental Systems Research Institute, Inc., ArcGIS Desktop 9.3 computer software using the NRCS Soil Survey Geographic Database (SSURGO) datasets. Effects are described qualitatively and, where possible quantitatively.
- The BLM would use published and preliminary (NRCS 2011b) county soil survey information to predict soil behavior, limitations, or suitability for a given activity or action. NRCS SSURGO soils data, properties, suitabilities, limitations, and local, regional and national interpretations are used for analysis.
- For analysis purposes with the geographic information systems (GIS) tools described above, if a Soil Map Unit (SMU) has a severe management hazard rating, the entire (SMU) is rated severe. However, there could be areas in the (SMU) that could have a rating of slight or moderate.
- Any disturbance proposed on a soil identified as a "sensitive soil" has the potential to have a major impact to the soil resource, since soil erosion affects an area larger than the physical disturbance. Reclamation in these areas is challenging. Extra steps are necessary to conserve the soil resource.
- Surface disturbance on sensitive soils is distributed across the landscape in the same proportion the soils occur on the land. In other words, if five percent of the soils in the planning area are highly erosive, it is assumed that five percent of the projected total disturbance would occur on highly erosive soils. In general on BLM-administered surface in the planning area, 28% of the soils have high erosion potential. This assumption applies only to Alternative C, which allows for unrestricted surface disturbance throughout the planning area.
- For analysis purposes, water erosion is the primary mechanism for loss of soil productivity.
- For analysis purposes with the GIS tools described above, miscellaneous areas such as badlands, rock outcrops, and areas susceptible to mass movement (SMU) were filtered by most limiting; therefore, any map unit symbol with a miscellaneous area would be identified. The area consisting of the miscellaneous component would be substantially less.
- The BLM will use soil survey data and interpretations to predict soil behavior, limitation, or suitability for a given activity or action. Soil interpretations are developed by the cooperators in the National Cooperative Soil Survey (NCSS) and maintained by the NRCS. Soil interpretations (see Glossary) are ever evolving; therefore, as new or updated soil interpretations become available they would supersede prior interpretations. Soil interpretations do not preclude activities or actions, rather, they provide a reasonable guide to the risks, limitations, and probable outcomes of a particular use or practice. The information is not site-specific and does not eliminate the need for onsite investigation of the soil.
- Roads and trails would be properly designed and built in accordance with BLM Manual 9113 (BLM 1985b).
- Linear disturbances such as pipelines, utility corridors, and transmission lines will be managed consistent with other resource requirements and BMP's including but not limited to corridors and collocating disturbances.

Significance Criteria

In addition to the scale of effects identified at the beginning of Chapter 4, soil erosion increases where associated vegetative communities would no longer be supported at their current community composition and cover would potentially be significant.

4.1.3.2. Impacts Common to All Alternatives

Soil (major beneficial)
Using soils surveys and onsite investigations would ensure proper use of soil resources. Applying appropriate mitigation (including project relocation or denial) and requiring an approved reclamation plan would ensure all disturbances were effectively remediated to BLM standards. The soils management actions common to all alternatives would have a major beneficial effect on soil resources.

Physical Resources

Management actions common to all alternatives for **Cave and Karst Resources** would not affect soil resources because the actions are procedural (inventories).

Air Quality (moderate beneficial)
Air quality management actions common to all alternatives include implementation of measures to mitigate effects to air quality, such as dust suppression and cooperative efforts to reduce dust emissions. These actions would help keep soil in place, and would have a moderate beneficial effect on soil resources because the actions would reduce soil loss, but not prevent it.

Water Resources (beneficial)
Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, including reducing channel and bank erosion, and managing water to meet *Wyoming Standards for Healthy Rangelands*. These actions are designed to reduce or prevent soil erosion and would be applied across the entire planning area. Therefore, water management actions would have a beneficial effect on soil resources.

Mineral Resources

Mining activities (locatable, coal, and salable) have the potential for the most long-term effects on soil resources. Soils would be completely removed from the active mining areas; therefore, soil functionality at those sites would be restored following the cessation of mining. Heavy equipment could compact soils not directly mined, and soil would be at risk for erosion, sedimentation, and ponding of surface runoff. Reclamation planning would be required and implemented to meet reclamation goals and objectives (Appendix O (p. 2085)).

The potential acreage available for mining in the planning area is extensive, but foreseeable mining activity is much less.

Locatable Minerals (negligible adverse)
BLM surface overlaying federal mineral estate in the planning area is available for potential locatable mineral exploration and development (777,310 acres) unless formally withdrawn. However, foreseeable locatable minerals development is anticipated to affect a maximum of 1,455 acres (0.2% of available area), which would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal (minor adverse)
Similarly, the potential acreage available for coal leasing is extensive, but the foreseeable activity would disturb a maximum of 195,700 acres (4.1% of available acreage) confined to central Campbell County and north-central Sheridan County. Overall, there would be minor adverse effects on soil resources from coal leasing due to the localized extent in the planning area.

Leasable Minerals – Fluids (minor adverse)
Federal fluid mineral estate in the planning area would be available to fluid mineral leasing unless identified as administratively unavailable. Although fluid minerals include oil and gas and geothermal resources, there is no geothermal potential in the planning area and no geothermal development is forecast. Therefore, the fluid mineral discussion is limited to oil and gas.

Fluid minerals development would affect soils during exploration, drilling, production, and abandonment. Effects on soils could include removal of vegetation, exposure of the soil, mixing of soil horizons, loss of topsoil productivity, soil compaction, and increased susceptibility to water and wind erosion. Increased erosion and surface runoff would occur from soil compaction and the channelization of surface runoff, which reduces plant productivity, alters species composition, and increases soil surface exposed to wind and water erosion. Drainages that receive this concentrated, increased flow often erode downward, further increasing erosion and sediment loading downstream. Effects are short-term and long-term–short-term within the initial areas of surface disturbance before the soils are stabilized and vegetation reclamation is in progress; long-term when areas such as roads and facility locations are not reclaimed after initial construction.

Oil and gas development involves cross-country travel to stake well locations and associated roads and pipelines. Geophysical exploration also requires cross-country travel. Frequently, these cross-country routes are not the locations of eventual roads or pipelines. Each cross-country trip crushes native vegetation and increases soil susceptibility to erosion. Travel on steep slopes and highly erodible soils allows for a higher potential for waterborne sediments to reach drainages. In addition, surface flows increase along vehicle tracks in loamy and clayey soils from an increase in soil compaction and reduced infiltration. Research has shown that it is common for water infiltration in wheel tracks to be reduced to approximately 50% of the infiltration rate without traffic (House et al. 2001; Baumhardt and Jones 2002). House et al. (2001) measured reductions in infiltration rates from 12% to 80%. House et al. (2001) and Baumhardt and Jones (2002) found water content of the soil at the time of compaction had a significant effect on infiltration, as did the compacting loads. Compaction primarily destroys the large pores necessary for retaining water available for plant growth. Baumhardt and Jones (2002) found water movement in vehicle tracks is twice as quick as in non-traffic areas. Damage from compaction can persist for years (House et al. 2001).

Water disposal methods from oil and gas fluid mineral production has the potential to adversely affect soil resources. These potential methods include infiltration and evaporation ponds, discharge to drainages, land application, and subsurface disposal. Potential effects include increased erosion, changes in plant communities, and changes in soil physical, chemical, and biological properties.

Although there would be major local adverse effects where the fluid minerals development occurred, the foreseeable development scenarios for all alternatives predict less than one percent of soil area would be physically disturbed. Since soil erosion affects an area larger than the physical disturbance the overall effect would be minor adverse at the planning-area scale.

Salable Minerals (negligible adverse)
Most BLM surface overlying federal mineral estate would be available for salable minerals exploration and development (777,310 acres). Foreseeable salable minerals development is anticipated to affect a maximum of 2,090 acres (0.3% of available federal mineral estate). Therefore, there would be negligible adverse effects on soil resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (negligible beneficial)
Fire and fuels management includes wildland fire response, soil stabilization following wildfire, planned or prescribed fire, and mechanical fuels treatment. In the short term, fire and fuels management actions reduce canopy and ground cover, thereby exposing soils to wind and water erosion and increasing runoff potential. Reduced infiltration from extremely hot fires in some areas would result in higher runoff and hill slope erosion. Effects on soil and water resources from resource-damaging fires include dramatic increases in peak flows (two to five times predisturbance conditions, depending on burn characteristics) and increases in salts, nutrients, and metals in the initial flush flows (1 to 2 years). Erosion, including slumps, debris flows, and other dramatic soil loss events can occur in wildland fire areas for 5 to 25 years depending on the burn characteristics, intensity of rain events, soils, and geology of the area (Hurteau et al. 2008). Over the long term, erosion would be reduced as vegetation recovers.

Suppression activities result in temporary surface disturbance and soil compaction from increased vehicle traffic, staging, and fire camps. Compared to effects on water and soil resources from wildland fire, effects from suppression activities would likely be negligible. The construction of fire lines would increase erosion as a result the removal of vegetation, duff, and the organic layer of the soil. Fire lines would vary in length, width, and depth; therefore, soil erosion would be highly variable. Concentrated surface runoff and increased erosion could occur, especially in areas with steep slopes and soils with low reclamation suitability.

Effects on soils from planned (prescribed) fire are typically less severe than from unplanned (wildland) fire. Prescribed fire ignitions can be controlled to times of year when there is less likelihood of damage to soils from excessive heating. Prescribed fires reduce fuel loading, which minimizes the risk of catastrophic wildland fires; therefore, short-term effects associated with prescribed fire generate long-term benefits by reducing the risk of highly damaging catastrophic wildland fires.

The use of prescribed fire to restore desired ecological conditions of rangelands, forests, or woodlands would improve soil quality in the long term. The use of prescribed fire to modify ecological communities, reduces canopy cover, disturbs the soil surface, and increases erosion in the short term. However, over the long term, prescribed fire effectively improves the health and vigor of the vegetative community, reducing soil erosion by reducing the chance of widespread vegetation loss from insects, disease, and catastrophic wildland fire. Improving the health and vigor of ecological systems would increase ground cover and reduce surface erosion. Generally, there should be beneficial effects on soil resources in the planning area from prescribed fire and fuels management.

Fire and fuels management actions common to all alternatives that would affect soil resources include adherence to national and local fire plans and policies, consultation with a resource advisor, implementation of stabilization and rehabilitation standards, and fireline rehabilitation. These actions would benefit soil resources at the local scale. However, at the planning-area scale,

there would be negligible beneficial effects on soil resources from fire and fuels management actions because of the limited acreage predicted to be disturbed by fire.

Biological Resources

Management actions for biological resources are designed to protect biological resources typically by limiting surface-disturbing activities, which benefits soil resources. The *Physical Resources* and *Mineral Resources* sections above describe how surface-disturbing activities affect soil resources.

There are no management actions common to all alternatives for **Forests and Woodlands**, **Special Status Species – Plants**, or **Special Status Species – Fish** that would affect soil resources.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Grassland and shrubland management actions common to all alternatives that would beneficially effect soil resources include managing vegetative communities in accordance with Wyoming Standards for Healthy Rangelands, using an integrated approach to manage the health and diversity of plant communities, and managing surface-disturbing activities to reduce adverse effects on vegetation. Grasslands and shrublands are the dominant vegetative communities in the planning area, comprising 718,636 acres (92%) on BLM-administered lands. Grassland and shrubland management actions would have a major beneficial effect on soil resources.

Vegetation – Riparian/Wetland Resources (negligible beneficial)
The BLM would manage riparian and wetland vegetative communities to achieve and maintain Proper Functioning Condition (PFC). Achieving or maintaining PFC in riparian areas promotes the growth of deep-rooted riparian vegetation that dissipates streamflow energy, stabilizes stream banks from cutting action, and filters sediment. PFC also promotes adequate amounts of vegetative cover to stabilize soils, provides organic material, and cycle nutrients. Vegetation management prescriptions would be implemented to meet the *Standards for Healthy Rangelands*, which would maintain soil erosion and deposition at acceptable levels. Achieving the *Standards for Healthy Rangelands* would benefit soils. Preventing the degradation, loss, or destruction of riparian and wetland habitats also would protect soils.

Collectively, riparian and wetland management actions common to all alternatives would have a negligible beneficial effect on soil resources because of the limited amount (23,831 acres, or 0.03%) of riparian and wetland communities on BLM-administered lands in the planning area.

Invasive Species and Pest Management (beneficial)
Limiting surface disturbance, using certified weed seed-free products, and requiring that disturbed areas be revegetated and treated for invasive species would benefit soil resources. Many invasive species have relatively sparse canopies and shallow roots, which results in increased erosion compared to native vegetation (BLM 2008e). For example Kentucky bluegrass (*Poa pratensis*) has a shallow root system that cannot stabilize stream banks as well as deep-rooted native species such as sedges (*Carex* spp.) and rushes (*Juncus* spp.). Invasive species can adversely affect soil function and reduce soil biodiversity. Treatments to control invasive species could result in short-term localized effects on soil stability because vegetation would be removed and make soil susceptible to erosion. However, in the long term, controlling invasive species would benefit soil if treatments resulted in increased native plant cover. These management actions would have a beneficial effect on soil resources.

Fish and Wildlife Resources – Fish (minor beneficial)
Fisheries management actions common to all alternatives include mitigation for surface-disturbing activities and managing non-native riparian vegetation for the benefit of native and desirable non-native fish. The *Physical Resources* and *Mineral Resources* sections above describe how surface-disturbing activities affect soil resources. There are 51,745 acres (1.1%) of BLM surface associated with fish-bearing waters. Therefore, fisheries management actions would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (beneficial)
Wildlife and special status wildlife management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and establishing a permanent disturbance-free buffer for bald eagle nests. Collectively, these wildlife and special status wildlife management actions would have a beneficial effect on soil resources because wildlife habitat is present throughout the planning area.

Heritage and Visual Resources

There are no **Cultural Resources**, **Paleontological Resources**, or **Visual Resources** actions common to all alternatives that would affect soil resources. Areas with high-quality or important paleontological resources are typically small (fewer than 40 acres), which would result in relocating activities but would not prevent surface-disturbing activities. Therefore, effects on soil resources from **Paleontological Resource** management actions would not differ among alternatives and are not further discussed in the soils section.

Land Resources

The following programs do not have any management actions common to all alternatives that would affect soil resources: **Lands and Realty**, **Renewable Energy**, and **Lands with Wilderness Characteristics**.

The lands and realty program does not include management actions common to all alternatives or that vary by alternative that would directly affect surface-disturbing activities. Therefore the **Lands and Realty** program would not affect soil resources and is not discussed in the soils section.

Forest Products (negligible beneficial)
Management actions common to all alternatives include a prohibition on timber harvest within 200 feet of surface waters and a personal-use forest product sales program. The amount of live plants harvested for personal use is very small and not considered to affect soil resources. The area in the planning area affected by the water buffer would be 5,584 acres, which is less than one percent of BLM surface. This would protect soils in the localized area, but result in negligible beneficial effects on soil resources at the planning area scale.

Rights-of-Way and Corridors (adverse)
Management actions common to all alternatives include the designation of ROW corridors and locating new ROW adjacent to existing disturbances. These actions would minimize additional surface disturbance, but not prevent disturbance resulting in an adverse effect on soil resources.

Travel and Transportation Management (beneficial)
Management actions common to all alternatives include minimizing surface disturbance and

erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if soils would be damaged. Travel and transportation management will follow a holistic approach, including the inventory, design, construction, maintenance, and reclamation of roads and trails, which would limit adverse effects on soil resources.

Motorized travel increases soil disturbance, resulting in increased soil compaction, rutting, surface runoff, and subsequent erosion. Effects would be greatest in areas of concentrated use that are not constructed or maintained for the present or future intended use. Travel during wet soil conditions on improperly designed and constructed roads could lead to rutting and the creation of alternative routes, parallel, and braided roads. Ruts can provide a channel for concentrated flow to accelerate soil erosion. BLM roads that are properly designed, graded, and maintained would improve road conditions. This could result in decreased soil disturbances associated with creation of parallel or braided roads and associated runoff and subsequent erosion. Poorly designed and improperly maintained roads would be the most susceptible to erosion due to runoff, compacted surfaces, and lack of vegetative cover. Typically, poorly designed and improperly maintained roads are incised and channel water, which leads to erosion within and adjacent to the road. Design standards minimize surface runoff and subsequent soil erosion for new roads. Road reclamation reduces erosion, surface runoff, nonpoint sources of sediment, and other adverse effects on soils.

Because the management actions are designed to protect soil resources, the effects are beneficial while the scarcity of public access roadways on BLM surface in the planning area, limit the beneficial effects on the soil resources. Surface disturbance related to roads constructed for other uses such as minerals development are included under ROW and the program for which the road was constructed.

Recreation (negligible adverse)
Recreation management actions common to all alternatives include avoiding riparian habitat for developed facilities and camping, and providing for dispersed recreation opportunities throughout the planning area. *Travel and Transportation Management* above addresses effects on soil resources from vehicle use for recreational purposes. Effects on soils associated with recreation include localized soil compaction and erosion. Effects would depend on duration and circumstance of use. Disturbance would be the greatest in areas of concentrated use, such as hiking trails, developed facilities, and dispersed camping sites. Improvement and maintenance of recreation sites localizes soil disturbances.

Based on the low level of recreation use and the acreage of riparian areas on BLM surface (less than one percent of BLM-administered lands in the planning area) there would be negligible adverse effects to soils resources.

Livestock Grazing Management (beneficial)
Most of the BLM surface acreage in the planning area would be available for livestock grazing. Livestock would be managed in accordance with the *Wyoming Standards for Healthy Rangelands* to sustain vegetative communities and special habitats.

Livestock grazing has the potential to affect soil physical properties (compaction and erosion), chemical properties (near-surface soil chemistry) and biological properties (microbiology). Livestock grazing reduces vegetative cover, causes surface disturbance from hoof action, and compacts soils in localized areas. Water or wind erosion of soils could be accelerated if insufficient litter or plant cover is left after the grazing season, or if plant composition changes. Livestock grazing can affect soil structure if biological or physical soil crusts are damaged.

Overgrazing can reduce the amount of organic matter, the carbon storing ability, and the kinds and numbers of microorganisms living in soils. The most noticeable effects occur around waterbodies, salt blocks, fencelines, and other areas where animals frequently congregate. In such areas, increased effects on soil would be expected. In contrast, dispersed distribution and periodic rotation of livestock would be expected to broaden the extent of effects on soil resources, but decrease their intensity. This would be expected to decrease the overall effects on soil resources and improve their overall resiliency to the effects of grazing.

Water sources and other range improvements improve the distribution of livestock, and prevent livestock concentration and overuse of forage that leads to increased surface runoff and soil erosion. Constructing range improvements results in short-term localized compaction and soil erosion. With proper planning and effective management of range projects, any adverse effects on soil resources would be minimized. Grazing management and range improvements would improve or maintain desired long-term range health, which would minimize adverse effects on soil resources from livestock grazing.

Management in accordance with the *Wyoming Standards for Healthy Rangelands* (Appendix P (p. 2091)) generally is effective in managing adverse effects on soils from domestic livestock grazing. Managing in accordance with these standards would have a beneficial effect on soil resources.

Special Designations

There are no management actions common to all alternatives related to **Areas of Critical Environmental Concern (ACECs), Scenic or Back Country Byways (BCBs), Wild and Scenic Rivers (WSRs), or Wilderness Study Areas (WSAs)** that would affect soil resources.

Byway designation would not affect other activities and are not addressed by alternative. WSR and WSA designation is not foreseen during the planning period. Therefore, no effect on soil resources from management of these special designations would be anticipated. The only special designation addressed by alternative in this section is ACECs.

Socioeconomic Resources

There are no **Social and Economic Conditions** or **Health and Safety** management actions common to all alternatives or under individual alternatives that would have a measurable effect on soil resources. Therefore, the soil section does not further address **Socioeconomic Resources**.

4.1.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Soil (minor adverse)
Surface-disturbing activities affect soils to varying degrees depending on the types, amounts, and locations of disturbance; soil type; time of year; climatic factors; and surface hydrology. Surface-disturbing activities remove protective vegetative cover and crusts and can alter soil physical, chemical, and biological properties. This increases soil susceptibility to water and wind erosion, and decreases soil quality and site productivity. Surface-disturbing activities also can affect biologic soil crusts. These crusts are comprised of cyanobacteria, lichens, and mosses,

which help to stabilize soils, which reduces erosion and increases soil productivity. All soils are susceptible to accelerated erosion. Accelerated erosion is in excess of natural erosion rates and occurs when soil particles are detached and removed as a result of human or animal activities. Soils with severe erosion hazards and soils with limited reclamation potential are the most vulnerable. Once disturbed, it is difficult and costly to stabilize these areas. The potential for accelerated erosion from proposed surface disturbances on highly erosive soils is approximately 40% greater (USFS 2004) than predicted for less-erodible soils.

Seasonally prohibiting surface-disturbing activities in areas of severe erosion hazard would have a minor beneficial effect on soil resources. Specific mitigation and BMPs are more effective in controlling erosion than a seasonal timing restriction. Wind and water can cause severe erosion. Wind speeds, direction, and timing are variable, which makes a timing restriction ineffective for preventing wind erosion. This restriction provides protection during the normal wet period, March 1 to June 15, but provides no protection during the remainder of the year. There is a secondary precipitation peak in September and October, and major storms can occur throughout the year. The seasonal restriction also conflicts with the optimum seeding dates to stabilize the soil. Finally, the authorized officer can waive this action on a project-specific basis without defined criteria. This has been applied inconsistently, thereby allowing for potential adverse effects on soil resources.

There are 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of federal mineral estate defined as having a severe erosion hazard; the BLM could apply the timing limitation to surface-disturbing activity in these areas. Although soils with severe erosion hazard do account for more than 10% of soils resources, because timing restrictions are generally ineffective, this management would have a lesser beneficial effect on soil resources.

Prohibiting surface-disturbing activities on slopes of more than 25% (see Map 4) can result in an adverse effect on soil resources when the prohibition is waived by the authorized officer. Surface occupancy is usually a long-term disturbance that results in long-term adverse effects on soil resources; steep slopes are difficult to stabilize and reclaim using traditional methods. Current management does not define waiver criteria, which has led to inconsistent restriction application thus resulting in adverse effects. Alternative A is potentially inconsistent with the Wyoming BLM guidance for mitigation of surface-disturbing and disruptive activities, and with the use of conventional construction equipment. Alternative A applies to 170,590 acres (22%) of BLM surface with slopes greater than or equal to 25% and 412,145 acres (12%) of federal fluid mineral estate. With the inconsistency in waiver application, and conflicts with the BLM mitigation policy, this management would have a greater adverse effect on soil resources.

Restrictions of surface-disturbing activities on soils with poor reclamation suitability do not protect soil resources, primarily because of the provision for waivers without defined criteria. The risk of BMP failure is great on low-reclamation suitability soils. Soils with poor reclamation suitability are present on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate. The inconsistent protection of soils with poor reclamation suitability would have an adverse effect

Limited Reclamation Potential (LRP) Areas identified as or including "miscellaneous areas" such as but not limited to badlands, rock outcrops, slopes susceptible to mass movement, and or other sensitive sites. They are identified by the NRCS soil survey SSURGO data and onsite investigation. Miscellaneous areas have essentially no soil and support little or no vegetation. They can result from active erosion, washing by water, unfavorable soil conditions, or human activities (NRCS 2010b). Miscellaneous areas have no defined physical or chemical

properties or interpretations, which makes management of these areas difficult. These sites exhibit little opportunity for meeting the Wyoming State Reclamation Policy requirements because reclamation is often impractical or unrealistic due to physical, biological, and chemical challenges. Miscellaneous areas occur on 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate. The inadequate protection of miscellaneous soils would have an adverse effect on soil resources

Overall, the soils management actions result in a minor adverse effect on the soils resource.

Physical Resources

Air Quality (no effect)
Air quality management actions under Alternative A would have no effect on soil resources.

Water Resources (moderate adverse)
There are two water management actions under Alternative A affecting soil resources that were not included in the 1985 RMP; they relate to on-channel reservoir placement and surface discharge of produced water. Without a previous management decision, these actions are considered on a project-specific basis, which has led to inconsistent management. Inconsistent management would have an adverse effect on soil resources on 32,912 acres (4.2%) of drainage channel on BLM surface and 397,753 acres (8%) of drainage channel over federal mineral estate.

The only water management action from the 1985 RMP affecting soil resources is a 500-foot restriction on surface-disturbing activities around springs, reservoirs, water wells, and perennial streams. Like many management actions in the 1985 RMP, the prohibition can be waived and waiver criteria were not defined; this has resulted in inconsistent management. This action would have an adverse effect on soil resources because it would fail to adequately protect the 2.5% (19,861 acres) of soils on BLM surface and the 2.8% (95,172 acres) of soils over federal fluid mineral estate within the water buffer. Overall, water management under Alternative A would have moderate adverse effects on the soil resource.

Cave and Karst Resources (minor adverse)
Cave and karst resources are associated with steep slopes, rock outcrops, and similar sensitive soil types. Management actions that protect caves would therefore also protect soil resources. However, because there are no cave and karst management actions in the 1985 RMP, management in cave and karst areas are considered on a project-specific basis; this has led to inconsistent management of surface-disturbing activities. Cave and karst resources could be present on 13% (101,455 acres) of BLM surface and 4.4% (212,626 acres) of federal mineral estate. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Although cave and karst resources comprise more than 10% of BLM surface, because of the limited foreseeable activity, the lack of previous management actions to consistently protect cave and karst resources would have a minor adverse effect on soil resources.

Mineral Resources

Impacts Common to All Alternatives above describes how mining activities affect soil resources.

Locatable Minerals (negligible adverse)
Under Alternative A, 554 acres (0.1% of soils over federal locatable minerals) are predicted to be

disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal (minor adverse)
The surface disturbance prediction of 195,700 acres of coal development is 4.1% of the federal mineral estate. This would have a minor adverse effect on soil resources under Alternative A.

Leasable Minerals – Fluids (minor adverse)
Alternative A would continue to lease and allow for development of federal oil and gas. Fluid minerals development would affect soil resources as described above under *Impacts Common to All Alternatives*. Drilling and development would occur mostly in areas with high and moderate potential for oil and gas (see Map 17) spread over the next 15 to 20 years. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines would be 10,575 acres. This represents 0.6% of soil resources over federal fluid mineral estate (3,386,530 acres). Since soil erosion affects an area larger than the physical disturbance the overall effect would be minor adverse at the planning-area scale.

Salable Minerals (negligible adverse)
Under Alternative A, 530 acres (0.01% of soils over federal salable minerals) of soils are predicted to be disturbed by salable minerals development. This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

Impacts Common to All Alternatives above describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from management actions under Alternative A.

Unplanned Fire (Wildfire) (negligible beneficial)
Response to unplanned wildland fire varies from full suppression to use of fire as a management tool under Alternative A. The use of some types of suppression equipment is limited in some areas, and fire and suppression damage will be rehabilitated. These actions would limit erosion and benefit soil resources. However, with a predicted 27,596 acres affected by wildfires, the benefits of these management actions would be negligible at the planning-area scale.

Planned Fire (Prescribed Fire) (minor beneficial)
Prescribed fire would be implemented to support vegetation and wildlife objectives, which also would result in long-term benefits to soil resources. With a predicted 14,000 acres (1.7%) of BLM surface to be treated by prescribed fire and mechanical treatments, there would be minor beneficial effects on soil resources from these management actions at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Timber harvest and other vegetative treatments would be designed to improve biodiversity and water quality. Disturbance associated with forest treatment activities would reduce canopy cover, disturb the soil surface, and increase erosion in the short term. Reduction of the canopy cover exposes the soil surface to rain-splash erosion and can increase rilling and gullying. Forest litter, duff, and organic material forming ground cover are the most important components for protecting the mineral soil from erosion in forested systems (Elliot et al. 1996). Studies of the

effects of logging roads show that post-storm turbidity can be attributed more to erosion from roads than any other source (Dunne and Leopold 1978).

Meeting the desired future condition in the long term with these vegetative treatments would contribute to properly functioning watersheds that support productive plant communities. Improving the health and vigor of forests would result in increased ground cover and would reduce surface erosion.

Up to 6,000 acres (0.8% of BLM surface) of forest and woodland treatments are predicted under Alternative A. Forest and woodland management under Alternative A would have a negligible beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Impacts Common to All Alternatives above describes effects on soil resources from grassland and shrubland management. There is only one management action that varies across the alternatives. This management action relates to whether non-native species can be used during reclamation. There was no decision in the 1985 RMP regarding this management action; therefore, under Alternative A, species used for reclamation would need to be consistent with the BLM reclamation policy, which does allow the use of non-native species. A primary goal of reclamation is soil stabilization, and vegetation species used in reclamation are chosen with this goal in mind. The effect on soils from this management action would be moderate and beneficial. Although this management action stabilizes all surface disturbances, the desired native ecological condition maybe slow to reestablish.

Vegetation – Riparian/Wetland Resources (minor adverse)
Surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be prohibited. Like many management actions in the 1985 RMP, the prohibition can be waived and waiver criteria were not defined. This has led to inconsistent management. Continuing this management would have a minor adverse effect on soil resources because it fails to adequately protect the 2.5% (23,831 acres) of soils on BLM surface within the water buffer.

Invasive Species and Pest Management (minor beneficial)
Impacts Common to All Alternatives above describes the types of effects on soil resources from invasive species and pest management. The only management action related to invasive species in the 1985 RMP was to control noxious weeds in cooperation with the counties. Under Alternative A, 8,000 acres (1.02%) of BLM surface are predicted to be treated. This would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (negligible beneficial)
There are no fisheries management actions in the 1985 RMP that affect soil resources. Fisheries management is considered on a project-specific basis; therefore, mitigation has been inconsistently applied to surface-disturbing activities potentially affecting the soil resources. There are 51,745 acres (1%) of BLM surface within 0.25 mile of fish-bearing waters and 818 acres (0.1%) of BLM surface associated with specials status fish bearing waters. Therefore, fisheries management under Alternative A would have a negligible beneficial effect on soil resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor beneficial)
There are a number of management actions under Alternative A that prohibit surface-disturbing activities for the protection of wildlife and special status wildlife species; these actions would benefit soil resources locally where soil disturbances are prevented. Typically, these management actions provide the opportunity for waivers, which reduces the benefits to soil resources. The

timing limitations for various wildlife species also do not benefit soil resources because they simply delay surface-disturbing activities.

The two largest acreages where surface disturbances are prohibited are 138,452 acres (17.7%) of BLM surface where timber harvest is prohibited in crucial elk habitat and permanent buffers around active raptor nests (385,148 acres, or 49%, of BLM surface and 2,298,687 acres, or 48%, of federal fluid mineral estate). These actions would have a minor beneficial effect on soil resources.

Special Status Species – Plants (negligible beneficial)
There are no management actions in the 1985 RMP that specifically address special status plant species; therefore, management is considered on a project-specific basis and consistent with the BLM special status species policy and the Endangered Species Act. Surface-disturbing activities would avoid special status plant populations. In addition, special status plant species have narrow habitat requirements and therefore are not widespread in the planning area. Special status plant management under Alternative A would have a negligible beneficial effect on soil resources.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Current management includes placing a No Surface Occupancy (NSO) stipulation on mineral leases associated with the Bozeman Trail. The stipulation is typically less than 0.25 mile in width. Management of cultural resources under Alternative A would have a negligible beneficial effect on soil resources due to the limited acreage affected (0.46%) of BLM surface.

Visual Resources (negligible beneficial)
The 1985 RMP manages visual resources in accordance with their Visual Resource Management (VRM) class. (VRM) Class II is the only class in the 1985 RMP likely to reduce surface-disturbing activities and therefore affect soil resources. The objective of (VRM) Class II designation is to retain the existing character of the landscape; management actions can be seen but they should not attract attention. There are 127,594 acres (16.3%) of BLM surface classified as (VRM) Class II. However, because surface disturbance is reduced but not prohibited and (VRM) management has been inconsistently applied, benefits to soil resources would be negligible.

Land Resources

Forest Products (negligible adverse)
Management actions under Alternative A include the sale of minor forest products, sale of commercial timber, and regeneration standards. Regeneration standards would not reduce the initial surface disturbance from harvest activities, but would help forest and woodland vegetation recover; this would reduce the duration of the long-term effects of vegetation removal. A maximum of 6,000 acres (0.8%) of forest product-related activity is predicted to occur on BLM surface. This would have a negligible adverse effect on soil resources.

Renewable Energy (minor adverse)
There are no renewable energy decisions in the 1985 RMP; therefore, proposals are considered on a project-specific basis. Although there have been no renewable energy projects to date, 20,000 acres (2.6%) of disturbance on BLM surface are predicted during the planning period. Renewable energy development at this scale would have a minor adverse effect on the soil resources.

Rights-of-Way and Corridors (minor adverse)
The only decision in the 1985 RMP specifically limiting ROW activity is a conditional prohibition on communications sites on North Middle Pumpkin Butte. The predicted disturbance from ROW actions is 38,762 acres (4.96%) of BLM surface, which would have a minor adverse effect on soil resources.

Travel and Transportation Management (minor adverse)
The 1985 RMP identified areas and routes where motorized vehicle is allowed (subject to restrictions) or excluded. However, implementation has been inconsistent. Existing roads have not been mapped for effective travel management enforcement.

Impacts Common to All Alternatives above describes road- and trail-related effects on soil resources. Off-road vehicle use can cause undue environmental degradation and accelerate soil erosion. The severity would depend on soil conditions (moist or wet versus dry or frozen), frequency, vehicle weight and type, and tire width or tread. Effects would be greatest in areas of concentrated use that are not maintained or improved. Continuous travel leads to compaction. There are several adverse environmental effects associated with compaction, including increased soil erosion, reduced soil permeability to air and water, reduced soil moisture, reduced soil depth and organic matter, and reduced nutrient cycling. While soil compaction can recover to some degree during periods of non-use, erosion usually continues whether or not use stops. Accelerated erosion resulting from motor vehicle use generally is constrained to isolated incidences. Limiting travel to designated routes confines the effects to areas disturbed or hardened from vehicle use.

Travel and transportation management under Alternative A would have a minor adverse effect on soil resources based on the potential number of existing roads many of which are pioneered roads without erosion protections.

Recreation (negligible adverse)
Fluid and locatable mineral activity is not allowed in developed recreation sites under Alternative A. The prohibition on mineral activity would benefit soil resources locally. There are no decisions in the 1985 RMP limiting soils disturbance from recreational activities; therefore, recreational activities and developments are considered on a project-specific basis. This has led to inconsistent management. There would be negligible adverse effects on soil resources because of the low level of recreational use in the planning area.

Lands with Wilderness Characteristics (no effect)
At present, there are no areas outside WSAs in the planning area managed for the preservation of wilderness characteristics. Therefore, there would be no effect on soil resources.

Livestock Grazing Management (minor beneficial)
Current livestock grazing management actions that directly affect soil resources include adjusting grazing use following timber harvest; allowing range improvements; conducting resource monitoring; continuing with the currently authorized areas and levels of grazing use; and resting pastures for a year followed by a year of grazing deferment following vegetative treatments. *Impacts Common to All Alternatives* describes effects on soils from livestock grazing common to all alternatives. Projected surface disturbances are the same across the alternatives. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface due to rugged topography and steep slopes, and where livestock grazing is determined to be incompatible with other resource uses or values. Cumulatively, these management actions would have a minor beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
The 1985 RMP did not designate ACECs. Therefore, there would be no effect on soil resources from ACEC management under Alternative A.

4.1.3.4. Alternative B

Soil (major beneficial)
Alternative B prohibits surface-disturbing activities on soils with a severe erosion hazard, which would have a beneficial effect on soil resources. Management would be consistent because Alternative B does not allow waivers. The Alternative B prohibition would apply year-round and would protect soils from erosion from wind and seasonal storms throughout the year. Alternative B would protect 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of the federal fluid minerals estate.

Prohibiting surface-disturbing activities on slopes equal to or greater than 25% would have a beneficial effect on soil resources. This alternative would avoid most soils with a severe water erosion hazard and avoid sites susceptible to mass failure, which are frequently on steep slopes and occur throughout the planning area. This restriction also is consistent with Appendix J (p. 1743). This restriction is consistent with the use of conventional construction equipment. Alternative B would achieve consistency in application because it does not allow exemptions. Alternative B would protect 170,590 acres (22%) of BLM surface and 412,145 acres (12%) of federal fluid mineral estate.

Prohibiting surface-disturbing activities on soils with poor reclamation suitability would have a beneficial effect on soil resources. Alternative B would prevent disturbance on areas with poor reclamation potential, is clearly defined, and would be consistently applied because it allows no exemptions. Alternative B would protect soils on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate.

Prohibiting surface-disturbing activities on areas identified as LRP such as but not limited to badlands, rock outcrops, and slopes susceptible to mass movement would have a beneficial effect on soil resources. These sites exhibit little opportunity for meeting the Wyoming State Reclamation Policy requirements; therefore, Alternative B prohibits disturbance of these sites. Alternative B would protect 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate. Overall soil management actions in Alternative B would have major beneficial effects on the soil resource.

Physical Resources

Air Quality (no effect)
Air quality management actions under Alternative B would not affect soil resources.

Water Resources (moderate beneficial)
Alternative B includes three water management actions that would affect soils resources, as follows: a prohibition on on-channel reservoir placement, a prohibition on surface discharge of produced water, and a 500 foot prohibition of surface-disturbing activities around springs, non-CBNG, reservoirs, water wells, perennial streams, and their associated riparian habitat. These management actions are unconditional. The 500-foot buffer would protect 2.5%, or 19,861

acres, of the soils on BLM surface and 2.8%, or 95,172 acres, of soils over federal fluid mineral estate. There are 32,912 acres (4.2%) of drainage channel on BLM surface and 397,753 acres (8.3%) of drainage channel over federal mineral estate that would be protected by the on-channel reservoir and surface discharge prohibitions. Collectively, these water management actions would have a moderate beneficial effect on soil resources.

Cave and Karst Resources (major beneficial)
Alternative B prohibits surface-disturbing activities, including minerals development and timber harvest, in cave and karst areas. The prohibitions are unconditional. Cave and karst resources could be present on 13% (101,455 acres) of BLM surface and 4.4% (212,626 acres) of federal mineral estate. Management actions to protect cave and karst resources would have a major beneficial effect on soil resources.

Mineral Resources

The *Impacts Common to All Alternatives* section above describes how minerals activities affect soil resources. In general, Alternative B substantially reduces the area available for mineral exploration and development compared to Alternative A, but does not reduce projected development as much as it reduces available area.

Locatable Minerals (negligible adverse)
Under Alternative B, 277 acres (0.03% of federal locatable minerals) of soils are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal (minor adverse)
The Alternative B surface disturbance prediction of 186,600 acres of coal development is 3.9% of the federal mineral estate. This represents a minor adverse effect on soil resources.

Leasable Minerals – Fluids (negligible adverse)
Alternative B would continue to lease and allow for the development of the federal fluid mineral estate, but with increased protections for soils and other resources. Alternative B would impose what are considered major constraints for development on 642,232 acres (95%) of the federal mineral estate. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines is 286, which represents 0.3% of soil resources over the federal fluid minerals estate. Even with erosion extending beyond the physical disturbances, the overall affected area should remain less than one percent of the soil resources. Therefore, management under Alternative B would have a negligible adverse effect on soil resources.

Salable Minerals (negligible adverse)
Under Alternative B, salable minerals development is predicted to disturb 114 acres (0.003% of federal salable minerals). This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

The *Impacts Common to All Alternatives* section above describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from management actions under Alternative B.

Unplanned Fire (Wildfire) (minor beneficial)
Under Alternative B, response to unplanned wildland fire varies from full suppression to monitoring fire as a management tool. The use of heavy equipment is limited to existing roads and trails. All fire and suppression damage will be rehabilitated. These actions would limit erosion and benefit the soil resources. However, with a predicted 27,596 acres (3.5%) of BLM surface to be affected by wildfires, the benefit of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire) (negligible beneficial)
Under Alternative B, prescribed fire and other vegetative treatments would be used to restore fire-adapted ecosystems, which would have a long-term beneficial effect on soil resources. With a predicted 3,500 acres (0.4%) of BLM surface to be treated by prescribed fire and mechanical treatments, the beneficial effect of these management actions would be negligible at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
The discussion under Alternative A describes how forest and woodland management activities affect soil resources. Alternative B emphasizes a natural, hands-off, approach to forest and woodland management. Timber harvest and other vegetative treatments would be minimized. Mature and old-growth forests are typically productive plant communities with more ground cover and less surface erosion than early successional forest communities.

Up to 1,000 acres (0.1%) of forest and woodland treatments are predicted under Alternative B. This would have a negligible beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities (minor adverse)
Under Alternative B, only native species would be authorized for reclamation activities. Native species often have distinct seeding windows and are sometimes slow to establish, which allows invasive species to establish. Initial stabilization and erosion control would be less in the short term. Allowing only native species for reclamation could have a minor adverse effect on soil resources.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Under Alternative B, surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be prohibited. Other management actions that would benefit soil resources include managing for Desired Future Conditions (DFC) in capable communities, and restoring wetland and riparian vegetation supported by (CBNG), produced-water discharge. The 500-foot buffer would protect 3.0%, or 23,831 acres, of soils on BLM surface and 4.2%, or 144,045 acres, of soils over federal fluid mineral estate. Collectively, these water management actions would have a minor beneficial effect on soil resources.

Invasive Species and Pest Management (minor beneficial)
The *Impacts Common to All Alternatives* section describes the types of effects on soil resources from invasive species. Alternative B takes an aggressive approach to managing invasive species. Under Alternative B, 15,000 acres (2%) of BLM surface are predicted to be treated, which would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Fish and **Special Status Species – Fish** (negligible beneficial)
Alternative B fish and special status fish management actions include maintaining, enhancing,

and restoring fish habitat; managing fish habitat toward DFC; and prohibiting surface-disturbing activities within 0.25 mile of fish-bearing waters. The *Soils* and *Mineral Resources* sections of this soils analysis describe how surface-disturbing activities effect soil resources. There are 261,870 acres (0.4%) of federal mineral estate associated with fish-bearing waters and 818 acres (0.1%) of federal mineral estate associated with special status species fish-bearing waters. Therefore, fisheries management under Alternative B would have a major beneficial effect on soil resources; special status species fish management would have a negligible beneficial effect.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
There are a number of management actions under Alternative B that prohibit surface-disturbing activities (without provisions) for the protection of wildlife and special status wildlife species; these actions would benefit soil resources locally where soil disturbances are prevented. The timing limitations for various wildlife species would not benefit soil resources because they delay, but do not prevent, surface-disturbing activities.

Under Alternative B, the largest acreages of surface disturbance prohibitions are timber harvest in crucial elk habitat (149,451 acres, or 19%, of BLM surface), disturbance activities in elk security habitat (132,148 acres, or 16.9%, of BLM surface), permanent buffers around active raptor nests (255,129 acres, or 33%, of BLM surface), disturbance activities in reptile and amphibian habitat (176,636 acres, or 23%, of BLM surface), renewable-energy projects in Greater Sage-Grouse habitat (467,897 acres, or 65.1% of BLM surface). Collectively these prohibitions would have a major beneficial effect on the soil resource.

Special Status Species – Plants (major beneficial)
Surface-disturbing activities are prohibited within special status plant species habitat under Alternative B. This prohibition effects all programs on BLM surface (126,811 acres [16.21%]). Surface disturbance associated with federal mineral development has the potential to effect the largest acreage (243,929 acres [5.08%]) of the total federal mineral estate. Cumulatively special status plant management would have a major beneficial effect on soil resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Management actions under Alternative B include a prohibition of surface-disturbing activities in areas with historic properties that retain their historic setting, Traditional Cultural Properties (TCPs), sacred sites, and other culturally sensitive areas. To protect the historic settings of these sites, the prohibition on surface-disturbing activities can extend 5 miles from the sensitive cultural site, which would protect soil resources on 330,592 acres, or 42%, of BLM surface, and 1,854,954 acres, or 39%, of federal fluid mineral estate. This would have a major beneficial effect on soil resources.

Visual Resources (minor beneficial)
Under Alternative B, areas inventoried as (VRM) Class II and special emphasis areas would be managed as (VRM) Class II. There are 218,178 acres, or 27.9%, of BLM surface classified as (VRM) Class II. This management action could have a major beneficial effect on the soil resource. However, because surface disturbance is reduced but not prohibited, planning level impacts maybe less beneficial thus having a minor beneficial effect on the soil resources.

Land Resources

Forest Products (negligible adverse)
Management actions under Alternative B include commercial sales of saw timber, limiting timber harvest units to 5 acres, managing sales to keep forests within ecologically sustainable limits, and natural regeneration of harvest areas. The reliance on natural regeneration could increase vegetative recovery time following vegetation removal, which would adversely affect soil resources. A maximum of 1,000 acres, or 0.1%, of forest product-related activity is predicted on BLM surface; this would have a negligible adverse effect on soil resources.

Renewable Energy (negligible adverse)
Management under Alternative B would exclude renewable-energy projects wherever minerals development and other surface-disturbing activities are prohibited and allow renewable-energy development where other surface-disturbing activities are allowed. Approximately 5,000 acres, or 0.6%, of disturbance on BLM surface are predicted over the planning period. Renewable-energy development at this scale would have a negligible adverse effect on soil resources.

Rights-of-Way and Corridors (minor adverse)
Management under Alternative B would exclude ROW activity from 370,088 acres of BLM surface and restricts communications sites. These actions would reduce additional surface disturbance. The predicted disturbance from ROW actions is 18,011 acres (2.3%) of BLM surface, which would have a minor adverse effect on soil resources.

Travel and Transportation Management (negligible adverse)
Management actions under Alternative B include limiting motorized vehicle use to designated routes and within stock driveways, closing and reclaiming roads to protect sensitive resources, and limiting travel off designated routes to permitted activities. These actions would limit the potential adverse effects on soil resources from motorized vehicles to a negligible level.

Recreation (moderate beneficial)
Alternative B would provide for recreation to be intensively managed in and would prohibit mineral leasing within a 0.5 mi buffer of SRMAs. The restriction on mineral leasing would reduce potential surface disturbance from mineral-development facilities and associated infrastructure. These management actions would prohibit surface-disturbing activities on 55,529, acres or 7.1%, of BLM surface, which would have a moderate beneficial effect on soil resources.

Lands with Wilderness Characteristics (minor beneficial)
Alternative B would prohibit most surface-disturbing activities on 12,237 acres, or 1.6%, of BLM surface to emphasize primitive recreation and natural values, which would have a minor beneficial effect on soil resources.

Livestock Grazing Management (moderate beneficial)
Management actions under Alternative B include reducing grazing effects following timber harvest, limiting or prohibiting grazing where it would not be compatible with other resources, locating mineral supplements away from sensitive resources, a provision for reserve allotments, and 2 years of livestock rest following vegetative treatments. The *Impacts Common to All Alternatives* section above describes effects on soil resources from livestock grazing. Projected surface disturbances are the same across alternatives. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface due to rugged topography and steep slopes, and where livestock grazing is determined to be incompatible with other resource uses or values. Livestock grazing may be further restricted in sensitive areas, increasing protections on the soil resource. This would have a direct beneficial effect on soil resources. Collectively, these management actions would have a moderate beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
Alternative B would designate seven ACECs encompassing 536,304 acres, or 8.3%, of BLM surface and implement limitations and prohibitions on surface-disturbing activities in ACECs. ACEC designation and management would have a moderate beneficial effect on soil resources.

4.1.3.5. Alternative C

Soil (major adverse)
Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, on slopes equal to or greater than 25%, on soils with poor reclamation potential, and on miscellaneous soil types would have a major adverse effect on soil resources. These are the most sensitive soils and the most difficult to reclaim following surface-disturbing activities. Allowing activities on these soils would be inconsistent with Appendix J (p. 1743) and inconsistent with the use of conventional construction equipment. Alternative C would fail to protect 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of federal fluid mineral estate that possess soils with a severe erosion hazard, 170,590 acres (22%) of BLM surface and 412,145 acres (45%) of federal fluid minerals estate with slopes equal to greater than 25%, 455,090 acres (12%) of BLM surface and 1,514,445 acres (48%) of federal fluid minerals estate that possess soils with poor reclamation potential, and 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate with badlands, rock outcrops, or slopes susceptible to mass movement.

Physical Resources

Air Quality (no effect)
Alternative C air quality management actions would not affect soil resources.

Water Resources (moderate adverse)
There are three water management actions under Alternative C that would affect soil resources — allowing on-channel reservoirs; allowing surface discharge of produced water; and allowing surface-disturbing activities near springs, non-(CBNG), reservoirs, water wells, perennial streams, and within riparian habitats. These management actions would not prevent surface-disturbing activities that would erode stream banks and soils; this would adversely affect soil resources. The absence of a 500-foot buffer would leave 2.5%, or 19,861 acres, of the soils on BLM surface and 2.8%, or 95,172 acres, of soils over federal fluid mineral estate available for development, therefore leaving soils vulnerable to impacts. Under Alternative C, there would be 32,912 acres (4.2%) of drainage channel on BLM surface and 397,753 acres (8.3%) of drainage channel over federal mineral estate available for on-channel reservoir placement and surface discharge of produced water. Collectively, these water management actions would have a moderate adverse effect on soil resources.

Cave and Karst Resources (minor adverse)
Alternative C would allow surface-disturbing activities, including minerals development and timber harvest, in cave and karst areas. Cave and karst resources could be present on 13% (101,455 acres) of BLM surface and 4.4% (212,626 acres) of federal mineral estate. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Although cave and karst

resources comprise more than ten percent of BLM surface, due to the limited foreseeable activity, the overall result would be a minor adverse effect on soil resources.

Mineral Resources

The *Impacts Common to All Alternatives* section describes how minerals activities affect soil resources. In general, the amount of area available for mineral exploration and development under Alternative C is comparable to Alternative A, but there would be more development because there are fewer management constraints.

Locatable Minerals (negligible adverse)
Under Alternative C, 1,455 acres (0.02% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal (minor adverse)
Under Alternative C, the surface disturbance prediction of 195,700 acres of coal development is 4.1% of the federal mineral estate. This is a minor adverse effect on soil resources.

Leasable Minerals – Fluids (minor adverse)
Alternative C would allow for the development of the federal fluid minerals estate with decreased protections for soils and other resources. Alternative C would place major constraints on fluid minerals development only on what is considered the coal conflict zone, which comprises 303,601 acres (0.9%) of the federal mineral estate. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines would be 22,255 acres. This represents 0.6% of soil resources over the federal fluid mineral estate. Since soil erosion affects an area larger than the physical disturbance the overall effect would be minor adverse at the planning-area scale.

Salable Minerals (negligible adverse)
Under Alternative C, 2,090 acres (0.1% of federal salable minerals) are predicted to be disturbed by salable minerals development. This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

The *Impacts Common to All Alternatives* section describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from fire and fuels management actions under Alternative C.

Unplanned Fire (Wildfire) (minor adverse)
Under Alternative C, full protection tactics would be used in response to unplanned wildland fire. Heavy equipment usage would not be limited, but would consider other resource values. These actions would do little to limit erosion and would adversely affect soil resources.
With an emphasis on suppression, this alternative would increase the probability of large watershed-damaging fires over the long term. Full suppression of wildland fires would result in an accumulation of fuels and an increase in late-seral vegetative communities that are more prone to soil-damaging catastrophic wildland fires. Greater fire suppression efforts would result in increased disturbance from suppression activities, such as building fire lines, which would increase localized soil erosion. In addition, no active rehabilitation of affected soils is predicted under Alternative C. With a predicted 27,596 acres of BLM surface to be affected by wildfires, the adverse effects of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire) (minor beneficial)
Wildland fire and other vegetative treatments would be used to restore fire-adapted ecosystems for commodity production. Long-term benefits to soil resources would be tempered by additional surface-disturbing activities related to commodity production. However, commodity production would be consistent with the required management for soils and other resources to reduce effects. With a predicted 42,000 acres (5.4%) of BLM surface to be treated by prescribed fire and mechanical treatments, the beneficial effects of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Timber harvest and other vegetative treatments would be designed to maximize forest health through active forest management under Alternative C. Discussion of how forest and woodland management actions affect soil resources is provided under Alternative A.

Under Alternative C, up to 24,000 acres (3.1%) of forest and woodland treatments are predicted on BLM surface. Forest and woodland management under Alternative C would have a minor beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, therefore protecting soils and controlling erosion. This alternative would allow for quick-growing species to compete with annual weeds, stabilize the soil, and provide an opportunity for slower-establishing native plants to inhabit the site. Initial soil stabilization for all soil disturbances in the planning area, would result in a moderate beneficial effect on soil resources from this management action.

Vegetation – Riparian/Wetland Resources (minor adverse)
Surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed under Alternative C. Wetland and riparian vegetation would be restored only where directly disturbed by (CBNG), activities such as dams and reservoirs. The 500-foot buffer would fail to protect 3%, or 23,831 acres, of the soils on BLM surface and 4.2%, or 144,045 acres, of soils over federal fluid mineral estate. Collectively, these water management actions would have a minor adverse effect on soil resources.

Invasive Species and Pest Management (minor beneficial)
The *Impacts Common to All Alternatives* section describes the types of effects to soil resources from invasive species. Alternative C would take a conservative approach to managing invasive species. Under Alternative C, 10,000 acres (1.3%) of BLM surface are predicted to be treated. This would have a minor beneficial effect on soil resources.

Fish and Wildlife – Fish and Special Status Species – Fish (negligible adverse)
Fish and special status fish management actions under Alternative C include considering all resources when affecting perennial waters; managing fish habitat toward PFC; allowing surface-disturbing activities near naturally occurring waterbodies except within 500 feet of waters containing special status fish species; and restoring or improving fisheries habitat only for special status fish. The *Soils* and *Mineral Resources* sections of this soils analysis describe how surface-disturbing activities affect soil resources. There are 261,870 acres (0.4%) of federal mineral estate associated with fish-bearing waters and 4,846 acres (0.1%) of federal mineral estate

associated with special status species fish-bearing waters. Therefore, allowing surface-disturbing activities under Alternative C would have a negligible adverse effect on soil resources.

Fish and Wildlife – Wildlife and Special Status Species – Wildlife (negligible beneficial)
Most management actions under Alternative C allow surface-disturbing activities with consideration of wildlife and special status wildlife species; therefore, these actions would have little direct benefit to soil resources. Actions that would provide measurable benefits include the designation of a Wildlife Habitat Management Area (WHMA) in the Fortification Creek crucial elk ranges (32,602 acres, or 4.2%, of BLM surface), a restriction on surface-disturbing activities near active Greater Sage-Grouse leks (3,594 acres, or 0.5%, of BLM surface), and a Controlled Surface Use (CSU) limitation on fluid mineral leases near active special status raptor nests (28,437 acres, or 3.6%, of BLM surface). Although a few management actions would affect more than one percent of soil resources, the benefit to soil resources would be negligible.

Special Status Species – Plants (no effect)
Under Alternative C, surface-disturbing activities would be allowed in special status plant habitat, but not in known populations. Populations are typically only a few acres in size. Special status plant species have narrow habitat requirements and therefore are not widespread in the planning area. Special status plant management under Alternative C would not affect soil resources.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Management actions under Alternative C include an allowance for surface-disturbing activities in areas with historic properties that retain their historic settings, TCPs, sacred sites, and other culturally sensitive areas when appropriate mitigation is accomplished. Cultural sites themselves are typically small in size and buffers to protect historic settings are typically less than 0.25 mile wide. These cultural resources management actions would have a negligible adverse affect soil resources.

Visual Resources (no effect)
Under Alternative C, areas inventoried as (VRM) Class II and special emphasis areas would be managed as (VRM) Class III. The objective of (VRM) Class III areas is to partially retain the existing character of the landscape; management activities should not dominate the view. Class III management would likely not affect the level of surface-disturbing activities. Therefore, Alternative C visual resources management would not affect soil resources.

Land Resources

Forest Products (minor adverse)
Management actions under Alternative C include offering an array of forest products to maximize economic returns, no limit on harvest unit size, and the planting and maintenance of trees following harvest. Planting and maintaining trees following harvest would help forest and woodland vegetation recover and reduce the duration of long-term effects from vegetation removal. A maximum of 24,000 acres, or 3.1%, of forest product-related activity is predicted to occur on BLM surface. This would have a minor adverse effect on soil resources.

Renewable Energy (major adverse)
Management under Alternative C would allow renewable-energy development throughout the planning area consistent with other resource values. Approximately 40,000 acres (19.2%)

of disturbance are predicted on BLM surface during the planning period. Renewable-energy development at this scale would have a major adverse effect on soil resources.

Rights-of-Way and Corridors (moderate adverse)
Management under Alternative C would allow for ROW activity unless specifically excluded. The predicted disturbance from ROW actions is 57,083 acres (7.3%) of BLM surface, which would have a moderate adverse effect on soil resources.

Travel and Transportation Management (minor adverse)
Management actions under Alternative C include allowing motorized use within stock driveway, retaining all existing roads, closing areas to motorized vehicle use to protect sensitive resources, and allowing travel off designated routes for necessary tasks. Additional allowances for motorized vehicle use would result in more adverse effects on soil resources than under current management. Travel and transportation management under Alternative C would have a minor adverse effect on soil resources based on the amount of area open to motorized vehicle access 754102 acres (96.4%).

Recreation (negligible adverse)
Alternative C would provide for mineral leasing and other surface-disturbing activities. Alternative C designates 30,570 asSRMAs. However, flexible management actions in Alternative C do not necessarily restrict development or surface disturbance in SRMAs. Therefore, the impact of recreation on soils resources is negligible.

Lands with Wilderness Characteristics (no effect)
There are no areas proposed to be managed for the preservation of wilderness characteristics under Alternative C. Therefore, there would be no effect on soil resources.

Livestock Grazing Management (minor beneficial)
Management actions under Alternative C soil resources include limiting or prohibiting grazing where it is currently prohibited, locating mineral supplements away from sensitive resources, and 2 years of livestock deferment following vegetative treatments. The *Impacts Common to All Alternatives* section above describes effects on soil resources from livestock grazing. Projected surface disturbances are the same across alternatives. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface due to rugged topography and steep slopes, and where livestock grazing is determined to be incompatible with other resource uses or values. Cumulatively, these management actions would have a minor beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
Alternative C would not designate any ACECs and there would be no additional limitations or prohibitions on surface-disturbing activities. Therefore, there would be no effect on soil resources.

4.1.3.6. Alternative D

Soil (minor beneficial)
Under Alternative D, surface-disturbing activities could be allowed on soils with a severe erosion hazard, on slopes equal to greater than 25%, and on soils with poor reclamation suitability with an approved construction, stabilization, and reclamation plan(s). Under Alternative D, LRP areas should be avoided, but in limited situations disturbances may be considered with the

applicable plan(s). This would allow for surface-disturbing activities on sensitive soil resources while minimizing and mitigating the impacts to soil resources.

A construction plan should include a site evaluation, construction techniques and other practices to be employed by a proponent for surface disturbing activities. The plan is to demonstrate how surface disturbance and the associated effects will be minimized, erosion controlled, and reclamation potential will be maintained. The content of the plan will vary with the complexity of the proposal (i.e., suitability of native materials as construction material, plan and profile, engineered diagram, geotechnical investigation, etc.).

The purpose of a stabilization plan is to control erosion and maintain soil/site stability through erosion control. Soil/site stability characteristics will meet those of the Ecological Site Description (ESD) reference sheet. Erosion will be controlled to prevent irrecoverable soil loss and will be measured using BLM approved methodologies such as Erosion Condition Classification System (Clark 1980).

For a description of reclamation plans, goals and objectives, refer to Appendix O (p. 2085).

Alternative D could potentially disturb 215,496 acres (28%) of BLM surface and 669,739 acres (20%) of federal fluid mineral estate possessing soils with a severe erosion hazard; 170,590 acres (22%) of BLM surface and 412,145 acres (12%) of federal fluid mineral estate with slopes equal to or greater than 25%; 455,090 acres (58%) of BLM surface and 1,514,445 acres (48%) of federal fluid mineral estate possessing soils with poor reclamation suitability; and 218,928 acres (28%) of BLM surface and 685,950 acres (20%) of federal fluid mineral estate potentially containing LRP areas consisting of but not limited to badlands, rock outcrops, or slopes susceptible to mass movement. A construction, stabilization, and reclamation plan does not mean that impacts will be avoided. In the short term impacts are similar to Alternative C (because surface-disturbing activities are not prohibited) and long-term impacts would be less, dependent upon the successful implantation and maintenance of the mitigation measures applied. This management would have a minor beneficial effect on soil resources.

Physical Resources

Air Quality (no effect)
Alternative D air quality management actions would not affect soil resources.

Water Resources (minor adverse)
Under Alternative D, there are three water management actions that would affect soil resources — allowing on-channel reservoirs; allowing surface discharge of produced water; and allowing surface-disturbing activities near springs, non-(CBNG), reservoirs, water wells, perennial streams, and in riparian habitats. These management actions would allow surface-disturbing activities with limited protection in place to prevent stream bank and soil erosion. The 500-foot buffer would encompass 2.5%, or 19,861 acres, of the soils on BLM surface and 2.8%, or 95,172 acres, of soils over federal fluid mineral estate. There are 32,912 acres (4.2%) of drainage channel on BLM surface and 397,753 acres (8.3%) of drainage channel over federal mineral estate that would evaluated when considering on-channel reservoir placement and surface discharge. Soils associated with water are typically sensitive and even with some restrictions in place erosion is likely to occur. These areas can be difficult to reclaim. BLM's authority to manage water discharge is limited as it is under the authority of the Wyoming DEQ. Collectively, these water management actions would have a minor adverse effect on soil resources.

Cave and Karst Resources (minor beneficial)
Under Alternative D, surface-disturbing activities, including minerals development and timber harvest, would be allowed in cave and karst areas with site-specific mitigation. Protections would likely focus on protecting significant caves. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Management actions to protect cave and karst resources would have a minor beneficial effect on soil resources due to the site-specific buffer near significant caves, with 13% of the BLM surface having a CSU for mineral development.

Mineral Resources

The *Impacts Common to All Alternatives* section above describes how minerals activities affect soil resources. In general, the amount of area available for mineral exploration and development is comparable to Alternative A, as is predicted development. Alternative D incorporates resource protections which allows mineral resources development when impacted resource objectives can be met.

Locatable Minerals (negligible adverse)
Under Alternative D, 1,252 acres (0.2% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. This would have a negligible adverse effect on soil resources.

Leasable Minerals – Coal (minor adverse)
The surface disturbance prediction of 195,700 acres of coal development is 4.1% of federal mineral estate. This would have a minor adverse effect on soil resources under Alternative D.

Leasable Minerals – Fluids (minor adverse)
Alternative D would allow for the development of federal fluid mineral estate with an approved construction, stabilization, and reclamation plan(s). Development of the federal fluid mineral estate (CBNG, conventional oil vertical and horizontal) within the planning area is predicted to potentially disturb, 14,186 acres, which is 0.42% of soil resources over the federal fluid minerals estate. Soil disturbance is site specific and dependent upon topography, as slope increases total disturbance increases. Reasonable Forseeable Development (RFD) predictions on the amount of disturbance is based on current proposals and activity, most current development activity is located in the southern portion of the planning area, in areas described as Plains. This geographic area is characterized by gently rolling to rolling landscapes.

The RFD predicts development potential into areas described as Breaks and Scoria Hills. These landscapes are generally steep and very steep, greatly increasing the soil disturbance associated with fluid mineral development. Soils disturbance would increase significantly from roads and infrastructure that were not included in the RFD for surface disturbance. This RMP predicts increases in initial soil disturbance of 13,164 acres (0.38%) from roads and infrastructure over the federal fluid mineral estate. Horizontal/vertical drilling locations or other large constructed disturbances have the potential to create areas described in this document as sensitive sites (soils with poor reclamation suitability, highly erodible soils, limited reclamation potential areas, and steep slopes [25% or greater]). As such impact to the soil resource has been elevated to a minor adverse impact.

Salable Minerals (negligible adverse)
Under Alternative D, 1,193 acres (0.03% of federal salable minerals) are predicted to be disturbed by salable minerals development. This would have a negligible adverse effect on soil resources.

Fire and Fuels Management

The *Impacts Common to All Alternatives* section above describes how fire and fuels management generally affects soil resources. The following paragraphs describe more specific effects on soil resources from management actions under Alternative D.

Unplanned Fire (Wildfire) (minor beneficial)
Under Alternative D, response to unplanned wildland fire varies from full suppression to monitoring fire as a management tool. The use of heavy equipment would be limited except when human safety is at risk, and fire and suppression damage would be rehabilitated where necessary. These actions would limit erosion and benefit soil resources. However, with a predicted 27,596 acres (3.5%) of BLM surface to be affected by wildfires, the beneficial effects of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire) (minor beneficial)
Under Alternative D, wildland fire and other vegetative treatments would be used to meet desired management objectives, which would result in long-term beneficial effects on soil resources. With a predicted 14,000 acres (1.8%) of BLM surface to be treated by prescribed fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Forest and woodland management under Alternative D would maximize forest health through active forest management similar to Alternative C, except with fewer acres predicted to be treated. Discussion of how forest and woodland management actions effect soil resources is provided under Alternative A (p. 562).

Under Alternative D, up to 20,000 acres (1.3%) of forest and woodland treatments are predicted on BLM surface. Forest and woodland management under Alternative D would have a minor beneficial effect on soil resources.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, thus protecting soil and controlling erosion. Alternative D would allow for quick-growing species to compete with annual weeds, which would stabilize the soil and provide an opportunity for slower-establishing native plants to inhabit the site. Initial soil stabilization for all soil disturbances in the planning area, would result in a moderate beneficial effect on soil resources from this management action.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Under Alternative D, surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed when in accordance with defined criteria. Other management actions that would benefit soil resources include managing for DFC within capable communities and restoring wetland and riparian vegetation supported by (CBNG), produced-water discharge. The 500-foot buffer would protect 3%, or 23,831 acres, of the soils on BLM surface and 2.8%, or acres, of soils over federal fluid mineral estate. Collectively, these management actions would have a minor beneficial effect on soil resources.

Invasive Species and Pest Management (minor beneficial)
The *Impacts Common to All Alternatives* section above describes the types of effects on soil resources from invasive species. Alternative D would take a balanced approach to managing invasive species. Under Alternative D, 12,000 acres (1.5%) of BLM surface are predicted to be treated, which would have a minor beneficial effect on soil resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (negligible beneficial)
Fish and special status fish management actions under Alternative D include maintaining, enhancing, and restoring fish habitat; managing fish habitat toward DFC; and allowing surface-disturbing activities within 0.25 mile of fish-bearing water when appropriately mitigated unless special status fish species are present, in which case disturbance would be prohibited.

The *Soils* and *Mineral Resources* sections of this soils analysis describe how surface-disturbing activities affect soil resources. There are 261,870 acres (0.4%) of federal mineral estate associated with fish-bearing waters and 4,846 acres (0.1%) of federal mineral estate associated with special status species fish-bearing waters. Because there are allowances for surface disturbance in sensitive soils, fisheries management under Alternative D would have a moderate beneficial effect on soil resources; special status species fish management would have a negligible beneficial effect.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
There are a number of management actions under Alternative D that would allow surface-disturbing activities where wildlife and special status wildlife species could be adequately protected. These actions would benefit soil resources locally where soil disturbances are prevented.

Some of the management actions with measurable benefits to soil resources include the following: timber harvest would maintain current amounts of crucial elk habitat (149,451 acres, or 19%, of BLM surface), elk security habitat would be retained (132,148 acres, or 16.9%, of BLM surface), surface-disturbing activities would be prohibited near Greater Sage-Grouse leks (7,688 acres, or 0.98%, of BLM surface), removal of sagebrush in Greater Sage-Grouse habitats would be restricted, and surface-disturbing activities would be prohibited near special status species raptor nests (17,417 acres, or 2.2%, of BLM surface). Collectively these prohibitions would have a major beneficial effect on the soil resource.

Special Status Species – Plants (no effect)
Under Alternative D, surface-disturbing activities would be allowed in special status plant habitat, but not within known populations. Populations are typically only a few acres in size. Special status plant species have narrow habitat requirements and are therefore not widespread in the planning area. Special status plant management would not affect soil resources.

Heritage and Visual Resources

Cultural Resources (moderate beneficial)
Management actions under Alternative D include a prohibition on surface-disturbing activities for specifically identified historic properties that retain their historic settings, and appropriate mitigation for surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. To protect the settings of the identified historic properties, surface-disturbing activities could be restricted up to three miles from the sensitive cultural site. This would protect soil resources on 221,490 acres, or 28.3%, of BLM surface. Because these

management actions limit, but do not prohibit, surface-disturbing actions, collectively they would have a moderate beneficial effect on soil resources.

Visual Resources (minor beneficial)
Under Alternative D, specifically identified areas inventoried as (VRM) Class II or special emphasis areas would be managed as (VRM) Class II. There are 112,350 acres, or 14.5%, of BLM surface classified as (VRM) Class II. However, because surface disturbance would be reduced but not prohibited, beneficial effects on soil resources would be minor.

Land Resources

Forest Products (minor adverse)
Management actions under Alternative D include offering an array of forest products managed within ecologically sustainable limits, and planting following harvest only when necessary to ensure regeneration. Regeneration standards would help forest and woodland vegetation recover, which would reduce the duration of long-term effects from vegetation removal. A maximum of 20,000 acres, or 2.6%, of forest product-related activity is predicted to occur on BLM surface. This would have a minor adverse effect on soil resources.

Renewable Energy (moderate adverse)
Management under Alternative D would exclude renewable-energy development in specifically identified areas and allow development in the remainder of the planning area. Approximately 75,240 acres (9.6%) of disturbance on BLM surface are predicted over the planning period. Renewable-energy development at this scale would have a moderate adverse effect on soil resources.

Rights-of-Way and Corridors (minor adverse)
Management under Alternative D would allows for ROW activity while conserving other resources. The predicted disturbance from ROW actions is 38,762 acres (4.9%) of BLM surface, which would have a minor adverse effect on soil resources.

Travel and Transportation Management (negligible adverse)
Management actions under Alternative D include limiting motorized vehicle use to designated routes and within stock driveways, closing and reclaiming areas to protect sensitive resources, and allowing travel off designated routes for identified tasks. Travel and transportation management under Alternative D would have a negligible adverse effect on soil resources based on the limited amount of area Open to motorized vehicle access.

Recreation (moderate beneficial)
Alternative D would prohibit or limit mineral leasing and limit surface-disturbing activities in designated SRMAs. Alternative D would protect soils on 54,160 acres (6.9%) of BLM surface by intensively managing recreation in these areas. This management action would have a moderate beneficial effect on soil resources.

Lands with Wilderness Characteristics (minor beneficial)
Alternative D would prohibit most surface-disturbing activities on BLM surface lands with wilderness characteristics to emphasize ecosystem health, primitive recreation, and natural values. This would have a minor beneficial effect on soil resources.

Livestock Grazing Management (moderate beneficial)
Management actions under Alternative D include managing grazing following timber harvest,

developing range improvements in accordance with resource needs, limiting or prohibiting grazing where it would not be compatible with other resources, locating mineral supplements away from sensitive resources, a provision for reserve allotments, and managing livestock following treatments until resource objectives are met. At present, livestock grazing is not authorized on approximately 10,000 acres (1.3%) of BLM surface. The lands where grazing could also be limited or prohibited may possess key soil features (sensitive soils). Therefore, this management action would have a beneficial effect on soil resources. Collectively, the livestock grazing management actions under Alternative D would have a moderate beneficial effect on soil resources.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Alternative D would designate three ACECs encompassing 35,451 acres, or 4.4%, of BLM surface, and implement limitations and prohibitions on surface-disturbing activities in ACECs. ACEC designation and management would have a minor beneficial effect on soil resources.

4.1.3.7. Cumulative Impacts

Chapter 4 describes effects to soil resources from past and present actions, federal and non-federal as part of the affected environment. Appendix G (p. 1671) lists projections of reasonably foreseeable federal and non-federal actions. Effects from foreseeable federal actions are described by alternative above. Non-federal actions will affect soils similar to federal actions. However, the extent of surface-disturbing activities and mitigation for effects to soil resources would differ between federal and non-federal actions.

The primary non-BLM authorized activities in the planning area relate to energy development, including ROW and livestock grazing. The extent of non-federal locatable minerals development, salable minerals development, renewable-energy development, and ROW activity is several times greater than BLM activities because the BLM administers approximately 11% of the surface acreage in the planning area. The coal estate is predominantly federally owned, but intermixed; therefore, coal mining follows federal authorities and mitigation. The level of non-federal coal development predicted is 15% of the federal coal development, which directly correlates to the non-federal coal estate. Non-federal fluid minerals development is also proportional to estate ownership; approximately 65% federal and 35% non-federal. Adverse effects on soil resources would likely be greater with non-federal fluid minerals development, because without BLM responsibility for sustainable resource management, there would be fewer mitigation measures implemented for soil resources.

Because of the intermingled ownership pattern, grazing management and the acres of livestock grazing on BLM surface versus non-federal surface does not change appreciably, and acre for acre, similar effects on soil resources would be anticipated.

4.1.3.8. Conclusion

Allowable uses and management actions described in this section for the various alternatives were used to determine anticipated effects on soil resources. Meaningful differences in long-term disturbance acreage, management tactics, and acreage of lands unavailable for surface disturbance form the basis for conclusion. Alternative B would produce the fewest potential adverse effects

on soil resources, because management actions would be the most protective of soil resources and are anticipated to result in the least soil disturbance. Alternative C is the least protective of the soils resource and would produce the most soil disturbance. Alternative D attempts to balance soil protections while allowing minerals and land use activities. The primary difference between alternatives D and A is that Alternative D defines when an activity could be allowed whereas Alternative A does not. The alternatives listed in order from most beneficial to the most adverse in terms of effects on soil resources are alternatives B, D, A, and C.

Table 4.26, "Summary of Impacts to Soil Resources" (p. 582) summarizes effect conclusions by alternative (the table does not list resources for which management actions would not affect soil resources under any alternative).

Table 4.26. Summary of Impacts to Soil Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Minor adverse	Major beneficial	Major adverse	Minor beneficial
Water Resources	Moderate adverse	Moderate beneficial	Moderate adverse	Minor adverse
Cave and Karst Resources	Minor adverse	Major beneficial	Minor adverse	Minor beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Fluids	Minor adverse	Negligible adverse	Minor adverse	Minor adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible beneficial	Minor beneficial	Minor adverse	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Negligible beneficial	Minor beneficial	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Negligible beneficial	Negligible beneficial	Minor beneficial	Minor beneficial
Vegetation – Grassland and Shrubland Communities	Moderate beneficial	Minor adverse	Moderate beneficial	Moderate beneficial
Vegetation – Riparian/Wetland Resources	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Invasive Species and Pest Management	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Fish and Wildlife Resources – Fish	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Major beneficial	Negligible beneficial	Major beneficial
Special Status Species – Plants	Negligible beneficial	Major beneficial	No effect	No effect
Special Status Species – Fish	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Special Status Species – Wildlife	Minor beneficial	Major beneficial	Negligible beneficial	Major beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major beneficial	Negligible adverse	Moderate beneficial
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Negligible beneficial	Minor beneficial	No effect	Minor beneficial
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Minor adverse	Minor adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Minor adverse	Negligible adverse	Major adverse	Moderate adverse
Rights-of-Way and Corridors	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Travel and Transportation Management	Minor adverse	Negligible adverse	Minor adverse	Negligible adverse
Recreation	Negligible adverse	Moderate beneficial	Negligible adverse	Moderate beneficial
Lands with Wilderness Characteristics	No effect	Minor beneficial	No effect	Minor beneficial
Livestock Grazing Management	Minor beneficial	Moderate beneficial	Minor beneficial	Moderate beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Moderate beneficial	No effect	Minor beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.1.4. Water Resources

This section describes effects on the quality and quantity of surface water and groundwater from management actions for other resources. Adverse effects result from actions that degrade surface water or groundwater quality, change surface water flow regimes, or change groundwater quantity. Short-term effects generally last fewer than five years while disturbed areas are reclaimed or impact mitigation measures are established. Long-term effects last more than five years.

This analysis considers actions that affect erosion, sediment transport, and sedimentation processes because sediment in the transport process is a water quality parameter, often measured as turbidity. Deposited sediment (sedimentation) affects channels, which contain water resources.

This analysis also considers pollutants other than sediment, some of the more common of which in the planning area would be petroleum by-products, other chemicals, and bacterial contaminants. Petroleum and chemicals will likely be introduced through spills or oil and gas operations. Bacterial pollutants are most commonly generated by livestock and wildlife, or through improper or ineffective sewage disposal.

4.1.4.1. Methods and Assumptions

This section describes the methods and assumptions used in the water resources effects analysis. Impacts are quantified where possible; in the absence of quantitative data, best professional judgment was used to qualitatively describe effects. Impacts are sometimes described using ranges of potential effects or in qualitative terms, if appropriate, according the definitions provided below.

Analysis of effects to water resources is based on achieving the watershed objectives of managing surface land use and water resources to maintain or improve water quality to comply with the water quality standards for uses and classes as established by the State of Wyoming in the Water Quality Rules and Regulations.

Nonpoint sources of pollution can include, but are not limited to, surface disturbance from construction activities for oil and gas development activities; concentrated livestock operations areas such as holding pens, watering areas, salt-block locations, shade spots, or lambing grounds; roads; and recreation areas. A watershed can experience any or all of these activities and could possess natural features such as poor soils and steep slopes that contribute to effects and could involve a mixture of private and public land. This means that causes and effects of pollution in waterbodies as a result of nonpoint sources can be difficult to identify. However, the BLM is committed to addressing any nonpoint pollution sources that could be directly or indirectly result from BLM-approved activities. This commitment might mean addressing such effects during activity planning (see Chapter 1). Areas also can be designated for special management (see Chapter 2, Actions for Water Quality, Watersheds, and Soils, and Actions for Special Designation/Management Areas), if new problems arise during the planning period, and if a waterbody with the potential to be added to the state's Clean Water Act section 303(d) list of impaired waters is identified. The BLM will address these issues within its legal jurisdiction as they are identified. The watershed approach to evaluating and monitoring Wyoming Standards for Healthy Rangelands will occur on a 10-year rotation schedule, and will allow the BLM to identify areas with potential water-quality problems.

The proposed management of each resource program is discussed in terms of the potential to affect water resources, either beneficially or adversely. Some BLM actions, such as surface mining, could intensively disturb project sites of limited size. In the discussion of such resource management, in instances where there is a possibility of intense disturbance of sites equaling 5 or more acres, the term “local impacts” is used to acknowledge these situations, especially when the total disturbance acreage under an alternative would be relatively small. No watersheds in the planning area are managed entirely by the BLM; therefore, the effects of management of each resource are dispersed according to the layout of public lands and federal mineral estate within the watersheds of the planning area.

Assumptions

Assumptions used in this analysis include, but are not limited to, the following:

- Surface disturbance that could affect water resources during the planning period will result mainly from road, pipeline, impoundment, and well-pad construction associated with oil, gas, and other minerals development including coal mining.
- Surface disturbance, especially in areas with highly erosive soils, can affect surface water quality by increasing sediment transported to small drainages and ultimately to larger streams during runoff events.

- The extent of unsurfaced roads (i.e., those lacking gravel or other surfacing material) is an indicator of the relative quantity of sediment delivery that could affect surface water quality within each watershed (Furniss et al. 2000). New unsurfaced roads will be constructed to access new oil and gas wells; therefore, an increase in oil and gas wells is associated with an increase in roads.
- The State of Wyoming has primacy over water quality and quantity regulations for the state. Activities of parties involved in BLM management actions can affect the quality and timing of affected water flow, but these activities must have appropriate state permits. It is assumed that any water discharged as a result of BLM actions must be permitted by the state and must meet the appropriate water quality standards.
- The BLM will help state agencies ensure that state rules and regulations are met by reviewing permitting information submitted as part of BLM actions, but does not have the authority to enforce state regulations or assume liability in cases where state water standards are not met by parties involved in BLM actions.
- Water production from individual CBNG wells is generally highest during the first year of pumping and decreases relatively rapidly thereafter. Therefore, the rate of water production follows the pace of mineral development, and water production rates will decrease as development is completed in an area and aquifers are drawn down (BLM 2003c).
- Deep groundwater resources associated with target coal zones could be substantially drawn down or depleted as a result of CBNG development (BLM 2003c).
- Actions that protect soil and vegetative resources will generally minimize effects to water resources.
- Effects conclusions are based largely on the acreage within 500 feet of surface waters that would experience surface disturbance or be protected from surface disturbance by the management actions being analyzed; there are 19,861 acres of BLM surface and 95,172 acres of federal fluid mineral estate within 500 feet of surface waters.

Significance Criteria

In addition to the scale of impacts identified in Methods and Assumptions, an adverse effect on water resources as a result of project actions would be considered potentially significant if the following were to occur:

- Degradation of water quality beyond the designated use of the receiving waters as defined by the Wyoming DEQ, or other violations of federal or state water quality standards, or adversely affecting a waterbody on the state's Clean Water Act section 303(d) list of impaired waters.
- Unmitigated loss of wetlands or wetland function (Executive Orders [EOs] 11990 and 11988) or activities that would degrade riparian and wetland areas such that, as a minimum physical state, PFC and Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) are not being maintained.
- Streamflow characteristics of perennial streams are altered such that established fisheries, wildlife, livestock, recreation, domestic, municipal, and industrial uses are affected.
- The alteration of stream hydraulic geometry by accelerated runoff and erosion (i.e., undue erosion, sedimentation, or mass wasting) beyond that expected through natural processes.
- The natural flow to or level of groundwater in existing springs, seeps, artesian wells, or permitted water supply wells is reduced to the point where beneficial uses cannot be maintained.
- Groundwater quality in an aquifer is degraded such that it can no longer be classified for its current and potential use(s).

4.1.4.2. Impacts Common to All Alternatives

Water Resources (negligible beneficial)
The BLM will install flow control devices on developed springs and water wells when problems at such sites are identified. This action would minimize waste of the water resources and reduce erosion caused by overflowing water supplies. These facilities would have a beneficial effect on water resources; however, due to the small number and localized areas where this management will apply, benefits would be negligible.

Water rights will be applied for BLM surface when and where the need arises. These could be groundwater rights or surface water rights used primarily for livestock or wildlife watering. This process will allow the BLM to protect legal priority in maintaining long-term water resources. Additionally, the BLM will work to develop offsite water sources for livestock and wildlife where other activities present an opportunity or need. Acquisition of water rights and modifying water sources would have a beneficial effect on water resources; however, due to the small and localized areas where these actions would apply, the beneficial effect would be negligible.

Water resources would be managed to meet the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) to achieve PFC and to meet Wyoming water quality standards established by the Wyoming DEQ. Managing for these conditions in specific projects, and at the project planning stage could preserve proper watershed function and minimize adverse effects on water quantity and quality. Interdisciplinary review is performed for mineral resource development on federal lands and mineral estate. This process would allow detailed analysis of proposed actions for compliance with these goals. At present, there is no BLM program in the planning area to measure water quantity and quality in relation to the Wyoming Standards for Healthy Rangelands, Standard 5. The BLM could develop a new monitoring program during the planning period.

Land uses and surface-disturbing activities would be managed to reduce channel and bank erosion, sediment transport, and sedimentation in accordance with project-specific reclamation plans and Wyoming DEQ applied Storm Water Pollutant Prevention Plans (SWPPP). These activities would benefit water resources because they would prevent the transport and deposition of sediment and other pollutants into surface waters.

Overall, activities described above for water resources would have a negligible beneficial effect on water resources.

Physical Resources

Air Quality (negligible beneficial)
Air quality management actions common to all alternatives include the implementation of air quality impact mitigation measures such as dust suppression and cooperative efforts to reduce dust emissions. These actions reduce airborne pollutants that could precipitate into surface waters. However, due to the small amount of pollutants that could be introduced into water resources, the actions would have a negligible beneficial effect on water resources.

Soil (negligible adverse)
Surface-disturbing activities that affect soil resources are evaluated on a case-by-case basis using NRCS soil survey data and interpretations and onsite investigations. Requiring mitigation measures, relocating project disturbance, or denying authorization would reduce adverse effects on water resources by limiting disturbances and the associated deposition of sediment

and chemical pollutants in surface waters. Requiring reclamation plans with authorized surface-disturbing activities would minimize long-term effects on water resources, especially in relation to transport and deposition of sediment and chemical pollutants.

Cave and Karst Resources (no effect)
Management actions common to all alternatives for cave and karst resources would not affect water resources because they are procedural actions (inventories).

Mineral Resources

Locatable Minerals (negligible adverse)
There are 777,310 acres of BLM surface overlying federal mineral estate available for potential locatable minerals exploration and development, with foreseeable locatable minerals development anticipated to affect a maximum of 1,455 acres (0.2%). Because most of the available area would not be within 500 feet of surface water, the adverse effect on water resources would be negligible.

Leasable Minerals – Coal (moderate adverse)
The potential acreage available for coal leasing is extensive, but the foreseeable activity has a maximum disturbance of 195,700 acres confined to central Campbell County and north-central Sheridan County. This would have an overall minor adverse effect on surface water resources because of the localized extent in the planning area; only 856 acres (1.3%) of the federal coal likely to be developed (coal administrative zone) is within 500 feet of surface waters. Additionally, during the 20-year life of this plan, we can expect to see at least 8 billion more tons of the Wyodak coal aquifers to be replaced by backfill aquifers. Groundwater quality has been and will be degraded in mined areas; research shows that elevated Total Dissolved Solids (TDS) levels occur until the salts made available by the greater surface area of rock fragments exposed to water draining through the spoil have been flushed out. This process creates significant short-term, if not long-term, impacts. In certain areas the elevated TDS levels are high enough to change the class of use of the groundwater. Combined, the adverse impacts to surface water and groundwater could be elevated to moderate.

Leasable Minerals – Fluids (moderate adverse)
Fluid minerals development in the planning area would expose soils to erosive processes. Sediment and other pollutants could subsequently be transported to surface water and groundwater and adversely affect water quality.

Other than erosion and sedimentation, the most visible contributor to water resource impacts from oil and gas operations would be water management during CBNG development. Typical CBNG development requires the production of large quantities of water (compared to conventional gas or oil production). Reinjection of produced water to the subsurface could result in groundwater mounding and increased pressures in the injection zone, potential loss of beneficial uses of produced water, and water quality changes in the receiving aquifer. Treatment and surface discharge of water to perennial systems would result in surface disturbance from the treatment site and pipelines or other infrastructure construction needed to convey the water to discharge points. A variety of treatment methodologies are used to bring the produced water within limits specified by the Wyoming DEQ in Wyoming Pollutant Discharge Elimination System (WYPDES) permits.

Water produced while dewatering coal formations during CBNG development would deplete groundwater aquifers. CBNGdevelopment could lower water levels and hydrostatic pressure in springs geologically connected to the producing formations. Other potential effects on

groundwater could include infiltration of poor-quality water stored in impoundments and dewatering of coal zones that could provide usable water.

Hydraulic fracturing is a process that injects large quantities of water, sand, and chemicals into the mineral bearing formation to fracture the formation and increase oil and gas recovery by creating passages through which gas and liquids can flow. The proper cementing of wells prevents the potential contamination of any aquifers. Thousands of wells pierce aquifers in western Texas, Oklahoma, and Kansas with essentially no effect to that groundwater as fracturing is typically conducted thousands of feet below aquifers (Montgomery and Smith 2010). The chances of creating a flow path for natural gas to the surface are diminishingly small. A 2004 EPA study found it unlikely that hydraulically fractured CBNG wells would contaminate ground water (EPA 2004a).

Minimizing impacts to groundwater quality and quantity as a management action would help preserve groundwater resources. A maximum of 5,280 new CBNG wells are projected for drilling as a part of BLM projects during the planning period, and effects on groundwater are projected as part of minerals development. Activities associated with CBNG development would be the largest contributors to effects on water resources in the planning area. At least this many additional CBNG wells would be drilled for non-BLM projects, which would affect groundwater resources associated with BLM projects. Dewatering coal zones for the purpose of producing natural gas would reduce the quantity of groundwater available for future use, a major adverse effect under all alternatives.

Deep groundwater-monitoring wells would be used to assess effects on groundwater from CBNG water production over the planning period. The 2003 PRB Oil and Gas FEIS (BLM 2003c) projected effects on groundwater quantity and quality. Effects on groundwater quality in the deep groundwater aquifers would likely be minor, but monitoring activities will be needed to track potential effects. Shallow groundwater resources have the potential to be affected by water infiltrating into the subsurface from water storage impoundments, and from CBNG produced water discharged to surface drainages. However, thus far, Wyoming DEQ-required water quality monitoring as part of CBNG development suggests that effects on shallow groundwater aquifers would be minor.

Water discharged into ephemeral channels could affect the hydrologic characteristics of receiving drainage systems and result in the loss or gain of riparian and wetland features. Many of these systems are formed under an intermittent or ephemeral discharge regime. When the stream hydrology is changed to a perennial flow regime, channel incision, and headward and lateral erosion can occur in many locations. These erosions processes could increase chemical and sediment transport and associated sedimentation in downstream perennial systems.

Water discharged to storage impoundments has the potential to seep or leak beyond the impoundment and affect downstream surface drainages. However, due to the low volume of water that generally resurfaces in the drainages, overall effects would be minor. Localized impacts from individual impoundments could be considered significant when water resurfaces downstream of a CBNG impoundment as a seep with poor water quality, or in areas that exhibit highly erosive conditions. If mitigation measures are not pursued when the problem is identified, there could be longer-term effects on riparian vegetation and bottomland soils.

Collectively, adverse effects from management of leasable fluid minerals could result in moderate adverse effects on water resources.

Salable Minerals (negligible adverse)
Local effects to water resources from salable minerals actions could be noticeable, but due to the small size of potential disturbance (fewer than 2,090 acres), adverse effects would be negligible.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (negligible adverse)
Fire and fuels management actions include fuels reduction projects involving prescribed fires, and chemical, biological, and mechanical treatments. In the short term, fuels reduction projects would reduce canopy and ground cover, thereby potentially increasing surface water runoff and exposing more soil to erosion. In the long term, management actions are successful if they would limit the areal extent and frequency of intense and destructive wildland fires, thus reducing the overall effects on water resources from wildland fires. All prescribed burn projects include provisions for reclamation. This, combined with the fact that acreages projected for treatment under the various alternatives are relatively small (extreme case of 42,000 acres), adverse effects on water resources would be negligible.

Peak runoff and chemical and sediment transport via runoff can increase dramatically after wildland fires. Loss of vegetation and hydrophobic soil conditions developed during intense fires can result in increased runoff and erosion, which could increase pollutants transported to surface waters. Fire and fuels management actions would include wildfire suppression and implementing Emergency Stabilization and Burned Area Rehabilitation Standards; these actions would reduce adverse effects on water resources after wildfires. When necessary, rehabilitation and restoration efforts would reduce erosion after wildfires by using mechanical erosion control techniques and enhancing plant recovery.

Wildland fire suppression activities can result in temporary surface disturbance and soil compaction due to increased vehicle traffic, equipment staging, and fire camps, and result in negligible to minor effects on water resources impacts. Fire line construction can increase runoff and erosion due to vegetation and duff removal. Fire line construction also can provide preferential pathways for surface water runoff that can result in channelization, especially in areas with steep slopes and poor soils. Rehabilitation of fire control lines would occur after most fires, thereby minimizing the effects of runoff and erosion. Fire-retardant chemicals used during suppression activities would not be applied within 300 feet of surface water sources. Fire suppression chemicals that do enter surface waters generally only persist in the aquatic environments for one to four days. Due to the highly localized areas in which these fires would likely occur, the overall adverse effect on water resources would be negligible.

Biological Resources

Vegetation
Vegetative communities would be managed to achieve and maintain proper ecosystem function and meet resource goals, which would benefit water resources by keeping hillslopes stable and preserving healthy watershed conditions. Vegetation management prescriptions would be implemented to meet the Wyoming Standards for Healthy Rangelands, which would maintain watershed conditions. Improving and diversifying vegetation would have the indirect benefit of improving watershed health by maintaining natural runoff peak flows, stable hillslopes, and functioning channel conditions.

Vegetation – Forests and Woodlands (no effect)
There are no forests and woodlands management actions common to all alternatives that would affect water resources.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
In addition to the effects described above for overall vegetation, management of grasslands and shrublands on the uplands would improve watershed health by improving the vigor of native plants and increasing surface cover, which decreases sediment transport and overland flow rates. This would have a negligible beneficial effect on water resources.

Vegetation – Riparian/Wetland Resources (negligible beneficial)
Plans to manage riparian systems to move toward PFC will be implemented. Properly functioning riparian systems beneficially affect water resources by reducing erosion and filtering out sediment before it reaches surface waters. Riparian areas also will provide shaded bank conditions that will help cool water, which will slow the growth of algae that can lead to eutrophic conditions.

The BLM will work to manage loss of riparian and wetland conditions, and evaluate for retention and maintenance riparian and wetland conditions that have developed as a result of CBNG development. Managing riparian and wetland areas to meet PFC as part of the Wyoming Standards for Healthy Rangelands would ensure wetlands are not declining and would be able to withstand flood events. Healthy riparian and wetland vegetation decreases bank erosion and serves as a filter to remove and recycle nutrients, remove chemical and organic wastes, and reduce sediment loads that reach streams and water sources. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Invasive Species and Pest Management (negligible beneficial)
Effects on water resources from invasive species and pest management would be negligibly beneficial to water resources by helping to maintain or restore natural streamflow characteristics through healthier watershed conditions, as discussed in the Vegetation section above.

Fish and Wildlife Resources – Fish (negligible beneficial)
Mitigation of surface-disturbing activities would reduce erosion, sediment transport, and sedimentation. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Harmful non-native riparian vegetation will be managed to improve fish habitat. Some of these species, such as Tamarix (salt cedar), consume large volumes of surface water and shallow groundwater. Managing this vegetation would reduce the consumptive loss of this water, which would potentially help restore natural flows to some streams. This would have a beneficial effect on water resources.

Barriers to fish passage will be managed under all alternatives. Many of the existing barriers are in the form of culverts that have eroded on the downstream side through improper placement or maintenance. Often this leaves an elevated culvert outlet. Water exiting the culvert can do so with tremendous energy that constitutes a substantial erosive force in the receiving stream channel. Managing these features to enhance fish passage also would alleviate much of the erosive potential of the structure. Any efforts that will minimize stream channel erosion would beneficially affect water resources. However, construction activities in the stream channels necessary to accomplish these actions would have short-term negligible effects from erosion, sediment transport, and sedimentation if effective BMPs were not implemented and until reclamation efforts were complete.

Efforts to improve public access to fish-bearing waters would increase the potential for introduction of pollutants to those waters. This would have a negligible adverse effect on water resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Wildlife and special status wildlife management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and establishing a permanent disturbance-free buffer for bald eagle nests. Mitigating and prohibiting surface-disturbing activities would reduce erosion, sediment transport, and sedimentation. Any efforts that decrease these processes would have a major beneficial effect on water resources.

Special Status Species – Plants (negligible beneficial)
Effects on water resources from special status plant management are described under the overall vegetation discussion in this section. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Special Status Species – Fish (negligible beneficial)
Supporting the Wyoming Game and Fish Department (WGFD) to obtain water rights for the benefit of special status fish habitat would generally have a beneficial effect on water resources because it would enhance in streamflows. However, often the acquisition of a water right means that it has been taken from an alternative use. If this were the case, it could represent an adverse effect on that previous water use. Overall, the result would be a negligible beneficial effect on water resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (no effect)
There are no cultural or paleontological resource management actions common to all alternatives that would affect water resources.

Areas with paleontological resources of high quality or importance are typically small (fewer than 40 acres), which would result in the displacement, not prevention, of any surface-disturbing activities. There would be no effect on water resources from any of the paleontological management actions under any alternative; therefore, paleontological resources are not further discussed in this section.

Visual Resources (major beneficial)
The three WSAs and proposed Middle Fork Powder River WSR would be managed as VRM Class I, with an objective to preserve the existing character of the landscape. Most surface-disturbing activities would be prohibited. There are 2,982 acres (15.0%) of BLM surface within 500 feet of surface water in the WSAs (2,300 acres) and Middle Fork Powder River WSR (682 acres). Visual resource management would have a major beneficial effect on water resources.

Land Resources

Lands and Realty (no effect)
The above lands program does not have any management actions common to all alternatives that would affect water resources.

The lands and realty program does not have any management actions that vary by alternative that would affect surface-disturbing activities. Therefore, lands and realty management is not furthered discussed in this section.

Forest Products (negligible beneficial)
Depending on the methodology used for timber harvesting, soils can be exposed to accelerated erosion during the harvesting process. This activity can increase erosion, sediment transport, and sedimentation potential. Under all alternatives, timber harvesting would be prohibited within 200 feet of surface waters. This management action would maintain vegetative buffers adjacent to surface waters that filter out mobilized sediment before it reaches areas of runoff concentration. This would mitigate many of the adverse effects on water quality as a result of timber harvesting. Due to the small areas involved, management actions would have a negligible beneficial effect on water resources.

Rights-of-Way and Corridors (negligible adverse)
The designation of ROW corridors would create less dispersed disturbance by locating utilities in or adjacent to existing disturbed areas associated with existing ROW, constructed roads, or highways. The BLM would designate ROW corridors to minimize surface disturbance and adverse effects on other resources. Due to the small areas involved, management actions would have a negligible adverse effect on water resources.

Travel and Transportation Management (negligible beneficial)
Management actions common to all alternatives include minimizing surface disturbance and erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if damage to soils would result. Travel and transportation management would follow a holistic approach, including the inventory, design, construction, maintenance, and reclamation of roads and trails, which would limit adverse effects on water resources. Road closures and maintenance would reduce erosion, surface runoff, sediment transport, and sedimentation of downstream waters.

Public input would be considered for appropriate motorized vehicle use areas consistent with other resource values. Motor vehicle use could result in localized increases in erosion caused by soil compaction and runoff concentration in tire ruts on roads and routes. Where roads and routes bisect or parallel stream channels and riparian and wetland areas, there could be increased runoff and sedimentation. In areas where resource damage is a concern or where there are risks to public health or safety, temporary closures to motorized vehicle use would be allowed. Motorized vehicle travel would be prohibited on soils if damage to vegetation, soils, or water quality would result. These management actions would result in localized beneficial, but negligible, impacts to water resources by reducing pollutant transport, including sediment, into surface waters.

Recreation (negligible beneficial)
Recreation management areas (RMAs) would avoid riparian habitat or develop and manage recreational sites, recreation facilities, and recreational access in a manner that minimizes adverse effects on riparian habitat. Dispersed camping and commercial camps would be prohibited within 200 feet of perennial surface waters, and developed recreational sites would be closed to livestock grazing. These actions would reduce erosion, sediment transport, and sedimentation to surface waters in the localized RMAs. Due to the small areas involved, recreation management actions would have a negligible beneficial effect on water resources.

Livestock Grazing Management (minor adverse)
Most BLM-administered lands in the planning area would be available for livestock grazing,

except for limited areas included in developed recreation sites and areas where livestock grazing would not be compatible with other resource values. Livestock grazing can reduce vegetative cover, cause surface disturbance from hoof action, and compact soils in localized areas. The most noticeable of such impacts would be around waterbodies, salt blocks, fencelines, and other areas where animals frequently congregate. In contrast, dispersed distribution and periodic livestock grazing rotation would be expected to reduce the intensity of localized impacts. This would be expected to decrease the overall adverse effects on water resources, but the potential for adverse effects on water resources could be major. Reducing vegetative cover could result in increased surface runoff, erosion, sediment transport, and sedimentation from affected areas. However, continued implementation of livestock management to achieve the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) would reduce adverse effects on water resources from livestock grazing. Conservation and mitigation measures for livestock operations would be implemented, and if successful, many of these measures would reduce adverse effects on water resources from livestock grazing.

Livestock grazing on public lands can result in periodic increases of fecal coliform when streamflow rates are low and livestock concentrations are high (e.g., *E. coli* is a bacteria that can be present in animal feces and causes human health problems). Several waterbodies in the planning area are currently listed as “Impaired” or “Not Supporting” on the state's Clean Water Act section 303(d) list of impaired waters for E. coli. If a waterbody were found to exceed standards for E. coli due to livestock grazing, adjustments to management would be implemented where appropriate and in coordination with the Wyoming DEQ.

Water storage reservoirs, water wells, water troughs and pipelines would be provided to disperse grazing use. In addition, livestock would be managed to sustain riparian, wetland, and other special habitats. These actions would help reduce adverse effects on water resources and would be considered a moderate benefit.

Overall, management actions associated with livestock grazing could result in a minor adverse effect on water resources.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways (no effect)
There are no management actions common to all alternatives for ACECs or Scenic or BCBs that would affect water resources.

Byway designation would not affect other activities; therefore, Scenic or BCBs are not discussed by alternative. WSR and WSA designation is not predicted during the planning period; therefore, such special designations are not anticipated to affect water resources. The only special designation addressed by alternative is ACECs.

Wild and Scenic Rivers (negligible beneficial)
Managing surface waters to maintain WSR characteristics would preclude alternative surface water uses and developments such as reservoir construction for irrigation and recreational use. Because the designation would be limited to the Middle Fork Powder River, and the likelihood of any such projects being completed during the planning period is minimal, beneficial effects from precluding development would be negligible.

Wilderness Study Areas (negligible beneficial)
These areas would be managed to maintain or enhance their natural characteristics, which would

protect surface water from the adverse effects of development. Use would emphasize primitive, nonmotorized activities to maintain current natural values. These actions would have a negligible beneficial effect on water resources due to the small size of the affected areas. Public use could increase in these areas, but that is not likely due to limited public access to the WSAs.

Socioeconomic Resources

Social and Economic Conditions (no effect)
The social and economic management actions have no direct relationship with water resources and therefore there would be no effect. Social and economic resources will not be considered further in this section.

Health and Safety (negligible beneficial)
This resource includes management provisions designed to prevent accidental spills of hazardous materials, which would benefit surface water and groundwater resources. There is a potential for accidental spills of hazardous waste in the planning area because such materials, including oil, drilling fluids, water treatment system chemicals and end products, pesticides, and cleaning solvents, are being produced, used and transported in the planning area. Spills, misuse, or improper disposal of such materials have the potential to adversely affect water resources. There could be locally significant impacts to water quality from accidental spills or inappropriate use and disposal; however, given the large size of the planning area and the sparse concentration of hazardous materials sources, the overall potential adverse effects on water resources would be negligible. Effects on water resources from health and safety management would be the same under all alternatives.

4.1.4.3. Alternative A

Water Resources (negligible adverse)
Under Alternative A, adverse effects on water resources would continue (the Impacts Common to All Alternatives (p. 586) section above describes some of these effects). Many of the issues that came to the forefront with the onset of CBNG development were not considered in the 1985 RMP. Therefore, all management actions under Alternative A had no previous decision except for the prohibition on surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams unless waived by the authorized officer. Consequently, Alternative A does not include most of the management actions included under other alternatives.

Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams unless waived by the authorized officer would benefit water quality through the filtering effects of buffer strips near surface waters. This action reduces the potential for surface contamination around wells to infiltrate shallow groundwater. In some or many cases, the 500-foot prohibition could be waived, which could result in major effects at localized sites. However, with proper analysis, adverse effects should be negligible. Under the current plan, the 500-foot setback distance has been waived many times because it was judged to be too restrictive. One example of where the setback distance has typically been judged to be too restrictive is around surface water impoundments that were constructed as part of a CBNG development, and their value as a resource to be protected is limited. The option of waiving the setback distance would still be available under Alternative A. In any event, the waiver option can lead to inconsistent decisions and poor management of adverse effects.

Physical Resources

Air Quality (no effect)
Air quality modeling would have no effect on water resources.

Soil (moderate beneficial)
The Alternative A seasonal prohibition on surface-disturbing activities on soils with severe erosion hazard and year-round prohibition on surface disturbance on slopes equal to or greater than 25% unless waived by the authorized officer, could have a major beneficial effect on water resources, especially regarding erosion, sediment transport, and sedimentation associated with surface-disturbing activities. However, the lack of defined criteria and inconsistent use of waivers in the past reduce beneficial effects to moderate.

Cave and Karst Resources (negligible beneficial)
Because there are no cave and karst management actions in the 1985 RMP, management of cave and karst areas is considered on a project specific basis. This has led to inconsistent management of surface-disturbing activities. Karst formations are present on 32% (63,171 acres) of BLM surface within 500 feet of water. The potential for surface-disturbing activities in cave and karst areas is low, related both to the difficult topography and limited potential for mineral resources. Although karst formations comprise more than ten percent of BLM surface, due to limited foreseeable activity and the fact that protection would likely be in the form of a buffer limiting surface-disturbing activities around the caves themselves (and not the karst formation), the result would be a negligible beneficial effect on water resources. At present, there are five significant caves identified within 500 feet of surface water.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative A, 554 acres (0.1% of soils over federal locatable minerals) are predicted to be disturbed by locatable minerals development. Little of this would likely be within 500 feet of surface water resources, and therefore would have a negligible adverse effect on water resources.

Leasable Minerals – Coal (minor adverse)
The foreseeable area for coal development could affect 1.3% (856 acres) of the federal mineral estate within 500 feet of surface water, which would have a minor adverse effect on water resources under Alternative A.

Leasable Minerals – Fluids (minor adverse)
Oil and natural gas exploration and development, both conventional and CBNG would result in almost 31,572 acres of new surface disturbance. This represents 0.9% of the groundwater resource associated with federal fluid mineral estate (3,386,530 acres), and therefore would have a negligible adverse effect on water resources. Effects to surface water are expected to be greater due to wells near streams and the effects of produced water discharges into surface waters. This would result in overall minor adverse effects on water resources though processes described under Impacts Common to All Alternatives (p. 586).

Salable Minerals (negligible adverse)
Alternative A management actions would result in effects similar to those described under Impacts Common to All Alternatives (p. 586). Surface-disturbing activities associated with mineral extraction could result in locally intense disturbance that could have short- and long-term locally

adverse effects on water resources near sites through chemical and sediment loading. However, the total acreage predicted for salable minerals development, is relatively low (530 acres, or 0.01% of federal salable minerals). This would have a negligible adverse effect on water resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible beneficial)
Under Alternative A, response to unplanned wildland fire varies from full suppression to use of fire as a management tool. The use of some types of suppression equipment would be limited in some areas, and fire and suppression damage would be rehabilitated. These actions would limit erosion and benefit water resources. However, with a prediction of 27,596 acres of BLM surface to be affected by wildfires, the benefit of these management actions would be negligible at the planning-area scale.

Planned Fire (Prescribed Fire) (minor beneficial)
Prescribed fire and chemical, mechanical, and biological treatments would be implemented to support vegetation and wildlife objectives, which would result in long-term benefits to water resources. The use of these processes would reduce canopy cover, disturb the soil surface, and increase erosion in the short term. Over the long term, fire and fuels management actions would improve the health and vigor of the vegetation and improve watershed condition by reducing the chance of widespread vegetation loss through insects, disease, and wildfire. Such a widespread loss of vegetation would contribute to accelerated runoff due to lower vegetation density and increase erosion, sediment transport, and sedimentation by exposing the soils to erosive processes caused by higher overland flow rates. Loss of root mass also would be a long-term factor in hillslope condition. Fire lines built with heavy equipment are more difficult to reclaim, and create more disturbance on the landscape (about 10 feet wide as opposed to 1 foot wide for hand lines), but all disturbances are projected to be reclaimed under this alternative. With a forecast of 14,000 acres (1.8%) of BLM surface to be treated by prescribed fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Timber harvest and other vegetative treatments would be designed to improve biodiversity and water quality. Disturbance associated with forest treatment activities would reduce canopy cover, disturb the soil surface, and increase erosion in the short term. Reducing the canopy cover would expose the soil surface to rain-splash erosion and could increase rilling and gullying. Forest litter, duff, and organic material forming ground cover are the most important components for protecting the mineral soil from erosion in forested systems (Elliot et al. 1996).

Meeting the DFC in the long term with these vegetative treatments would contribute to properly functioning watersheds that support productive plant communities. Improving the health and vigor of forests would result in increased ground cover and would reduce surface erosion.

Under Alternative A, up to 6,000 acres of forest and woodland treatments are predicted (0.8% of BLM surface). Forest and woodland management under Alternative A would have a negligible beneficial effect on water resources.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
There is only one grasslands and shrublands management action that varies across the alternatives.

This management action relates to whether non-native species can be used during reclamation. There was no decision in the 1985 RMP regarding this management action; therefore, species used for reclamation would need to be consistent with the BLM reclamation policy, which does allow the use of non-native species. A primary goal of reclamation is soil stabilization, and vegetation species used in reclamation are chosen with this goal in mind. Allowing the use of non-native species would be beneficial to water resources by reducing potential erosion. However, because little of the potential surface disturbance would occur within 500 feet of surface waters, this beneficial effect would be negligible.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Under Alternative A, surface-disturbing activities would be prohibited within 500 feet of springs, water wells, and perennial streams unless waived by the authorized officer. Like many management actions in the 1985 RMP, the prohibition can be waived and waiver criteria were not defined. This has resulted in inconsistent management. *Impacts Common to All Alternatives* describes the benefits to water resources from protecting riparian and wetland communities. This management action would keep most erosion resulting from surface-disturbing activities from reaching surface waters; however, due to the provision for waivers and the resulting reduction in protection, this management would have a moderate beneficial effect on water resources.

Invasive Species and Pest Management (negligible beneficial)
Impacts Common to All Alternatives describes impacts to water resources from invasive species and pest management. The only management action related to invasive species in the 1985 RMP was to control noxious weeds in cooperation with the counties. Under Alternative A, 8,000 acres (1.02%) of BLM surface predicted to be treated. Because most of the treatment areas would be more than 500 feet from surface water, the result would be a negligible beneficial effect on water resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (negligible beneficial)
Reservoirs are occasionally maintained, and are designed to enhance fisheries. This alternative would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes. Maintenance actions would cause short-term adverse effects, but long-term beneficial effects. However, due to limited applicability of this action in the planning area, overall beneficial effects on water resources would be negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor beneficial)
There are a number of management actions under Alternative A that prohibit surface-disturbing activities for the protection of wildlife and special status wildlife species; these actions would benefit water resources locally where surface disturbance is prevented. Typically, these management actions provide the opportunity for waivers without defined criteria, which reduce the benefits to water resources because the waivers have been inconsistently applied. In practice, prohibitions on surface-disturbing activities to protect wildlife rarely prevent surface-disturbing activities; rather, they cause the activities to be relocated outside the protected area, which would not benefit water resources. Timing limitations on surface-disturbing activities for various wildlife species also do not benefit water resources because they simply delay surface-disturbing activities.

The management action affecting the largest acreage is the permanent buffer around active raptor nests (10,686 acres, or 53.8% of BLM surface within 500 feet of surface water). However, despite this large acreage, the benefit to water resources would be minor because of the inconsistent application of waivers.

Special Status Species – Plants (negligible beneficial)
There were no decisions regarding special status plants in the 1985 RMP; therefore, management would be considered on a project-specific basis. Surface disturbance prohibitions would likely be limited to identified plant populations, which are typically widespread and small. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species, at present there are no documented populations in the planning area. Because there are no documented populations of special status plant species and populations are typically small, the benefit to water resources would be negligible.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Protection or preservation of cultural sites would benefit water resources by limiting or excluding surface-disturbing activities on or near specific sites. Surface-disturbing activities would be avoided within 0.25 mile or the visual horizon, whichever is closer, of the Bozeman Trail, Crazy Woman Battle Site, and other sites selected on a project-specific basis. These avoidance areas would reduce activities that cause surface disturbance in these locations. However, it is likely that these avoidance areas would change the individual locations of facilities and not the total acres of surface disturbance. New locations might not necessarily be better sited from a watershed-impact perspective. Impacts to water resources, such as increased local erosion and overland flow, would be considered on the activity-planning and decision level, and impacts would be avoided when possible. Data recovery as a result of cultural site disturbance typically occurs in areas that have already been disturbed. Scientific data recovery projects are extremely rare and protection measures afforded by the NHPA and required reclamation would mitigate any adverse effects to acceptable levels.

Beneficial effects on water resources from the management of cultural resources would be negligible due to the relocation of projects and the small amount of acreage affected (180 acres, 0.9% of the Bozeman Trail within 500 feet of surface water).

Visual Resources (moderate beneficial)
The 1985 RMP manages visual resources in accordance with their VRM classes. VRM Class II is the only class in the 1985 RMP likely to reduce surface-disturbing activities and therefore benefit water resources. The objective of VRM Class II is to retain the existing character of the landscape; management actions can be seen but they should not attract attention. There are 9,891 acres, or 50%, of BLM surface classified as VRM Class II within 500 feet of surface water. However, because surface disturbance is reduced and not prohibited and VRM management has been inconsistently applied, benefits to water resources would be moderate.

Land Resources

Forest Products (negligible adverse)
A maximum of 6,000 acres (0.8%) of BLM surface would be available for commercial wood products harvesting, most of which is in the southern Big Horn Mountains. As roads are upgraded to provide access to commercial products, impacts would include changes in surface hydrology and increased local erosion where runoff would concentrate in ditches and culverts. Reduction of the canopy cover resulting from logging opens the soil surface to erosion processes. Forest litter, duff, and organic material forming ground cover are the most important components for protecting soil from erosion in forested systems (Eiswerth and Shonkwiler 2006). Any harvesting

techniques that remove ground cover would contribute more to rain-splash and hillslope erosion processes. Hillslope erosion could increase sediment transport and sedimentation in receiving waters. This is especially true for logging in areas with steep slopes and riparian areas. Therefore, harvesting techniques designed to reduce soil disturbance would be applied where possible during timber cutting activities. Reclamation techniques and erosion and sediment control BMPs would be used on all cutting areas, thus limiting the severity and longevity of adverse effects. Because of the sensitive nature and important function of these potential harvest areas for watershed resources, direct effects to water resources from commercial logging activities would be expected to be locally significant. However, the overall adverse effect on water resources in the planning area be negligible due to the small amount of acreage.

Renewable Energy (negligible adverse)
The 1985 RMP does not include decisions on renewable energy. Under Alternative A, proposals for renewable-energy development would be considered, and it is expected that several small wind-energy facilities would be proposed. Road construction and use and surface disturbance for facilities related to wind-energy development would increase local erosion. However, due to the small number of acres of BLM surface suitable for wind-energy development, renewable-energy management actions under Alternative A would have a negligible adverse effect on water resources.

Rights-of-Way and Corridors (negligible beneficial)
ROW and corridors management and effects under Alternative A would be the same as described under *Impacts Common to All Alternatives*. In addition, surface-disturbing activities and surface occupancy would not be allowed on slopes equal to or greater than 25%. This would result in a negligible beneficial effect on water resources because it would reduce soil erosion, sediment transport, and sedimentation.

Travel and Transportation Management (negligible adverse)
Under current management, approximately 3,704 acres (4.6%) of BLM-administered lands are Closed to Off-highway Vehicle (OHV) use in specially designated areas, and would continue under this alternative. OHV use would be Limited to existing or designated roads and trails. Approximately 29,011 acres (16%) of BLM-administered lands would be seasonally Closed to motorized vehicle use.

Under this alternative travel and transportation management would be largely unchanged. Therefore, adverse effects to water resources would continue. However, as land use increases, adverse effects on water resources would increase. More vehicle access would contribute to accelerated erosion, sediment transport, and sedimentation. Depending on the rate of land use increases, this alternative could result in a negligible adverse effect on water resources.

Recreation (negligible beneficial)
Effects on water resources from recreation resource management would be similar to those described under *Impacts Common to All Alternatives*, with the addition of a prohibition on surface-disturbing activities associated with oil and gas development within 0.5 mile of certain RMAs. This change would have a negligible beneficial effect on water quality due to the minimal likelihood of oil and gas development in the area.

Lands with Wilderness Characteristics (negligible beneficial)
Parcels that meet the size and naturalness requirements have been evaluated for wilderness characteristics. Newly acquired lands will be evaluated for wilderness characteristics. The

likelihood of acquiring any areas meeting the wilderness characteristics requirements is minimal. Therefore, beneficial impacts to water resources from this action would be negligible.

Livestock Grazing Management (minor adverse)
Impacts from livestock grazing management would be the same as those described under *Impacts Common to All Alternatives*. With proper planning and effective management of range improvements, any adverse effects on water resources would be minimized. Range improvements would be designed to maintain or improve the distribution of livestock within each allotment and prevent livestock concentration and overuse of forage that leads to increased surface runoff and soil erosion. Adverse effects from range improvement projects would be negligible due to the small number of acres associated with such projects. Grazing systems and range improvements would improve or maintain desired range conditions, which would minimize adverse effects on water resources from livestock grazing. Overall, BLM actions could disturb 225,609 acres, mostly through grazing allotment use. As discussed under *Impacts Common to All Alternatives*, concentrated livestock use of areas near water has the potential to adversely affect water resources. A minor adverse effect on water resources would be expected under Alternative A.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are no areas proposed for ACEC designation under this alternative; therefore, there would be no effect on water resources.

4.1.4.4. Alternative B

Water Resources (moderate beneficial)
As previously discussed, management of water produced in association with CBNG development can have major adverse effects on water resources. Historically, much of this water has been managed by discharging it into on-channel reservoirs where it was allowed to infiltrate and evaporate. Under Alternative B, development of new on-channel reservoirs for this purpose would no longer be authorized.

On-channel reservoirs have the effect of altering the natural flow characteristics of a drainage. The reservoir captures runoff from upstream precipitation events, and unless the reservoir is full or a drainage gate is open, no water will pass the dam. This phenomenon has the effect of attenuating the natural streamflow hydrograph, resulting in lower peak flows with potentially longer durations. Reducing peak flows would have the beneficial effect of decreasing the erosive forces of elevated streamflow and reducing the effects of flash flooding. However, the same attenuating effects would alter the natural channel characteristics and vegetation that have evolved to rely on these “flashy” systems. In addition, on-channel reservoirs can capture natural runoff that downstream water users rely on for agricultural purposes. This effect is most pronounced when there are multiple reservoirs in a drainage basin. Capturing natural runoff can adversely affect aquatic life, wildlife habitat, and wetland conditions that have formed under a more natural flow regime. Alternative B would likely cause on-channel reservoir development to be relocated outside BLM authority, and therefore would have only a minor to moderate beneficial effect on regional water resources.

There have been a few cases in which on-channel reservoirs have leaked to downstream channels or hillslopes. At times, vegetation exposed to the leakage was killed due to poor water quality or the vegetation was not adapted to the altered soil moisture. In addition, altered vegetative

conditions or soil moisture can provide favorable conditions that induce the spread of invasive plant species, such as Tamarix (salt cedar). Therefore, eliminating additional on-channel reservoirs would be have a beneficial effect related to these issues. Adverse effects from prohibiting on-channel reservoirs would include the loss of the potential for shallow aquifer recharge from impounded water, whether that water is from natural runoff or produced from oil and gas operations. In addition, not authorizing on-channel reservoirs could adversely affect the availability of year-round water for livestock use.

Not authorizing surface discharge of CBNG produced water would have multiple beneficial effects. Potential channel degradation as a result of enhanced flows would be eliminated. This channel degradation could be in the form of headward or lateral stream channel erosion, or vegetation changes that could induce stream channel or bank instability. Vegetation changes caused by the addition of CBNG produced water also could alter forage availability for livestock and wildlife. Adverse effects would include the loss of additional water sources for wildlife and livestock. In some cases, this would constitute a loss of artificial irrigation that would reduce available forage for livestock and wildlife. It also could adversely affect the establishment or enhancement of riparian conditions that help stabilize stream channels and provide additional wildlife habitat.

Water users have adapted to plentiful water provided by CBNG development. Not authorizing new on-channel impoundments or surface discharge would force CBNG operators to find alternative methods to manage produced water or cut back on production. Both of these options would reduce or halt water availability to water users, particularly agricultural users. As water production from existing CBNG projects declined, water users would have to find other sources of water or cut back on usage to meet supply. Under Alternative B, abandoned CBNG wells would not be converted to water supply wells to help meet that demand. In localized areas, some landowners would likely develop new water wells to compensate for the loss of CBNG produced water. However, due to cost, this would not be likely to be widespread. In most areas of the PRB, non-federal CBNG development is relatively close by. Because this non-federal development would not be subject to the restrictions under this alternative, that development might be able to compensate for some of the lost water. However, there are areas where all of the development is federally attached. In these areas, there might not be a practical alternative water source available. Due to the potential availability of non-federal water sources, this alternative would have a minor to moderate effect on water resources.

An NSO restriction within 500 feet of springs, non-CBNG reservoirs, water wells, perennial surface water, and riparian areas would reduce the potential for sediment to be transported to the water feature and subsequent sedimentation in that feature that would contribute to the degradation of water quality. The beneficial effect of this decision are described under Alternative A. Like Alternative A, under Alternative B surface disturbance could be modified or displaced in many cases as a result of this management action. Therefore, the beneficial effect of this action could be moderate.

Overall, these management actions are anticipated to have a moderate beneficial effect on water resources.

Physical Resources

Air Quality (no effect)
Air quality modeling would have no effect on water resources.

Soil (major beneficial)
The effects of this alternative on water resources would be similar to under Alternative A, except that restrictions on surface-disturbing activities in areas with severe erosion hazard, slopes equal to or more than 25%, and soils with poor reclamation potential would be year-round. In addition to these restrictions, prohibiting disturbance on badlands, rock outcrops, and slopes prone to mass movement would be applied on highly erodible soils. The prohibition on surface-disturbing activities on soils with poor reclamation potential would protect soils on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate. It is anticipated that a similar percentage of water resources would benefit from these prohibitions. This would have a major beneficial effect on water resources.

Cave and Karst Resources (major beneficial)
Under Alternative B, all surface-disturbing activities, including minerals development and timber harvest, would be prohibited in cave and karst areas. The prohibitions would be absolute, and there would be no exceptions. Karst formations are present on 32% (63,171 acres) of BLM surface within 500 feet of water. Management actions to protect cave and karst resources would have a major beneficial effect on water resources.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative B, 277 acres (0.03% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. It is likely that little of this disturbance would be within 500 feet of surface water resources. Management under Alternative B would have a negligible adverse effect on water resources.

Leasable Minerals – Coal (minor adverse)
The foreseeable area for coal development could affect 1.3% (856 acres) of the federal mineral estate within 500 feet of surface water. This would result in a minor adverse effect on water resources.

Leasable Minerals – Fluids (minor adverse)
Oil and natural gas (both conventional and CBNG) exploration and development would result in approximately 286 acres of surface disturbance. This would result in the potential for adverse effects on water resources though processes described under Impacts Common to All Alternatives. Reclamation procedures and the application of BMPs would reduce long-term effects, such as increased erosion and surface runoff, on water resources. Even with successful reclamation and full implementation of BMPs, minerals management actions would lead to direct adverse effects on water resources and these effects could be major in local areas and therefore are considered minor at the planning area scale area despite the small acreage affected.

Salable Minerals (negligible adverse)
Under Alternative B, salable minerals development is predicted to disturb 114 acres (0.003% of federal salable minerals). This would have a negligible adverse effect on water resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible beneficial)
Under Alternative B, response to unplanned wildland fire would vary from full suppression to monitoring fire as a management tool. The use of heavy equipment would be limited to existing

roads and trails, and all fire and suppression damage would be rehabilitated. These actions would limit erosion and be beneficial to water resources. With a forecast of 27,596 acres (3.5% of BLM surface) to be affected by wildfires, the benefit of these management actions would be negligible at the planning-area scale. This alternative would result in a higher accumulation of fuels than Alternative A, and could eventually increase the likelihood of high-intensity watershed-damaging wildfires.

Planned Fire (Prescribed Fire) (negligible beneficial)
Wildland fire and other vegetative treatments would be used to restore fire-adapted ecosystems, which would result in long-term benefits to water resources. With a forecast of 3,500 acres (0.4%) of BLM surface to be treated by planned fire and mechanical treatments, the benefit of these management actions would be negligible at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Alternative B emphasizes a natural, hands-off, approach to forest and woodland management. Timber harvest and other vegetative treatments would be minimized. Mature and old-growth forests are typically productive plant communities with increased ground cover and reduced surface erosion. Insects, disease, wildland fire, and other stochastic events would be allowed to run their course. Old-growth forest stands would be managed to emphasize old-growth characteristics. This alternative would likely increase fuels availability significantly. In the event of a severe wildfire, this action could have substantial localized adverse effects on water resources. Depending on topography, soils, vegetative characteristics, and fire intensity, a severe wildfire could result in severe erosion and sediment transport if not controlled. In some cases this could result in ecosystem-destroying sedimentation in the surface waters. At the planning area scale the overall effect would be negligible.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Under Alternative B, only native species would be authorized for reclamation activities. Native species often have distinct seeding windows and are sometimes slow to establish, allowing invasive species to establish. Allowing only native species for reclamation could have a negligible adverse effect on water resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Under Alternative B, surface-disturbing activities would be prohibited within 500 feet of springs, water wells, and perennial streams. Adverse effects from surface-disturbing activities would be largely avoided, which would be a major benefit to water resources.

Invasive Species and Pest Management (negligible beneficial)
Impacts to water resources from invasive species and pest management are described under Impacts Common to All Alternatives. Alternative B takes an aggressive approach to managing invasive species. Under Alternative B, 15,000 acres (2%) of BLM surface are predicted to be treated. However, because much of the treated areas would be more than 500 feet from surface water, the result would be a negligible beneficial effect on water resources.

Fish and Wildlife Resources – Fish (major beneficial) **and Special Status Species – Fish** (negligible beneficial)
Under Alternative B, reservoirs and riparian areas would be managed to enhance fisheries. This

management would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Reservoirs would be required to be designed to include fisheries. This management would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Perennial waters that affect fish habitat would be maintained or enhanced. This management would generally benefit water resources.

Surface-disturbing and disruptive activities would be prohibited within 0.25 mile of naturally occurring waterbodies containing native or desirable non-native fish species. This management would minimize the likelihood of sediment being transported to waterbodies that would result in sedimentation of the water. This action would affects 10,529 acres within 500 feet of surface water, or 53% of water resources, a major beneficial effect. Yellowstone cutthroat trout could be present in streams associated with 182 acres (0.9%) of BLM surface within 500 feet of water, a negligible beneficial effect.

Restoration of important stream segments for fish habitat would be in accordance with WGFD priorities. This management would generally provide a minor benefit to water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
There are a number of management actions under Alternative B that prohibit surface-disturbing activities, without exception provisions, for the protection of wildlife and special status wildlife species; these actions would benefit water resources locally where soil disturbances are prevented. Timing limitations for surface-disturbing activities for various wildlife species also would not benefit water resources because those restrictions delay, but do not prevent, surface-disturbing activities.

Two of the largest surface disturbance prohibitions in terms of acreage include permanent buffers around active raptor nests (6,415 acres, or 32%, of BLM surface within 500 feet of surface water) and in reptile and amphibian habitat (13,909 acres, or 70%, of BLM surface within 500 feet of surface water).

Special Status Species – Plants (major beneficial)
Alternative B would prohibit surface-disturbing activities that could adversely affect special status plant habitat. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species; therefore, adverse impacts from surface-disturbing activities would be largely avoided within 500 feet of surface water. This would have a major beneficial impact on water resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Management actions under Alternative B include a prohibition on surface-disturbing activities in areas with historic properties that retain their historic setting, TCPs, sacred sites, and other culturally sensitive areas.

Benefits to water resources from cultural resources management would be major due to the amount of acreage affected (8,671 acres [44%] of BLM surface within 500 feet of surface water).

Visual Resources (moderate beneficial)
Under Alternative B, areas inventoried as VRM Class II and special emphasis areas would be managed as VRM Class II. There are 218,178 acres, or 28%, of BLM surface classified as VRM Class II. However, because surface disturbance would be reduced but not prohibited, the benefits to water resources would be moderate.

Land Resources

Forest Products (negligible adverse)
Forest resources management under Alternative B would emphasize natural processes to achieve forest health goals. Commercial timber harvesting would be limited to 5 acres per select group and to remove timber after catastrophic events for safety reasons. This management would have negligible adverse effects on water resources because of the limited area where harvest, and therefore erosion, would occur.

Renewable Energy (negligible beneficial)
Renewable-energy projects would be excluded in certain otherwise restricted areas. The likelihood of these areas coinciding with areas suitable for renewable-energy development is minimal. Due to these considerations, effects on water resources would be negligible, but would be beneficial if they occurred.

Rights-of-Way and Corridors (minor beneficial)
Alternative B management of ROW corridors would be as described under *Impacts Common to All Alternatives*. In addition, 370,088 acres would be excluded from ROW, 395,444 acres would be identified for ROW avoidance, and 16,570 acres would have minor ROW constraints. ROW would be excluded on slopes equal to or greater than 25% and in areas with highly erodible soils. This would result in a minor beneficial effect on water resources because it will reduce the occurrence of soil erosion, sediment transport, and sedimentation.

Travel and Transportation Management (minor beneficial)
Under Alternative B, areas in special status species habitat would be Closed to motorized vehicle use, including activities related to fire suppression. In the event of a severe wildfire, this action could have a negligible localized effect on water resources. Depending on topography, soils, vegetative characteristics, and fire intensity, a severe wildfire could result in severe erosion and sediment transport and deposition if not controlled.

Existing routes would be evaluated for closure and reclamation consistent with other resource values. Approximately 312,561 acres in selected areas would be Closed to motorized vehicle use. Motorized vehicle use would be limited to designated roads on 451,077 acres, and an additional 18,464 acres would have seasonal prohibitions on motor vehicle use. These actions would reduce erosion, sediment transport, and sedimentation associated with motor vehicle activity, thereby providing a minor beneficial effect on water resources.

Recreation (negligible beneficial)
Alternative B effects on water resources from recreation resource management would be similar to those described under *Impacts Common to All Alternatives* and under Alternative A, with the addition of a recommendation to withdraw some appropriations under the mining laws. This alternative also would prohibit minerals leasing within a half mile of designated SRMAs. Designated SRMAs overlap the Tongue River and Middle Fork Powder River. Recreation management alternatives might afford some additional protection for waterways within SRMAs.

The Middle Fork is currently protected by the Wild and Scenic River provisions; however, an SRMA may extend additional protection from major surface disturbing development. These management actions would have a negligible beneficial effect on water quality due to the small areas involved.

Lands with Wilderness Characteristics (negligible beneficial)
Areas with wilderness characteristics would prevent or minimize exposure to motorized vehicle traffic, close areas to mineral leasing, recommend withdrawal from locatable minerals entry, close areas to salable minerals, exclude ROW, prohibit commercial woodcutting, and prohibit all other surface-disturbing activities. Due to the small area involved, 12,237 acres, these actions would have a negligible beneficial effect on water resources.

Livestock Grazing Management (minor beneficial)
Alternative B livestock grazing management effects would be similar to those under Alternative A, except grazing systems and range improvements would be implemented to enhance wildlife, watershed, and riparian values, instead of designing improvements to achieve livestock management objectives. Actions to enhance watershed and riparian values would reduce erosion and sediment loading to nearby streams, maintain adequate vegetative cover, and enhance soil productivity. Livestock salt or mineral supplements would be placed a minimum of 0.5 mile from water sources and riparian areas. Livestock grazing would be prohibited in areas where it has been determined to be incompatible with other resources. These actions would have a minor beneficial effect on water resources.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
If the seven proposed ACECs were designated, local water resources would benefit because ACEC designation would prevent disturbance and potential degradation of surface water quality and protect relatively undisturbed watersheds. The BLM would evaluate authorized activities and develop mitigation measures to protect the integrity of the characteristics for which the ACEC was designated. These areas would be managed for preservation and would minimize potential future development. This management would maintain or improve water resources by limiting surface disturbance that could contribute to erosion and nonpoint sources of sediment and other pollutants. However, the designation of ACECs could increase popularity with recreationists, resulting in increased potential for degradation of surface water resources if overuse or misuse were to occur. Management under Alternative B would have a negligible beneficial effect on water resources because of the small areas involved.

4.1.4.5. Alternative C

Water Resources (moderate adverse)
The potential effects from on-channel reservoirs are addressed under Alternative B (p. 600). Allowing on-channel reservoirs in consideration of other resource values would contain natural streamflow and storm water runoff, thereby resulting in adverse effects on flow regimes. Alternative C would not cause the on-channel reservoir development to be displaced to locations outside BLM authority, as suggested under Alternative B. Because neither alternative presents a significant difference in scale of reservoir development, just the location of the development, Alternative C would have a minor to moderate adverse effect on water resources.

Reservoir leakage, as described under Alternative B (p. 600), would be more likely to occur under Alternative C. Adverse effects from leaking impoundments would primarily involve impacts to vegetation and soils from altered water quality as well as from accelerated erosion. Beneficial effects of on-channel reservoirs would be the potential for shallow aquifer recharge from CBNG waters and additional artificial water sources for wildlife and livestock. However, because effects would be small and localized, adverse effects on water resources would be minor.

Authorizing surface discharge of CBNG produced water would have multiple adverse effects. There would be potential channel degradation as a result of enhanced flows. This channel degradation could be in the form of headward or lateral stream channel erosion, or vegetation changes that could make stream channels or banks unstable. Vegetation changes caused by the addition of CBNG produced water also could alter forage availability for livestock and wildlife. Beneficial impacts would include the supply of additional water sources for wildlife and livestock. In some cases, this would constitute artificial irrigation that would enhance available forage for livestock and wildlife. It could also promote the establishment or enhancement of riparian conditions that help stabilize stream channels and provide additional wildlife habitat.

Water users have adapted to plentiful water provided by CBNG development. As water production from CBNG projects declines, water users will have to find other sources of water or cut back on usage to meet supply. Under Alternative C, the option of converting abandoned CBNG wells to water supply wells to help meet that demand would be available. Historically, operators have had varying degrees of success at converting these wells for water supplies. Often, problematic well conversions are local issues related to the availability of a suitable water-bearing zone. Other times, the issue is related to the cost of re-completing a well. Because of these and other issues, the likelihood of large numbers of CBNG wells being converted is minimal. Therefore, this alternative would have a minor to moderate adverse effect on water resources.

Allowing surface occupancy within 500 feet of springs, non-CBNG reservoirs, water wells, perennial surface water, and riparian areas would increase the potential for sediment transport to the water feature and subsequent sedimentation in that feature that would contribute to the degradation of water quality. The beneficial effects of this decision are described under Alternative A (p. 594). Proper implementation of BMPs would minimize the effects of this management action to negligibly adverse.

Maintaining existing water supply sources and adding new sources would meet current demand and allow for added use. New water sources would have an adverse effect for more locations of concentrated use, but the potential beneficial effect would be the dispersion of existing usage, thereby possibly allowing for some recovery. Not requiring alternative energy sources at new water sources would have a negligible adverse effect on water resources due to the possible erosion and sedimentation involved with the development of conventional power sources.

Allowing surface disturbance and surface occupancy within 500 feet of perennial surface water, springs, non-CBNG reservoirs, and wetland and riparian areas would greatly increase the potential for erosion, sediment loading of runoff, and degradation of water quality. This would have a minor adverse effect on water resources.

Under Alternative C, unneeded CBNG-related surface water impoundments would be removed and reclaimed. Reclamation of disturbed impoundment sites must follow the Wyoming Reclamation Policy (BLM 2009f) and the BFO Impoundment Reclamation Guidance (BLM 2012e) to minimize the long-term effects of the disturbance, restore channel capacity and stability, and mitigate effects to down-gradient flow regimes.

Overall, the management actions under Alternative C would have a moderate adverse effect on water resources.

Physical Resources

Air Quality (no effect)
There would be no effect on water resources from Alternative C air quality management.

Soil (major adverse)
Alternative C would remove all restrictions on surface disturbance and occupancy in areas with severe erosion hazard, on slopes equal to or more than 25%, and on soils with poor reclamation potential. These actions would have a major adverse effect on water resource, because allowing disturbance and occupancy on all soil types would increase the likelihood of soil erosion, sediment transport, and sedimentation in receiving waterbodies.

Cave and Karst Resources (minor adverse)
Under Alternative C, surface-disturbing activities, including minerals development and timber harvest, would be allowed in cave and karst areas. Karst formations are present on 32% (63,171 acres) of BLM surface within 500 feet of water. The potential for surface-disturbing activities in cave and karst areas would be relatively low, related both to the difficult topography and limited potential for minerals resources. Although cave and karst resources comprise more than ten percent of BLM surface, due to the limited foreseeable minerals activities, the result would be a minor adverse effect on water resources.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative C, 1,455 acres (0.002% of federal locatable minerals) are predicted to be disturbed by locatable minerals development. It is likely that little of this acreage would be within 500 feet of surface water resources. Therefore, Alternative C would have a negligible adverse effect on water resources.

Leasable Minerals – Coal (minor adverse)
Under Alternative C, all lands in the planning area would be open to coal exploration and leasing. However, during the planning period, there is minimal likelihood of significant coal development beyond the high-potential development areas previously described in Impacts Common to All Alternatives. New coal development would have a major effect on localized groundwater resources, but due to the low probability of extensive development, the effect would be minor. The foreseeable area for coal development could affect 1.3% (856 acres) of the federal mineral estate within 500 feet of surface water. This would have a minor adverse effect on water resources.

In addition, federal coal resources would be available for coal-gasification projects and from methanogenisis. Little data are available on the associated effects because the processes are relatively new. However, it is anticipated that localized aquifer drawdown would be required. This dewatering process would produce water that would need to be managed. Some projects have proposed injecting the produced water on the margins of the project area to control the gasification process. Other water management options will likely resemble methodologies used for CBNG development. Any proposed coal-gasification project would have associated surface disturbance, which would involve erosion and sedimentation issues like all surface-disturbing activities.

Regardless of the water-handling methodologies employed, the effect on water resources would be minimal due to the small, localized areas that would be subjected to the processes.

Leasable Minerals – Fluids (moderate adverse)
Under Alternative C, no lands would be administratively unavailable to oil and gas leasing. Oil and natural gas (conventional and CBNG) exploration and development would result in approximately 43,252 acres (1.3% of fluid mineral estate) of surface disturbance. This alternative would have a moderate adverse effect on water resources associated with the level of surface disturbance.

Salable Minerals (negligible adverse)
The total acreage predicted for salable minerals development under Alternative C is 2,090 acres (0.1% of federal salable minerals). If all development occurred within 500 feet of surface waters, the predicted development represents 1.2% of the total federal mineral estate within 500 feet of surface waters. However, the true acreage likely to be developed within 500 feet of surface water would be much less. Therefore, the result would be a negligible adverse effect on water resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse)
Under Alternative C, full suppression tactics would be used in response to unplanned wildland fire. Heavy equipment use would not be limited, but would consider other resource values. These actions would do little to limit erosion and would have adverse effects on water resources. With an emphasis on suppression, this alternative would increase the probability of large watershed-damaging fires over the long term. Full suppression of wildland fires would result in an accumulation of fuels and an increase in late-seral vegetative communities that are more prone to catastrophic wildland fires. Wildland fires reduce canopy and ground cover, thereby exposing soils to erosion and increasing the potential for hillslope runoff. In addition, physical soil properties could be adversely affected, such that infiltration rates are lowered in some cases, thus increasing surface runoff. Wildland fire would increase sediment loading and impact downstream water quality, depending on the severity of the fire and its location within the watershed. Evapotranspiration and other hydrologic properties also would be altered in some locations because of increases in late-seral vegetation resulting from wildland fire suppression.

Greater fire suppression efforts would result in increased disturbance from suppression activities such as building fire lines, which increase localized soil erosion. In addition, no active rehabilitation of affected soils is forecast. This alternative could result in changes to water quality in the form of sedimentation, and increased surface runoff in some locations, if a large wildland fire could not be suppressed. With a forecast of 27,596 acres (3.5% of BLM surface) to be affected by wildfires, the adverse effect of these management actions would be minor at the planning-area scale.

Planned Fire (Prescribed Fire) (minor beneficial)
Under Alternative C, wildland fire and other vegetative treatments would be used to restore fire-adapted ecosystems for commodity production. Long-term benefits to water resources would be tempered by additional surface-disturbing activities related to commodity production. However, commodity production would be consistent with the required management for water and other resources to reduce impacts. With a forecast of 42,000 acres (5.4%) of BLM surface to be treated by planned fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale because not all the treated areas would be near surface water.

Biological Resources

Vegetation – Forests and Woodlands (minor adverse)
Intensive management tactics, such as large clear cuts, would be used to manage for desired forest health. If not properly managed, these actions could increase erosion, sediment transport, and sedimentation that would have an adverse effect on water resources. Under Alternative C, up to 24,000 acres (3.1%) of BLM surface of forest and woodland treatments are predicted. Forest and woodland management under Alternative C would have a minor adverse effect on water resources.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, thus controlling erosion. Alternative C would allow for quick-growing species to compete with annual weeds and provide an opportunity for slower-establishing native plants to inhabit the site. Given the amount of potential soil disturbance within 500 feet of surface water, the beneficial effect on water resources from this management action would be negligible.

Vegetation – Riparian/Wetland Resources (minor adverse)
Surface-disturbing activities would be allowed within 500 feet of springs, water wells, and perennial streams consistent with other resource values. Wetland and riparian vegetation would be restored only where directly disturbed by CBNG activities such as the construction of dams and reservoirs. These management actions would have a minor adverse effect on water resources.

Invasive Species and Pest Management (negligible beneficial)
Impacts Common to All Alternatives describes effects on water resources from invasive species and pest management. Alternative C would take a conservative approach to managing invasive species. Under Alternative C, 10,000 acres (1.3%) of BLM surface are predicted to be treated; most treatment areas would be more than 500 feet from surface waters. This management would have negligible beneficial effects on water resources.

Fish and Wildlife Resources – Fish (major adverse) **and Special Status Species – Fish** (negligible adverse)
Reservoir designers would be encouraged to be design reservoirs to enhance fisheries, this would generally benefit water resources in the long term, but could add to potential erosion, sediment transport, and sedimentation during construction and maintenance processes.

Reservoirs and riparian areas would be managed to enhance fisheries as a secondary concern. This alternative would likely add to potential erosion, sediment transport, and sedimentation during construction and maintenance processes.

All resource values would be considered regarding actions that would affect perennial waters. This alternative would increase the likelihood of sediment being transported to waterbodies, which would result in sedimentation of the water. However, consistency with other resource values would temper the effect.

Surface-disturbing and disruptive activities would be allowed within 0.25 mile of naturally occurring waterbodies consistent with other resources. Alternative C would increase the likelihood of sediment being transported to waterbodies that would result in sedimentation of the water. This action allows surface-disturbing activities on 10,529 acres within 500 feet of surface water, or 53% of water resources, which would be a major adverse effect.

Important stream segments for fish habitat would be restored on a project-specific basis, resulting in a long-term benefit to water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Overall, the alternative would result in major long-term adverse effects from general fisheries management and negligible adverse effects from special status species fisheries management due to the limited range of Yellowstone cutthroat.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (negligible beneficial)
Most management actions under Alternative C would allow surface-disturbing activities with consideration of wildlife and special status wildlife species; these actions would provide little direct benefit to water resources. Actions that would still provide a measurable benefit include a restriction on surface-disturbing activities near active Greater Sage-Grouse leks (85 acres, or 0.4%, of BLM surface within 500 feet of surface water) and a disturbance-free buffer zone for bald eagle nest sites and winter roosts (150 acres, or 0.8%, of BLM surface within 500 feet of surface water). Due to the limited area protected by these management actions and allowance for surface disturbance under other management actions, the overall benefit to water resources would be negligible.

Special Status Species – Plants (negligible beneficial)
Alternative C would limit surface disturbance prohibitions to identified plant populations, which are typically rare and small. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species; at present there are no documented populations in the planning area. Because there are currently no documented populations and populations are typically small, the benefit to water resources would be negligible.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Management actions under Alternative C include an allowance for surface-disturbing activities in areas with historic properties that retain their historic settings, TCPs, sacred sites, and other culturally sensitive areas when appropriate mitigation is accomplished. Cultural sites themselves are typically small and buffers to protect historic settings are typically less than 0.25 mile wide. Therefore, minerals activities would likely be displaced, but not prevented. Fewer restrictions on surface disturbance could result in a negligible adverse effect on water resources.

Visual Resources (no effect)
Under Alternative C, areas inventoried as VRM Class II and special emphasis areas would be managed as VRM Class III. The objective of VRM Class III areas is to partially retain the existing character of the landscape (management activities should not dominate the view). Class III management would likely not affect the level of surface-disturbing activities. Therefore, there would be no effect on water resources.

Land Resources

Forest Products (negligible adverse)
Forest products management actions under Alternative C would be similar to those under Alternative A, except that Alternative C would focus more on commercial timber harvest instead of natural processes. Effects on water resources would be the same nature as under *Impacts*

Common to All Alternatives. 24,000 acres would be harvested during the planning period. Rather than natural processes, commercial treatments would primarily be tool to achieve forest health objectives. This action would require more aggressive management and would likely require the use of more roads and off-road vehicle use. Under Alternative C, there likely would be an increase in human disturbances in remote areas that would undergo natural processes under other alternatives. Therefore, compared to Alternative A, adverse effects from roads and disturbance under Alternative C would likely increase in some locations. Mitigation and BMPs would still be applied to forest management activities to reduce these effects where possible. Adverse impacts on water resources would be negligible from the application of mitigation and due to the limited area of commercial forests within 500 feet of water resources.

Renewable Energy (negligible adverse)
Alternative C would allow renewable-energy development anywhere in the planning area if consistent with other resource values. However, there is very little likelihood that large areas suitable for renewable-energy development would coincide with areas where management of other resource values would allow such activities. Therefore, this alternative would have a negligible adverse effect on water resources.

Rights-of-Way and Corridors (minor adverse)
Alternative C management of ROW corridors would be as described under *Impacts Common to All Alternatives*. In addition, 28,554 acres would be excluded from ROW, 27,706 acres would be identified for ROW avoidance, and 199,829 acres would have minor ROW constraints. Areas with slopes equal to or greater than 25% and highly erodible soils will not be excluded from ROW. This would have a minor adverse effect on water resources.

Travel and Transportation Management (negligible beneficial)
Under Alternative C, motor vehicle access would be allowed in special status species habitat consistent with the travel management plan. This action could have adverse effects on water resources from accelerated erosion, sediment transport, and sedimentation related to vehicular traffic.

Some areas near sensitive resources would be Closed to motor vehicle use. Motor vehicle travel would be Limited to designated roads and trails on 723,497 acres, and there would be seasonal motor vehicle prohibitions in selected areas of the southern Big Horn Mountains. These actions would reduce erosion, sediment transport, and sedimentation associated with motor vehicle activity, which would have a negligible beneficial impact on water resources as motor vehicle use levels would likely not be affected.

Recreation (negligible beneficial)
Alternative C recreation management would have negligible beneficial effects on water resources similar to those described under *Impacts Common to All Alternatives*.

Lands with Wilderness Characteristics (negligible adverse)
Under Alternative C, areas with wilderness characteristics would be managed the same as the surrounding areas. Due to the small areas involved, these actions would have a negligible adverse effect on water resources.

Livestock Grazing Management (negligible adverse)
Under Alternative C, livestock grazing management would result in effects to water resources similar to those described for Alternative B, except that livestock salt or mineral supplements would be placed a minimum of 500 feet from water sources and riparian areas, and grazing would

be restricted only in areas where it is currently restricted. These actions would have a negligible adverse effect on water resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
There would be no effects on water resources from ACEC management under Alternative C as no ACECs would be designated.

4.1.4.6. Alternative D

Physical Resources

Water Resources (moderate beneficial)
Alternative D allows for the flexibility to not authorize certain activities when the adverse effects would be excessive. Surface discharge of CBNG produced water, on-channel reservoirs, and surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed if the water resources are adequately protected and other resource values warrant the authorization. In addition, unneeded reservoirs would be evaluated on an individual basis for removal and reclamation. This alternative would provide a moderate benefit to water resources because it gives the BLM authority to mitigate effects on a site-specific basis within established limits.

Air Quality (negligible beneficial)
Under Alternative D, mitigating adverse impacts to air quality could have limited effect on water resources by reducing erosion sources. This would be a negligible beneficial effect.

Soil (moderate beneficial)
Under Alternative D, surface-disturbing activities in areas with severe erosion potential, on slopes equal to or greater than 25%, and on soils with poor reclamation potential would be allowed on a project-specific basis. The use of stringent criteria would cause these areas to be avoided in most cases. When these areas could not be avoided, specific measures would be applied to mitigate or prevent adverse effects on water resources. This alternative would provide a moderate benefit to water resources because it gives the BLM authority to reduce effects on a site-specific basis.

Cave and Karst Resources (negligible beneficial)
Under Alternative D, surface-disturbing activities, including mineral development and timber harvest, would be allowed in cave and karst areas, with site-specific mitigation. Protections would likely focus on protecting significant caves. At present, there are five identified significant caves within 500 feet of surface water. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Management actions to protect cave and karst resources would have a negligible beneficial effect on water resources.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative D, 1,252 acres (0.2% of federal locatable minerals) are predicted to be disturbed

by locatable minerals development. It is likely that little of this be within 500 feet of surface water resources. Therefore, this would have a negligible adverse effect on water resources.

Leasable Minerals – Coal (minor adverse)
The foreseeable area for coal development could affect 1.3% (856 acres) of federal mineral estate within 500 feet of surface water; this would have a minor adverse effect on water resources. Federal coal lands would be available for in situ gasification and from methanogenisis which also would have a minor adverse effect on water resources.

Leasable Minerals – Fluids (minor adverse)
Oil and natural gas (conventional and CBNG) exploration and development would result in approximately 35,185 acres (1% of federal fluid mineral estate) of surface disturbance. This would have minor adverse effects on water resources.

Salable Minerals (negligible adverse)
The total acreage predicted for salable minerals development under Alternative D is 1,193 (0.3% of federal salable minerals) acres. Due to the small areas involved, adverse effects on water resources would be negligible.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible beneficial)
Under Alternative D, response to unplanned wildland fire varies from full suppression to monitoring fire as a management tool. The use of heavy equipment is limited except when human safety is at risk, and fire and suppression damage would be rehabilitated where necessary. These actions would limit erosion and benefit water resources. However, with a predicted 27,596 acres (3.5%) of BLM surface to be affected by wildfires, the benefit of these management actions would be negligible at the planning-area scale as few of these acres are likely to be within 500 feet of water resources.

Planned Fire (Prescribed Fire) (minor beneficial)
Under Alternative D, wildland fire and other vegetative treatments would be used to meet desired management objectives, which would result in long-term beneficial effects on water resources. With a predicted 14,000 acres (1.8%) of BLM surface to be treated by prescribed fire and mechanical treatments, the benefit of these management actions would be minor at the planning-area scale.

Biological Resources

Vegetation – Forests and Woodlands (minor adverse)
Under Alternative D, intensive management tactics would be used to manage for desired forest health. If not properly managed, these actions could increase erosion, sediment transport, and sedimentation, which would have an adverse effect on water resources. Under Alternative D, up to 20,000 acres (1.3% of BLM surface) of forest and woodland treatments are predicted. Due to the acreage in the planning area where these treatments would be applied, adverse effects on water resources would be minor.

Vegetation – Grasslands and Shrubland Communities (negligible beneficial)
Allowing desirable non-native plant species for initial reclamation would help stabilize soils in a timely manner, thus controlling erosion. Alternative D would allow for quick-growing species

to compete with annual weeds and provide an opportunity for slower-establishing native plants to inhabit the site. Given the amount of potential surface disturbance within 500 feet of surface water, there would be a negligible beneficial effect to water resources.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Under Alternative D, surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would be allowed when the resources could be protected. Other management actions that would benefit water resources include managing for DFC within capable communities and restoring wetland and riparian vegetation supported by CBNG produced-water discharge. The 500-foot buffer would protect surface waters unless a waiver was granted. The ability to grant waivers would reduce the beneficial effect to moderate.

Invasive Species and Pest Management (negligible beneficial)
The *Impacts Common to All Alternatives* section above describes the types of effects on soil resources from invasive species. Alternative D would take a moderate approach to managing invasive species. Under Alternative D, 12,000 acres (1.5%) of BLM surface are predicted to be treated. Due to the small areas where invasive species management would overlap water resources, the beneficial effect on water resources would be negligible.

Fish and Wildlife Resources – Fish (moderate beneficial) and **Special Status Species – Fish** (negligible beneficial)
Alternative D would maintain or enhance streams and riparian areas associated with Class I and II streams, the Powder River, the Tongue River, and appropriate areas for desired fisheries potential. This management would generally have a beneficial effect on water resources. Fisheries enhancement would be incorporated into reservoir designs consistent with other resource values. This alternative would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during construction and maintenance processes. Perennial waters that affect fish habitat would be maintained or enhanced consistent with other resource values. This would generally benefit water resources.

Surface-disturbing and disruptive activities would be allowed within 0.25 mile of naturally occurring waterbodies that contain native or desirable non-native fish species in accordance with fisheries objectives. This alternative would reduce the likelihood of sediment being transported to waterbodies that would result in sedimentation of the water. This alternative would allow surface-disturbing activities on 10,529 acres within 500 feet of surface water, or 53.0% of water resources, when adverse effects on water and other resources are adequately mitigated. Yellowstone cutthroat trout could be present in streams associated with 182 acres (0.9%) of BLM surface within 500 feet of water.

Important stream segments for fish habitat would be restored in accordance with WGFD priorities. Alternative D would generally benefit water resources, but could add to potential erosion, sediment transport, and sedimentation during maintenance processes.

Overall, activities to maintain or enhance fish habitat would benefit water resources. However, due to the provision for waivers under defined conditions, the beneficial effects would be moderate for fish and negligible for special status fish because of their limited distribution.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor beneficial)
There are a number of management actions under Alternative D that allow surface-disturbing activities where wildlife and special status wildlife species could be adequately protected. These actions would benefit water resources locally where surface disturbances are prevented by

reducing erosion, sediment transport, and sedimentation. Any efforts that would minimize these processes would beneficially affect water resources. However, because most management actions regulate, but do not prohibit surface disturbance, and the small amount of land in close proximity to water resources, the benefit to water resources would be minor.

Special Status Species – Plants (negligible beneficial)
Alternative D would limit surface disturbance prohibitions mostly to identified populations, which are typically widespread and small. Ute-ladies'-tresses orchid is the only riparian-dependent special status plant species; at present there are no documented populations in the planning area. Because there are documented populations and populations are typically small, beneficial effects on water resources would be negligible.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
Management actions under Alternative D include a prohibition on surface-disturbing activities for specifically identified sites with historic properties that retain their historic settings, and appropriate mitigation of surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. To protect the settings of the identified historic properties, surface-disturbing activities could be restricted up to 3 miles from sensitive cultural sites. Water resource would be protected on 627 acres, or 3.2%, of BLM surface within 500 feet of surface water. This would have a minor beneficial impact on water resources.

Visual Resources (moderate beneficial)
Under Alternative D, specifically identified areas inventoried as VRM Class II or as special emphasis areas would be managed as VRM Class II. There are 4,825 acres, or 24%, of BLM surface within 500 feet of surface water classified as VRM Class II. However, because surface disturbance is reduced but not prohibited, the benefits to water resources would be moderate.

Land Resources

Forest Products (negligible adverse)
Alternative D would result in effects similar to Alternative B, except that Alternative D provides more latitude to manage forest product sales within ecologically sustainable limits to maximize economic return. It also provides increased flexibility to perform rehabilitation activities to create healthy and economically sustainable forest stands in consideration of other resource values. Due to the limited areas where these actions would correspond to water resources, adverse effects on water resources would be negligible.

Renewable Energy (negligible beneficial)
Alternative D would exclude renewable-energy projects in certain otherwise restricted areas. The likelihood of these areas coinciding with areas suitable for renewable energy is minimal. Therefore, effects on water resources would be negligible, but would be beneficial if they occurred.

Rights-of-Way and Corridors (minor adverse)
Alternative D management of ROW corridors would be the same as described under *Impacts Common to All Alternatives*. In addition, Alternative D would exclude 101,081 acres from ROW and identify 290,336 acres for ROW avoidance. Areas with slopes equal to or greater than 25% and highly erodible soils would be avoided. This would result in a minor adverse effect on water

resources compared to alternatives A and B, but would represent a decrease in adverse effects compared to Alternative C.

Travel and Transportation Management (minor beneficial)
Alternative D would allow motor vehicle use in special status species habitat consistent with travel management designations and within routes designated to protect habitat. This action would benefit water resources because it would minimize erosion, sediment transport and sedimentation caused by motor vehicle use, but would allow needed flexibility to control catastrophic wildfires that could result in much worse effects on water resources.

Existing routes would be evaluated for closure and reclamation consistent with other resource values. Approximately 31,536 acres in selected areas would be Closed to motorized vehicle use. Motorized vehicle use would be Limited to designated roads on 620,252 acres, and an additional 18,464 acres would have seasonal motor vehicle prohibitions. These actions would reduce erosion, sediment transport, and sedimentation associated with motor vehicle activity, thereby having a minor beneficial effect on water resources.

Recreation (negligible beneficial)
Alternative D effects on water resources would be similar to those under Alternative B.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative D would manage 6,864 acres to emphasize ecosystem health, natural values, and primitive recreational opportunities. Due to the small areas involved, these actions would have a negligible beneficial effect on water resources.

Livestock Grazing Management (minor beneficial)
Alternative D would give watershed protection priority over forage and habitat concerns regarding vegetation production. This could have a minor to moderate beneficial effect on water resources because it would restore natural streamflows and reduce adverse effects on water quality. Livestock grazing would be allowed on all public lands except in areas that determined to be incompatible with other resource values. This would have a minor adverse effect on water resources, but would be consistent with existing conditions. Livestock salt or mineral supplements would be placed a minimum of 500 feet from water sources and riparian areas, which would have a minor beneficial effect on water resources.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Alternative D effects from ACEC management would be almost the same as under Alternative B. Due to the limited areas where these actions would correspond to water resources, the effects would be beneficial but negligible.

4.1.4.7. Cumulative Impacts

The BLM manages approximately 11% of the surface lands in the planning area, but manages approximately 65% of the mineral resources (90% of coal resources). In addition, the authority over water resources primarily lies with the Wyoming State Engineer's Office (WSEO) or the Wyoming DEQ. The WSEO has authority over all issues related to water supply, production, and availability, while the Wyoming DEQ has primacy over all issues related to water quality. This leaves the BLM with the ability to manage actions that could subsequently affect water resources,

such as surface disturbance that could supply pollutants to water resources. Given that most water resource management decisions lie with the state, effects are relatively consistent throughout the planning area, regardless of land ownership. Therefore, it is reasonable to assume that impacts assessments related to areas where the BLM only has authority over the surface could be multiplied by 0.89 to estimate the total effect on water resources in the planning area. In addition, it would be reasonable to estimate all effects related to minerals development; multiply impacts by 0.35 to account for all effects.

4.1.4.8. Conclusion

Allowable uses and management actions described in this section were used to determine potential effects on water resources. Meaningful differences in long-term disturbance acreage; acreage of highly erosive soils; number of oil and gas (including CBNG) wells; and produced-water discharge form the basis for the conclusion described here. Alternative B would result in the least adverse effects on water resources because management actions under this alternative would 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. Alternative A is consistent with current management and provides moderate levels of water resource protection and results in somewhat more adverse effects on water resources than Alternative B. Alternative D would result in fewer adverse effects on surface water than Alternative A, and effects similar to Alternative A related to groundwater quality and quantity. In ascending order from the least adverse to the most adverse effects on water resources, the alternatives rank as follows: Alternative B, Alternative D, Alternative A, and Alternative C.

Table 4.27, "Summary of Impacts to Water Resources" (p. 618) summarizes effects on water resources.

Table 4.27. Summary of Impacts to Water Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	Negligible beneficial
Soil	Moderate beneficial	Major beneficial	Major adverse	Moderate beneficial
Water Resources	Negligible adverse	Moderate beneficial	Moderate adverse	Moderate beneficial
Cave and Karst Resources	Negligible beneficial	Major beneficial	Minor adverse	Negligible beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Fluids	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible beneficial	Negligible beneficial	Minor adverse	Negligible beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Negligible beneficial	Minor beneficial	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Negligible beneficial	Negligible adverse	Minor adverse	Minor adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Grassland and Shrubland Communities	Negligible beneficial	Negligible adverse	Negligible beneficial	Negligible beneficial
Vegetation – Riparian/Wetland Resources	Moderate beneficial	Major beneficial	Minor adverse	Moderate beneficial
Invasive Species and Pest Management	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Fish and Wildlife Resources – Fish	Negligible beneficial	Major beneficial	Major adverse	Moderate beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Major beneficial	Negligible beneficial	Minor beneficial
Special Status Species – Plants	Negligible beneficial	Major beneficial	Negligible beneficial	Negligible beneficial
Special Status Species – Fish	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Special Status Species – Wildlife	Minor beneficial	Major beneficial	Negligible beneficial	Minor beneficial
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major beneficial	Negligible adverse	Minor beneficial
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Moderate beneficial	Moderate beneficial	No effect	Moderate beneficial
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Rights-of-Way and Corridors	Negligible beneficial	Minor beneficial	Minor adverse	Minor adverse
Travel and Transportation Management	Negligible adverse	Minor beneficial	Negligible beneficial	Minor beneficial
Recreation	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Lands with Wilderness Characteristics	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Livestock Grazing Management	Minor adverse	Minor beneficial	Negligible adverse	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible beneficial	No effect	Negligible beneficial
Scenic or Back Country Byways	No effect	Negligible beneficial	Negligible adverse	Negligible adverse
Wild and Scenic Rivers	Negligible beneficial	No effect	Negligible beneficial	Negligible beneficial
Wilderness Study Areas	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial

4.1.5. Cave and Karst Resources

This section describes potential effects on cave and karst resources from proposed management of all other resources. Chapter 3 describes existing cave and karst conditions. Actions that disturb or destroy cave and karst resources or disrupt the habitat of flora or fauna that utilize cave and karst areas are considered adverse; actions that avoid or prevent adverse impacts are beneficial.

The Federal Cave Resources Protection Act of 1988 requires inventory and determinations of significance for cave resources under federal management. Cave resources determined to be significant will be protected from all actions that could adversely impact the resources. This could result in the modification or denial of certain proposals. Cave resources are vulnerable to unauthorized uses and vandalism. Significant cave resources damaged or destroyed by unauthorized uses or vandalism might require protective measures, up to and including closing caves.

Cavities in bedrock can occur anywhere in the planning area. However, only caves found in the karst regions of the Big Horn Mountains are likely to be significant. Those in plains areas will be sandstone rock shelters. The only potential element of significance in rock shelters will be cultural resources, which will be protected under the National Historic Preservation Act. Therefore, for purposes of this analysis, only areas of the Big Horn Mountains likely to contain cave and karst resources are considered in this analysis. This focus area is comprised of 101,455 acres of BLM surface and 212,626 acres of federal fluid mineral estate.

4.1.5.1. Methods and Assumptions

The analyses of impacts to cave and karst resources under the alternatives are the result of coordination with BLM interdisciplinary team members, review of various publications, and information provided by interested cooperators.

Assumptions

The assumptions include, but are not limited to, the following:

- As populations grow and more people recreate, impacts to cave and karst resources of the Buffalo planning area will increase.
- Given the large amount of karst topography in the planning area, it is very likely that more caves will be discovered. Therefore, it is necessary to protect areas with formations likely to contain cave and karst resources.
- It is very likely that there will be additional discoveries of sensitive species in planning area caves. Therefore, protecting areas likely to contain cave and karst resources also will protect habitat for sensitive species.

4.1.5.2. Impacts Common to All Alternatives

Cave and Karst (major beneficial)
All alternatives will meet Federal Cave Resources Protection Act of 1988 requirements and will bring the BFO into compliance. Cave and Karst management that protects these sensitive resources will have a major beneficial effect on cave and karst resources.

Physical Resources

Air Quality (no effect)
Air quality management actions common to all alternatives or unique to each alternative will not effect cave and karst resources. Therefore, the Cave and Karst section does not further address air quality management.

Soil (major beneficial)
Runoff from destabilized soils can affect not only the water sources that are integral to cave and karst development, but also potentially impact the plant and animal life that inhabit caves. Using soil surveys and onsite investigations would ensure protection of soil resources. Applying appropriate mitigation (including relocation or denial of projects) and requiring an approved reclamation plan would ensure all disturbances were effectively remediated to BLM standards. This would have a major beneficial effect on cave and karst resources.

Water Resources (moderate beneficial)
Cave and Karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Water management actions common to all alternatives that would affect cave and karst resources include managing surface-disturbing activities to prevent degradation of water quality and preventing the loss of riparian areas and would have a moderate beneficial effect on cave and karst resources.

Mineral Resources (no effect)

Mining activities (locatable, leasable, and salable minerals) would have no impact to cave and karst resources. Minerals development in cave and karst areas is not expected. There are no known deposits of leasable minerals in cave and karst areas. Locatable minerals in the form of metallurgical grade limestone has a moderate potential for occurring in the limestone formations that partially make up the cave and karst formation areas; however the potential for development if located is low. Salable mineral deposits overlap with cave and karst formations by one percent; current salable development overlaps with cave and karst areas by 51 acres. It is possible, although unlikely, that deposits of salable, locatable, or leasable minerals could be found in cave and karst areas. However, due to the inherent difficulty of development in these areas, no impacts to cave and karst resources are anticipated. Therefore, the cave and karst section does not further address management of mineral resources.

Fire and Fuels Management

There are no management actions common to all alternatives or unique to each alternative for fire and fuels management that would affect cave and karst resources. Therefore, the cave and karst section does not further address these resources.

Biological Resources

Management actions for biological resources are designed to protect biological resources, typically by limiting surface-disturbing activities and preventing erosion and degradation of water quality. Limiting these types of disturbances benefits cave and karst resources (see Water - Impacts Common to All Alternatives).

There are no management actions common to all alternatives for special status species-plants that affect cave and karst resources.

There are no management actions common to all alternatives or unique to each alternative for **Grassland and Shrubland Communities**, **Invasive Species and Pest Management**, **Special Status Species – Fish**, or **Forest and Woodlands** that would affect cave and karst resources. Therefore, the cave and karst resources section does not further address these resources.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Cave and Karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Preventing the degradation, loss, or destruction of riparian and wetland habitat would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Fish (moderate beneficial)
Cave and Karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Fisheries management actions common to all alternatives that would affect cave and karsts resources include mitigation for surface-disturbing activities. Surface disturbing activities that impact the quality or flow of water in cave and karst areas could impact cave and karst resources. Mitigating surface disturbing activities in cave and karst areas would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife (moderate beneficial)
Wildlife management actions common to all alternatives that affect cave and karst resources include mitigation for surface-disturbing activities to prevent erosion and degradation of water quality. Preventing erosion and degradation of water quality would moderately benefit cave and karst resources (see above Fish and Wildlife Resources-Fish).

Special Status Species – Wildlife (negligible beneficial)
Several Greater Sage-Grouse leks, located on the eastern slopes of the southern Big Horns, are in close proximity to the eastern edge of karst formations. Management actions that would prevent degradations to Greater Sage-Grouse habitat could potentially benefit cave and karst resources. However, the formation areas in question are marginal, both in terms of location and quality, and are not expected to produce caves of significance. Therefore any effects to cave and karst resources from Greater Sage-Grouse management would be negligible and will not be discussed further in the cave and karst resources section.

There are no other common to all alternatives from Special Status Species that would affect cave and karst resources.

Heritage and Visual Resources

There are no **Cultural Resource**, **Paleontological Resource**, or **Visual Resource Management** actions common to all alternatives or unique to each alternatives that would affect cave and karst resources. Therefore, the cave and karst resources section does not further address these resources.

Land Resources

The following programs do not have any management actions common to all alternatives that would affect cave and karst resources: **Renewable Energy** and **Lands with Wilderness Characteristics**.

The following programs do not have any management actions common to all alternatives or unique to each alternative that would affect cave and karst resources: **Lands and Realty** and **Travel and Transportation Management**. Therefore, the cave and karst resources section does not further address these resources.

Forest Products (moderate beneficial)
Management actions common to all alternatives include a prohibition on timber harvest within 200 feet of surface waters. Because adverse impacts to water quality in cave and karst areas could adversely impact cave and karst resources (see Water - Impacts Common to All Alternatives), this management action would have a moderate beneficial effect on cave and karst resources.

Rights-of-Way and Corridors (minor beneficial)
Management actions common to all alternatives include the designation of ROW corridors to minimize surface disturbance and impacts to resources. Surface disturbing activities that impact the quality or flow of water in cave and karst areas could impact cave and karst resources. However, the likelihood of significant ROW corridors occurring in cave and karst areas is minimal given the rugged topography where cave and karst resources occur. Minimizing the potential for impacts to water resources near cave and karst areas through ROW management would have a minor beneficial effect on cave and karst resources.

Recreation (negligible adverse)
Management actions common to all alternatives include opening the planning area to casual, diverse, and dispersed recreation; avoidance of riparian habitat for developed facilities and camping; and managing caves through a cave management plan. Increased human visitation to caves can adversely impact cave resources. Actions such as vandalism, disturbance of plants and animals, and looting of cultural resources are all probable results. Opening the planning area to dispersed recreational opportunities increases theses risks, which would have an adverse effect on cave and karst resources. Protecting cave and karst resources through cave management plans would minimize impacts on cave and karst resources.

Livestock Grazing Management (minor beneficial)
Under all alternatives, most of the BLM surface acreage within the planning area would be available for livestock grazing. Livestock grazing would be managed in accordance with the *Wyoming Standards for Healthy Rangelands* to sustain vegetative communities and special status species habitats. Multiple special status species inhabit cave and karst areas, however very little of these areas are suitable for grazing. Therefore, while grazing management would sustain special status species habitat the small overlap would reduce the benefit to minor.

Special Designations

There are no **Areas of Critical Environmental Concern** or **Scenic or Back Country Byways** management actions common to all alternatives or unique to each alternative that would affect cave and karst resources. Therefore, the cave and karst resources section does not further address these resources.

Wild and Scenic Rivers (major beneficial)
Management actions common to all alternatives include managing the proposed Middle Fork Powder River WSR in accordance with the Middle Fork Interim Management Plan. Many of the known significant caves in the planning area are in the Middle Fork Canyon area. The Interim Management Plan would help protect this important area, which would have a major beneficial effect on cave and karst resources.

Wilderness Study Areas (major beneficial)
Management actions common to all alternatives include managing WSAs for natural conditions and primitive recreation. While WSAs only overlap with cave and karst areas by seven percent, these areas are known to have cave and karst formations that could be significant. Protecting the areas through WSA management would have a major beneficial effect on cave and karst resources.

Socioeconomic Resources

There are no social, economic, or health and safety management actions common to all alternatives or unique to each alternative that would affect cave and karst resources. Therefore, the cave and karst resources section does not further address this resource.

4.1.5.3. Alternative A

Cave and Karst Resources (major adverse)
Alternative A does not include management of cave and karst resources. Current management could potentially allow significant cave and karst resources to be impacted without analysis. This would have a major adverse effect on cave and karst resources.

Physical Resources

Soil (major beneficial)
Cave and karst resources are associated with steep slopes, rock outcrops, and other sensitive soil types. Under Alternative A, management or prohibition of surface disturbance on soils with severe erosion hazards would have a beneficial effect on cave and karst resources; management or prohibition of surface disturbance on steep slopes and on soils with poor reclamation suitability would have a beneficial effect on cave and karst resources. Alternative A considers surface disturbance on rock outcrops on a project-specific basis. Therefore, it is not possible to determine a level of impact to cave a karst resources from soil resources management on rock outcrops. Overall, management actions under Alternative A for soil will be a major benefit to cave and karst resources.

Water Resources (moderate beneficial)
Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Under Alternative A, prohibiting surface-disturbing activities within 500 feet of any spring or perennial stream to prevent erosion and degradation of water quality would have a moderate beneficial effect on cave and karst resources (see Water - Impacts Common to All Alternatives).

Biological Resources

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Cave and karst resources often are found in or near riparian areas. Under Alternative A, prohibiting surface-disturbing activities to prevent erosion and degradation of water quality would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Fish (moderate beneficial)
Cave and karst resources often are found in or near riparian areas. Under Alternative A, prohibiting surface-disturbing activities to prevent erosion and degradation of water quality would have a moderate beneficial effect on cave and karst resources

Fish and Wildlife Resources – Wildlife (minor beneficial)
Management actions under Alternative A that prohibit surface-disturbing activities for the protection of wildlife would beneficially impact cave and karst resources by preventing erosion and habitat disruption. A small portion of cave and karst areas are overlapped by big-game wintering areas. Prohibiting development in big game winter ranges would have a minor beneficial effect on cave and karst resources.

Special Status Species – Plants and Wildlife (moderate beneficial)
Large portions of cave and karst formation areas are overlapped by limber pine habitat. Amphibians, reptiles, and bats often utilize cave and karst resources. Management of surface-disturbing activities to prevent disruption and degradation of limber pine, amphibian, reptile, and bat habitat would have a major beneficial effect on cave and karst resources. However, Alternative A considers actions on a project-specific basis, so it is not possible to have adverse impacts limiting the benefits to moderate.

Land Resources

Forest Products (negligible adverse)
Management actions under Alternative A include the sale of minor forest products. The areas of potential harvest overlap cave and karst areas by seven percent. However, most caves in the planning area are in terrain that does not allow for timber harvest. Therefore, adverse effects (e.g., erosion and habitat disruption) on cave and karst resources resulting from timber harvest would be negligible.

Renewable Energy (moderate adverse)
Alternative A considers renewable-energy development on a project-specific basis. Although there have been no renewable energy projects to date, 20,000 acres (2.6%) of BLM surface are predicted over the planning period. The southern Big Horn Mountains have excellent wind energy potential and contain most of the cave and karst resources in the planning area. Construction of wind farms in the southern Big Horn Mountains would likely impact cave and karst resources. While wind farms would not necessarily physically damage cave and karst areas, they would pose a significant risk to the bats that utilize these resources. Because these actions are considered on a project-specific basis, some caves and bat populations would likely be protected and others would not, so that the level of impact to cave and karst resources would likely be moderate.

Rights-of-Way and Corridors (minor beneficial)
Cave and karst resources are often found on steep slopes and highly erodible soils. Under Alternative A, prohibiting surface disturbance on slopes equal to or greater than 25% and on highly erodible soils would prevent erosion and water degradation and would apply to most cave

and karst areas. However, the likelihood of major ROW permits being issued in cave and karst areas due to difficult topography reduces the benefit to minor.

Recreation (moderate adverse)
Significant cave and karst resources are located in areas being considered for SRMA designation. Designation and management of cave and karst areas as SRMAs would benefit cave and karst resources by preventing erosion and degradation of habitat. However, Alternative A does not include such management and would not result in this beneficial effect on cave and karst resources. Therefore current management results in moderate adverse impacts to cave and karst resources.

Lands with Wilderness Characteristics (minor adverse)
Cave and karst resources often are found in areas with wilderness characteristics. Alternative A is implemented on a project specific basis and does not currently provide cave and karst protection. Therefore current management results in minor adverse impacts to cave and karst resources as 12,237 acres have been determined to have wilderness characteristics.

Livestock Grazing Management (minor beneficial)
Cave and karst resources often are found in areas not compatible with livestock grazing. While livestock have a difficult time accessing many cave and karst areas, some animals successfully negotiate the rugged terrain and steep slopes. While the total number of animals are limited, allowing livestock access to cave and karst areas creates erosion and habitat disruption. Under Alternative A, limiting or prohibiting livestock grazing where it is not compatible with other resources would have a minor beneficial effect on cave and karst resources.

Special Designations

Wild and Scenic Rivers (major beneficial)
Many of the planning area's known significant caves fall within the proposed WSR. While this action is considered on a project specific basis, current management is protective of cave and karst resources and is a major benefit.

Wilderness Study Areas (negligible adverse)
WSAs contain seven percent of total cave and karst area. If Congress does not designate the WSAs as wilderness, they will be opened for oil and gas leasing. While this means that seven percent of cave and karst resource areas would be opened for oil and gas leasing, the fact that there are no known deposits of oil or gas in these areas reduces the potential major impact to negligible.

4.1.5.4. Alternative B

Cave and Karst Resources (major beneficial)
Alternative B includes the highest levels of cave and karst protections. Surface- and subsurface-disturbing activities would be prohibited in cave and karst areas. This would include all mineral exploration and development, timber harvest, and ROW. In addition, each cave containing significant resources would be managed under an individual cave management plan. Caves with significant resources also would be fenced to exclude livestock from entering. These actions would have a major beneficial effect on cave and karst resources.

Physical Resources

Soil (major beneficial)
Cave and karst resources are associated with steep slopes, rock outcrops, and other sensitive soil types. The Alternative B prohibition on surface-disturbing activities on soils with a severe erosion hazard would have a beneficial effect on cave and karst resources. Prohibiting surface-disturbing activities on slopes equal to or greater than 25% would have a beneficial effect on cave and karst resources. Prohibiting surface-disturbing activities on soils with poor reclamation suitability would have a beneficial effect on cave and karst resources. Prohibiting surface-disturbing activities on badlands, rock outcrops, biologic crusts, and slopes susceptible to mass movement would have a beneficial effect on cave and karst resources. Overall soil alternatives will have a major beneficial affect on cave and karst resources.

Water Resources (moderate beneficial)
Cave and karst resources often are present near water resources and riparian areas. Alternative B management actions that prohibit surface-disturbing activities within 500 feet of springs, perennial streams, and their associated riparian habitat would have a moderate beneficial effect on cave and karst resources.

Biological Resources

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Cave and karst resources often are found in or near riparian areas. Alternative B management actions that prohibit surface-disturbing activities within 500 feet of riparian habitat would have a moderate beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Fish (major beneficial)
Cave and karst resources often are found in or near riparian areas. The Alternative B prohibition on surface-disturbing activities within 0.25 mile of naturally occurring waterbodies that contain fish would have a major beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Management actions under Alternative B that prohibit surface-disturbing activities for the protection of wildlife would benefit cave and karst resources by preventing erosion and habitat disruption. Some big game wintering areas overlap cave and karst resources. Prohibiting development in big game winter ranges would have a minor beneficial effect on cave and karst resources.

Special Status Species – Plants and Wildlife (major beneficial)
Management actions under Alternative B that prohibit surface-disturbing activities for the protection of special status plant and wildlife species would beneficially impact cave and karst resources. Large portions of cave and karst formation areas are overlapped by limber pine habitat. Prohibiting development in limber pine habitat would have a major beneficial effect on cave and karst resources. Amphibians, reptiles, and bats often utilize cave and karst resources. Management of surface-disturbing activities to prevent disruption and degradation of amphibian, reptile, and bat habitat would have a major beneficial effect on cave and karst resources.

Land Resources

Forest Products (negligible adverse)
Management actions under Alternative B include the sale of saw timber. The areas of potential harvest overlap with cave and karst areas by seven percent. However, most caves in the planning

area are in terrain that does not allow for timber harvest. Therefore, adverse effects (erosion and habitat disruption) on cave and karst resources resulting from timber harvest would be negligible.

Renewable Energy (major beneficial)
Alternative B would avoid development of renewable-energy projects in cave and karst areas. This would have a major beneficial effect on cave and karst resources.

Rights-of-Way and Corridors (major beneficial)
Cave and karst resources are often found on steep slopes and highly erodible soils. Under Alternative A, prohibiting surface disturbance on slopes equal to or greater than 25% and on highly erodible soils would prevent erosion and water degradation and would apply to most cave and karst areas. However, the likelihood of major ROW permits being issued in cave and karst areas due to difficult topography is slim.

Recreation (moderate beneficial)
Cave and karst resources often are found in areas with recreation potential. Designation and management of cave and karst areas as SRMAs would benefit cave and karst resources. Alternative B would provide for recreation to be intensively managed and not allow mineral leasing throughout most of the proposed SRMAs. The restriction on mineral leasing would reduce potential surface disturbance from facilities and associated infrastructure of mineral development. Although the proposed SRMAs only overlap cave and karst areas by three percent, that three percent contains many of the planning area's significant caves. Designating the Middle Fork Powder River as an SRMA would have a moderate beneficial effect on cave and karst resources.

Lands with Wilderness Characteristics (moderate beneficial)
Cave and karst resources often are found in areas with wilderness characteristics. Alternative B would prohibit most surface-disturbing activities on five percent of cave and karst areas to emphasize primitive recreation and natural values and would also prevent erosion and habitat degradation. This would have a moderate beneficial effect on cave and karst resources.

Livestock Grazing Management (minor beneficial)
Cave and karst resources often are found in areas not compatible with livestock grazing. While livestock have a difficult time accessing many cave and karst areas, some animals successfully negotiate the rugged terrain and steep slopes. While the total number of animals are limited, allowing livestock access to cave and karst areas creates erosion and habitat disruption. Alternative B would limit or prohibit livestock grazing where it would not be compatible with other resources. This would have a minor beneficial effect on cave and karst resources.

Special Designations

Wild and Scenic Rivers (major beneficial)
Many of the planning area's known significant caves fall within the proposed WSR. If Congress denies the WSR nomination, management will retain current characteristics. Current management benefits cave resources by precluding development that has the potential to create erosion and habitat disruption.

Wilderness Study Areas (negligible beneficial)
If Congress does not designate the WSAs as Wilderness, Alternative B WSA management would likely include prohibiting most surface-disturbing development. While the WSAs include seven percent of cave and karst formations, major surface- and subsurface-disturbing activities are

not expected to occur in these areas. Therefore surface disturbance prohibitions in these areas would be a negligible benefit.

4.1.5.5. Alternative C

Cave and Karst Resources (major beneficial)
Alternative C would include medium levels of protections for cave and karst resources. All surface- and subsurface-disturbing activities would be required to maintain buffers around significant cave entrances and passages. This would include all mineral exploration and development, timber harvest, and ROW. Caves containing significant resources would be managed under a planning area cave management plan. Grazing would not be restricted in areas with cave and karst resources except in areas restricted under current management. These management actions would have a major beneficial effect on cave and karst resources by preventing erosion and habitat degradation.

Physical Resources

Soil (major adverse)
Cave and karst resources are associated with steep slopes, rock outcrops, and other sensitive soil types. Allowing activities that may cause erosion and habitat degradation in these areas would adversely impact cave and karst resources to a major degree.

Water Resources (moderate adverse)
Cave and karst resources often are present near water resources and riparian areas. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions. Alternative C management actions allowing surface-disturbing activities within 500 feet of springs, perennial streams, and their associated riparian habitat would have a moderate adverse effect on cave and karst resources (e.g., erosion and habitat disruption).

Biological Resources

Vegetation – Riparian/Wetland Resources (moderate adverse)
Alternative C would allow surface-disturbing activities within 500 feet of springs and perennial streams. These actions would have a moderate adverse effect on cave and karst resources (see Water above).

Fish and Wildlife Resources – Fish (major adverse)
Cave and karst formations are created by the hydraulic and chemical processes of water eroding and reacting with sediment and rock. Cave and karst resources often are present near water resources and riparian areas. Surface-disturbing activities that impact the quality or flow of water in cave and karst areas could impact cave and karst resources. Allowing surface-disturbing activities near naturally occurring waterbodies would have a major adverse effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife (minor adverse)
A small portion of cave and karst areas are overlapped by big-game wintering areas. Management actions under Alternative C that allow surface-disturbing activities in big-game winter ranges would adversely impact cave and karst resources by potentially allowing erosion and habitat

disruption. Allowing development in big-game winter ranges would have a minor adverse effect on cave and karst resources.

Special Status Species – Plants and Wildlife (major adverse)
Large portions of cave and karst formation areas are overlapped by limber pine habitat. Amphibians, reptiles, and bats often utilize cave and karst resources. Allowing surface-disturbing activities may cause erosion and disruption and degradation of limber pine, amphibian, reptile, and bat habitat. Allowing surface-disturbing activities in limber pine, reptile, and bat habitat would result in major adverse effects.

Land Resources

Forest Products (negligible adverse)
Management actions under Alternative C include the sale of multiple forest products. The areas of potential harvest overlap with cave and karst areas by seven percent. However, most caves in the planning area are in terrain that does not allow for timber harvest. Therefore, adverse effects (erosion and habitat disruption) to cave and karst resources resulting from timber harvest would be negligible.

Renewable Energy (major adverse)
The southern Big Horn Mountains have excellent wind energy potential and contain most of the cave and karst resources in the planning area. Construction of wind farms in the southern Big Horn Mountains would likely impact cave and karst resources. While wind farms would not necessarily physically damage cave and karst areas, they would pose a significant risk to the bats that utilize these resources. Management under Alternative C would allow renewable-energy development throughout the planning area consistent with other resource values. This would have a major adverse effect on cave and karst resources.

Rights-of-Way and Corridors (minor adverse)
Cave and karst resources are often found on steep slopes and highly erodible soils. Any surface disturbance in these areas could potentially cause erosion and habitat disruption. Management under Alternative C would allow for ROW activity unless it is specifically excluded. However, the likelihood of significant ROW corridors occurring in cave and karst areas is minimal given the rugged topography where cave and karst resources occur. This would have a minor adverse effect on cave and karst resources.

Recreation (moderate adverse)
Alternative C provides for mineral leasing and other surface-disturbing activities in SRMAs. Any surface disturbance in these areas could potentially cause erosion and habitat disruption. Although the proposed SRMAs under Alternative C overlap cave and karst areas by only 0.5%, that 0.5% contains some of the planning area's significant caves. Designating the Middle Fork Powder River as a SRMA, but allowing surface-disturbing activities in the SRMA would have moderate adverse effect on cave and karst resources.

Lands with Wilderness Characteristics (moderate beneficial)
Alternative C would follow management recommendations outlined in other resource areas in the RMP. Because lands with wilderness characteristics (LWCs) are completely included within a large and contiguous cave and karst formation area, Alternative C recommendations for cave and karst would be followed; this would result in moderate beneficial effects by reducing surface disturbance and habitat disruption.

Livestock Grazing Management (minor beneficial)
Under Alternative C, limiting or prohibiting livestock grazing where it is currently prohibited would have a minor beneficial effect on cave and karst resources by reducing surface disturbance and habitat disruption.

Special Designations

Wild and Scenic Rivers (minor adverse)
If Congress denies the WSR nomination, management will follow the prescriptions outlined in Alternative C of this RMP. No special provisions will be made for the management of the river's free flowing characteristics or primitive values. If selected, Alternative C will potentially allow for the construction of a dam in Middle Fork Canyon, creating a large reservoir and destroying numerous significant caves. While Alternative C could remove major protections for the Middle Fork Canyon the likelihood of Congress denying the WSR and development being proposed are low therefore the adverse impacts are minor.

Wilderness Study Areas (negligible adverse)
If Congress does not designate the WSAs as wilderness, Alternative C WSA management would include allowing surface-disturbing development. While the WSAs include seven percent of cave and karst formations, major surface and subsurface disturbing activities are not expected to occur in these areas. Therefore allowing surface disturbance in these areas would be a negligible adverse effect.

4.1.5.6. Alternative D

Cave and Karst Resources (major beneficial)
Alternative D includes adequate levels of protections for cave and karst resources. Under Alternative D, all surface- and subsurface-disturbing activities would be required to maintain buffers around significant cave entrances and passages. This would include all mineral exploration and development, timber harvest, and ROW. Caves with significant resources would be managed under a planning area cave management plan with cave-specific components. Grazing would only be restricted from the entrances to significant caves. These management actions would have a major beneficial effect on cave and karst resources.

Physical Resources

Soil (minor beneficial)
Under Alternative D, allowing surface-disturbing activities on soils with a severe erosion hazard; on slopes equal to or greater than 25%; and on miscellaneous soil types with approved reclamation and stabilization plans when soil resources objectives can be met would have minor beneficial effects.

Water Resources (moderate beneficial)
Alternative D would allow surface-disturbing activities near springs, near perennial streams, and in riparian habitats when adequate protection is in place to prevent stream bank and soil erosion. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions; the anticipated benefit of these actions is moderate.

Biological Resources

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Alternative D would allow surface-disturbing activities within 500 feet of springs and perennial streams when resource objectives can be met. While cave and karst areas overlap riparian areas by only four percent, the integral relationship between cave and karst resources and water elevates the potential impacts of any water-related management actions; the anticipated benefit of these actions is moderate.

Fish and Wildlife Resources – Fish (major beneficial)
Fish management actions under Alternative D include allowing surface-disturbing activities within 0.25 mile of fish-bearing waterbodies when appropriately mitigated. Any disturbance that potentially allows erosion and habitat disruption will adversely impact cave and karst resources. However, if the surface disturbances are carefully mitigated no adverse impacts should occur. This would have a major beneficial effect on cave and karst resources.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Management actions under Alternative D that prohibit surface-disturbing activities for the protection of wildlife would benefit cave and karst resources by preventing erosion and habitat disruption. Some big game wintering areas overlap cave and karst resources. Prohibiting development in big game winter ranges would have a minor beneficial effect on cave and karst resources.

Special Status Species – Plants and Wildlife (minor beneficial)
Large portions of cave and karst formation areas are overlapped by limber pine habitat. Amphibians, reptiles, and bats often utilize cave and karst resources. Allowing surface-disturbing activities in limber pine, reptile, and bat habitat would result in adverse effects to cave and karst resources by potentially causing erosion and habitat disruption. However, requiring site specific survey to locate existing populations of special status species would also identify and protect cave and karst resources in the proposed project locations. These mitigating factors result in a minor beneficial effect under Alternative D.

Land Resources

Forest Products (negligible beneficial)
Under Alternative D, the harvest of forest products in accordance with cave and karst resources protection would not disrupt habitat or cause erosion and will be a negligible benefit.

Renewable Energy (major beneficial)
The southern Big Horn Mountains have excellent wind energy potential and contain most of the cave and karst resources in the planning area. Prohibiting development of renewable-energy projects in the southern Big Horn Mountains would have a major beneficial effect on cave and karst resources.

Rights-of-Way and Corridors (minor beneficial)
Cave and karst resources are often found on steep slopes and highly erodible soils. Under Alternative D, avoiding surface disturbance on slopes equal to or greater than 25% and on highly erodible soils would prevent erosion and water degradation and would apply to most cave and karst areas. However, the likelihood of major ROW permits being issued in cave and karst areas due to difficult topography reduces the benefit to minor.

Recreation (major beneficial)
Designation and management of cave and karst areas as SRMAs and not allowing surface-disturbing activities in those areas would have a major beneficial effect on cave and karst resources by preventing erosion and habitat disruption.

Lands with Wilderness Characteristics (minor beneficial)
Alternative D would prohibit most surface-disturbing activities on 6,864 acres of cave and karst areas to emphasize primitive recreation and natural values and would prevent erosion and habitat disruption. This would have a minor beneficial effect on cave and karst resources.

Livestock Grazing Management (minor beneficial)
Alt. D proposes limiting or prohibiting livestock grazing where it would not be compatible with other resources. This would have a minor beneficial effect by keeping livestock away from significant caves.

Special Designations

Wild and Scenic Rivers (major beneficial)
If Congress denies the WSR nomination, management under Alternative D would continue to prohibit surface disturbing activities, a major beneficial effect.

Wilderness Study Areas (negligible adverse)
If Congress does not designate the WSAs as wilderness, Alternative D WSA management would likely be the same as surrounding areas and allow most surface-disturbing development. While the WSAs include seven percent of cave and karst formations, major surface- and subsurface-disturbing activities are not expected to occur in these areas. Therefore surface disturbance prohibitions in these areas would be a negligible adverse effect.

4.1.5.7. Cumulative Impacts

A lack of past management decisions has adversely affected cave and karst resources. This RMP will provide management actions that will result in major beneficial effects on cave and karst resources. Little is known about cave and karst resources on private property in the planning area. The few known caves on private surface are strictly protected by the surface owners. Cave and karst resources across the planning area, on both public and private surface, are well protected through private regulation, future RMP management actions, and general difficulty of access.

4.1.5.8. Conclusion

Allowable uses and management actions described in this section for the alternatives A, B, C, and D were used to determine potential impacts to cave and karst resources. Alternative B would result in the fewest adverse effects on cave and karst resources because management actions under that alternative would result in the least amount of direct and indirect change to the quality and quantity of cave and karst resources. Therefore, Alternative B provides the greatest protection to cave and karst resources. Alternative A is largely consistent with current management, provides moderate levels of cave and karst resources protection, and would result in more adverse effects on cave and karst resources than Alternative B. Alternative D would result in fewer adverse effects on cave and karst resources than Alternative A, and significantly fewer than Alternative C. In ascending order from the least adverse to the most adverse impacts to cave and karst resources, the alternatives rank as follows: Alternative B, Alternative D, Alternative A, and Alternative C.

Table 4.28, "Summary of Impacts to Cave and Karst Resources" (p. 634) summarizes impacts to cave and karst resources (the table does not list resources for which management actions would not affect cave and karst resources under any alternative).

Table 4.28. Summary of Impacts to Cave and Karst Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Major beneficial	Major beneficial	Major adverse	Minor beneficial
Water Resources	Moderate beneficial	Moderate beneficial	Moderate adverse	Moderate beneficial
Cave and Karst Resources	Major adverse	Major beneficial	Major beneficial	Major beneficial
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	No effect	No effect	No effect	No effect
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	Moderate beneficial	Moderate beneficial	Moderate adverse	Moderate beneficial
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	Moderate beneficial	Major beneficial	Major adverse	Major beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Special Status Species – Plants	Moderate beneficial	Major beneficial	Major adverse	Minor beneficial
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	Moderate beneficial	Major beneficial	Major adverse	Minor beneficial
Heritage and Visual Resources				
Cultural Resources	No effect	No effect	No effect	No effect
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Negligible adverse	Negligible beneficial
Lands and Realty	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Renewable Energy	Moderate adverse	Major beneficial	Major adverse	Major beneficial
Rights-of-Way and Corridors	Minor beneficial	Major beneficial	Minor adverse	Minor beneficial
Transportation and Travel Management	No effect	No effect	No effect	No effect
Recreation	Moderate adverse	Moderate beneficial	Moderate adverse	Major beneficial
Lands with Wilderness Characteristics	Minor adverse	Moderate beneficial	Moderate beneficial	Minor beneficial
Livestock Grazing Management	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	Major beneficial	Major beneficial	Minor adverse	Major beneficial
Wilderness Study Areas	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible adverse
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.2. Mineral Resources

4.2.1. Locatable Minerals

The BLM manages locatable minerals, which are made available by the various mineral laws, such as the General Mining Law of 1872, as amended. Locatable minerals are the uncommon varieties of minerals, including many metals (such as gold, silver, platinum, uranium), gemstones, and certain clays, among many others. Sodium bentonite (also called Wyoming-type bentonite, a very special clay) and uranium comprise all the historic and current mining development projects in the planning area. This section describes potential effects on the locatable minerals resource and/or activities from management actions for other resources and other management programs. The Locatable Minerals section of Chapter 3 describes existing locatable minerals resource conditions.

An unsuitability review was conducted at the planning area level. This review involved identifying areas within the planning area that may best serve the multiple resource use mission of the BLM by being designated as unsuitable for mineral entry, in order to conserve or protect other resource values. Closure to (withdrawal from) or segregation from mineral entry for these areas is being pursued in lieu of designation of unsuitability. After an RMP or plan amendment in which lands are designated unsuitable for mineral entry (and/or closure to or segregation from mineral entry) is approved, the authorized officer shall take all necessary steps to implement the results of this review as it applies to locatable minerals. This would involve recommending the proposed withdrawals to the Secretary of the Interior for appropriate action pursuant to Section 204(a) of Federal Land Policy and Management Act (FLPMA). Withdrawals of 5,000 acres or more would necessitate compliance with the congressional notice provisions of Section 204(c) of FLPMA (43 U.S.C. 1714(c)). Areas that are petitioned for designation as

unsuitable for mineral entry (or withdrawal/closure or segregation) shall receive public review and hearings as appropriate. The areas in the planning area identified in this RMP as unsuitable for mineral entry are listed in Table 4.29, "Current Areas Withdrawn or Restricted from Mineral Entry under All Alternatives" (p. 666). The areas listed in Table 4.30, " Areas Recommended for Withdrawal from Mineral Entry under All Alternatives" (p. 666) are recommended for withdrawal from mineral entry on behalf of a number of other resources: Wildlife (see *Special Designations – WSAs*), Cultural Resources, Paleontological Resources, Recreation, Lands with Wilderness Characteristics, and Special Designations (ACECs and WSRs). Each of these areas was recommended for withdrawal from mineral entry after careful consideration of all resource values known to be present in that area. Although these areas were recommended for withdrawal to conserve or protect more than one resource, a number of additional resources may also benefit from closure of these areas. For more information, see the main resource on whose behalf a given withdrawal from mineral entry was recommended, as listed in Table 4.30, " Areas Recommended for Withdrawal from Mineral Entry under All Alternatives" (p. 666).

4.2.1.1. Methods and Assumptions

This section describes the methods and assumptions used in the effects analysis for the locatable minerals resource. Actions that limit the acres of locatable minerals resource are considered adverse. Actions that increase the acres of locatable minerals resource are considered beneficial. In general, the greater the number of acres affected, the greater the effect on the resource. Other actions may affect the accessibility of the locatable minerals resource, and these will likely lead to increased project costs by delaying operations or production. However, these actions would not affect the locatable minerals resource itself, and are not discussed in detail. Even in the extreme example that a number of such limitations resulted in such high projects costs that the project became uneconomic, those acres of locatable minerals resource would still be available.

Assumptions

The assumptions may include, but are not limited to:

- The occurrence of a locatable mineral does not imply that the mineral can be economically developed. Mineral occurrence potential includes both exploitable and potentially exploitable occurrences.
- The potential development activity for the locatable minerals uranium and bentonite is moderate to high during the planning period.
- The potential development activity for other locatable minerals (e.g., gypsum, metallurgical-grade limestone, many metals, and gemstones) is low during the planning period.
- The development potential for the locatable mineral bentonite is high in southwestern Johnson County.
- The development potential for the locatable mineral uranium is moderate to high in southwestern Campbell County and southeastern Johnson County.
- The potential for occurrence in commercial quantities of other locatable minerals (e.g., gypsum, metallurgical-grade limestone, gemstones, and many other metals and non-metals) across the planning area is low.
- The administration of locatable minerals and related surface-disturbing activities would involve BLM cooperation with the Wyoming DEQ, as outlined in the current BLM Wyoming DEQ MOU for locatable minerals. This MOU (dated November 19, 2003) is entitled "Supplement to Memorandum of Understanding No. WY-19 between the U.S. Department

of the Interior (DOI), BLM, and the Wyoming DEQ, Land Quality Division (LQD), for Management of Surface Mining and Exploration for Locatable Minerals on Public Lands."

- The locatable minerals resource discussed and analyzed in this document consists of only those acres of mineral ownership type "All Mins" for only those lands also having BLM surface ownerships (see Chapter 3). Not included are lands in the Bighorn National Forest and the Thunder Basin National Grasslands, as the USFS administers the locatable minerals resource on those lands. Also not included are lands under Department of Defense jurisdiction (e.g., the lands attached to the Veteran's Hospital northwest of Sheridan), as the mineral estate of those lands was transferred to the Department of Defense.
- Notice-level operations do not require approval from the BLM (i.e., no federal action is required). However, such operations are still bound by statutory requirements, including the Endangered Species Act, the National Historic Preservation Act, and the requirement under the FLPMA to prevent unnecessary and undue degradation of public lands.
- Development of locatable minerals resources may or may not involve BLM, but must involve only valid active mining claims. Federally owned locatable minerals resource in lands with BLM surface (the resource analyzed here) is developed through BLM-approved actions (see Chapter 3). Development of federally owned locatable minerals resources in lands with private or state surface are approved and handled by those entities. However, if an operator cannot obtain the private surface owner's written consent on Stock Raising Homestead Act or certain other lands, BLM will administer the surface estate according to regulations in 43 CFR 3809 for surface-disturbing activities (in accordance with 43 CFR 3809.31). The administration of mineral estate in other lands, including those that have been sold, transferred, or acquired by the federal government, may operate differently (see 43 CFR 3800). Operations not involving BLM are subject to all appropriate statutory requirements.
- Any alternative that restricts locatable minerals activities (mining claim location, exploration, and development) would have some adverse effect on the potential use of the locatable minerals resource.
- Restrictions on the locatable minerals resource (acres open to activities) and/or activities (mining claim location, exploration, and development) apply for the duration of the planning period. However, there could be changes through RMP amendments or changes in regulations.
- Only a few management actions under the alternatives could affect the locatable minerals resource (acres open to locatable minerals activities). These would involve either withdrawing or segregating areas from mineral entry (operation under the mining laws). These actions (withdrawal or segregation) would close those areas to all locatable minerals activities (mining claim location, exploration, and development), subject to valid existing rights.
- Numerous management actions could place restrictions (e.g., timing limitations on certain activities to decrease effects to wildlife) or requirements (e.g., management of topsoil or reclamation activities) on surface-disturbing activities, therefore possibly affecting locatable minerals projects (exploration and development). These restrictions or requirements might increase project costs, but would not affect the available (open) acres of locatable minerals resource, as restrictions can only be imposed to meet the performance standards at 43 CFR 3809.420 for avoiding unnecessary and undue degradation.
- Except in areas withdrawn or segregated from mineral entry, mining claimants (as defined in 43 CFR 3830.3 and 3830.5) have an inherent right to locate claims, explore, and mine. The BLM cannot revoke this right.

Significance Criteria

In addition to the scale of effects identified above, an adverse effect on the locatable minerals resource as a result of management actions would be considered potentially significant if any of the following were to occur:

- An action would violate objectives associated with locatable minerals resource management (including the *General Mining Law of 1872*, as amended), and its magnitude would be such that special mitigation would be warranted.
- An action would violate the decisions, resolutions, and goals outlined in the current BLM Wyoming DEQ MOU for locatable minerals activities, and its magnitude would be such that special mitigation would be warranted.
- An approved locatable minerals project (an accepted Notice or approved plan of operation) became restricted to the point it would not be feasible to continue operations.
- An approved locatable minerals project (an accepted Notice or approved plan of operation) became restricted to the point it would not be feasible to begin operations.
- New opportunities for locatable minerals exploration and/or development on BLM-administered lands would be substantially reduced.

4.2.1.2. Impacts Common to All Alternatives

This section summarizes management actions common to all alternatives and the likely resulting effects on the federal locatable minerals resource and activities during the planning period due to their implementation. The acres of locatable minerals resource that could be affected, and the percent of the locatable minerals resource they represent, indicate the likely possible maximum number of acres affected by the given management actions; the actual acres affected could be fewer.

Locatable Minerals (major beneficial)
All lands in the planning area not formally withdrawn or segregated from mineral entry (locatable minerals activities) are open to the location of mining claims, and the exploration and development of locatable minerals.

Physical Resources

Air Quality (negligible adverse)
Air quality management actions include implementing mitigation measures, such as dust suppression and cooperative efforts, to reduce dust emissions. These actions could require ongoing monitoring for compliance, which would have a negligible adverse effect on locatable minerals projects through increased costs.

Soil (negligible adverse)
Soils management actions include an onsite evaluation of proposed projects, mitigation of possible adverse effects on soils, and site-specific reclamation plans. These actions would have a negligible adverse effect on locatable minerals projects through increased costs, for potential additional soil-handling and reclamation steps, and/or amending project site areas or access routes.

Water Resources (negligible adverse)
Water management actions include managing surface-disturbing activities to prevent degradation of water quality, managing water to meet Wyoming Standards for Healthy Rangelands, and reducing channel and bank erosion. Similar types of mitigation measures are already required

for Wyoming DEQ LQD Mine Permits, which are required for locatable minerals development projects. Increased project costs may occur; an overall negligible adverse effect.

Cave and Karst Resources (no effect)
The cave and karst resources management actions common to all alternatives will not affect the locatable minerals resource or activities.

Mineral Resources

Nearly the entire planning area is available for exploration and development of locatable, leasable, and salable minerals. Existing and future mining of minerals in areas currently open and to become open to those activities could affect the locatable minerals resource by increasing the acres where conflicts with other minerals projects might occur. In addition, multiple mineral resource uses in the same area are not always physically incompatible. Most potential incompatibility issues would likely result from differences in timing between the projects. This would likely result in increased project costs for one or both projects, due to delays in approval as timing issues are worked out between proponents. If timing cannot be worked out satisfactorily, it's likely one or more proponents would pursue similar projects in another or nearby area.

Leasable Minerals – Coal (negligible adverse)
The potential effect on locatable minerals from making all unleased federal coal lands with high development potential in central Campbell and north-central Sheridan counties open to coal leasing (115,372 acres, 14.84%) could be severe. As only a relatively minor portion of central Campbell County contains known potentially exploitable occurrences of locatable minerals, the potential effect is likely to be much smaller; therefore the overall effect should be negligible adverse.

Leasable Minerals – Fluids (negligible adverse)
Effects on locatable minerals projects could be up to minor adverse (20,955 acres, 2.7%) by opening all unleased federal fluid mineral estate to leasing. However, the areas where locatable minerals development would most likely occur during the planning period are of moderate to low development potential for oil and gas. Geothermal energy development potential in the planning area is low; therefore, conflicts with this resource are not likely during the planning period. Overall, negligible adverse effects are likely.

Salable Minerals (negligible adverse)
All lands are open to salable minerals activities except those closed to them. The two main areas where locatable minerals projects are currently developed also contain potentially exploitable salable minerals. However, it's unlikely salable minerals will be sought to be developed in these areas during the planning period as they are plentiful elsewhere. Therefore, the potential effect is likely to be negligible adverse.

Fire and Fuels Management (negligible adverse)

Fire and fuels management actions could result in increased costs for some locatable minerals projects by temporarily limiting access to certain areas. However, these effects will likely be of short duration, small in areal extent, occur only occasionally, and affect very few projects (negligible adverse).

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for forests and woodlands.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
To reduce effects on grasslands and shrublands, which cover most of the planning area, locatable minerals projects and access roads may need to be sited or redesigned to reduce adverse effects to vegetation. This would increase project costs; a negligible adverse effect.

Vegetation – Riparian/Wetland Resources (negligible adverse)
To reduce effects on riparian and wetlands areas, which are not uncommon in the planning area, locatable minerals projects and access roads may need to be sited or redesigned to prevent the degradation, loss, or reduction of these resources. Similar types of mitigation measures are already required for Wyoming DEQ Mine Permits, which are required for locatable minerals development projects. Increased project costs result; an overall negligible adverse effect.

Invasive Species and Pest Management (negligible beneficial)
Locatable minerals projects would be recommended to limit surface disturbance to prevent weed spread, required to use certified seed during reclamation, and treat reclaimed areas for invasive species, all likely to increase project costs. However, as these treatments should limit the spread of undesirable species, and assist in achieving more successful reclamation, proponents could see decreased overall project costs through avoidance of some planned or additional expenses, resulting in an overall negligible beneficial effect.

Fish and Wildlife Resources – Fish (negligible adverse)
Barriers to fish passage and activities potentially affecting native and desirable non-native fish species are to be managed with WGFD and other stakeholders. Increased project costs through redesign of water crossings are possible; negligible adverse.

Fish and Wildlife Resources – Wildlife (negligible adverse)
A number of management actions may lead to temporary inaccessibility to, and/or increase project costs in, certain areas: maintain or improve important wildlife habitats through various treatments and methods; consult with WGFD when applying mitigation, and before waiving, allowing exceptions to, or modifying wildlife-related land use restrictions and mitigation; provide, to the extent possible, suitable habitat and forage to support WGFD (and sometimes BLM modified) wildlife population objectives; manage access to protect crucial habitats; utilize current research, management and conservation plans, and other documents to guide wildlife habitat management; construct new fences to avoid adverse effects to wildlife; work with the WGFD augmentation and/or reintroduction programs for acceptable wildlife species in suitable habitats; promote maintenance and improvement of habitat for migratory birds of conservation concern consistent with national, regional, and statewide conservation priorities. Overall negligible adverse effect.

Special Status Species – Plants (negligible adverse)
Implement actions in recovery plans, conservation measures, terms and conditions, and BMPs, and reasonable and prudent measures within biological opinions for threatened and endangered (T&E) plant species. Allow treatments within habitat and known populations proven to benefit the species. These management actions may temporarily or permanently affect access to, and/or increase project costs in, certain areas. Overall negligible adverse effect.

Special Status Species – Fish (negligible adverse)
A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: Require modification of projects that may affect SSS fish;

require the BLM to assist in the restoration, reintroduction, augmentation, or reestablishment of SSS populations and habitats; implement actions in recovery plans, conservation measures, terms and conditions, and BMPs, and reasonable and prudent measures within biological opinions for T&E fish species. Overall negligible adverse effect.

Special Status Species – Wildlife (negligible adverse)
A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: utilize current research, management, and conservation plans and similar related documents to guide special status species (SSS) habitat management; implement actions in recovery plans, conservation measures, terms and conditions, and BMP, and reasonable and prudent measures within biological opinions for T&E wildlife species; maintain seeps, springs, wet meadows, and riparian vegetation in a functional diverse condition for young Greater Sage-Grouse and other species that depend on forbs and insects associated with these areas; restore Greater Sage-Grouse brood-rearing habitats in wetland/riparian areas; manage vegetation composition, diversity, and structure to achieve Greater Sage-Grouse habitat management objectives; minimize disturbance that would alter springs and riparian Greater Sage-Grouse habitat, and develop water sources to replace affect or destroyed natural sources; and design water facilities and fences to reduce effects to Greater Sage-Grouse and habitat. Year-round disturbance-free buffer of known active bald eagle nests (329 acres, 0.04%), and seasonal limited access buffer of known active nests (1,366 acres, 0.17%). Some of these areas fall within areas likely to be developed for locatable minerals. Overall negligible adverse effect.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Maintain and develop relationships with tribes to identify resources important to them and managing these resources to minimize disturbance are the common to all management actions that would affect locatable mineral development. The effect would be negligible adverse to locatable minerals activities from increased costs for some projects due to needing to adjust project areas, and also some temporary inaccessibility to project areas.

Paleontological Resources (negligible adverse)
Retaining public lands with significant paleontological resources would mean retention of locatable minerals acres. However, as these lands would likely be recommended to be avoided to conserve the paleontological resource, this may result in amending of some project areas.

Visual Resources (negligible adverse)
Locatable minerals activities in areas with established VRM classifications would need to conform to the facility siting and design criteria for that classification, thereby blending with the surrounding landscape. Mitigation for adverse effects on visual resources would increase costs for some locatable minerals projects in areas of certain VRM classifications (II, and sometimes III); a negligible adverse effect.

Land Resources

There are no management actions common to all alternatives for forest products and renewable energy that would affect the locatable minerals resource or activities.

Lands and Realty (minor adverse)
Management actions include the prohibiting of subsequent uses of Recreation and Public Purpose

(R&PP) lands if not compatible with that authorization, withdrawals of surface and/or mineral lands, disposing of lands meeting certain criteria, and modifying, revoking, or terminating certain withdrawals and segregations. Many of these actions could effect the acres of, or restrictions on, the locatable minerals resource. Certain withdrawals would result in permanent decreases in the acres of locatable minerals resource. It is likely that more lands will become closed (withdrawn or segregated) from locatable minerals activities due to such actions; minor adverse effect is likely.

Rights-of-Way and Corridors (negligible adverse)
Management actions include siting new ROWs adjacent to existing disturbances to minimize surface disturbance, which may necessitate modifying the siting of some roads and access routes. As ROW for locatable minerals projects are extremely rare (most use of BLM surface would qualify as legitimate occupancy under 43 CFR 3715), these actions would likely have an negligible adverse effect, due to possible increased costs for extremely few projects.

Travel and Transportation Management (negligible adverse)
Management actions include minimizing surface disturbance and erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if soils would be damaged. These actions may necessitate redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods. All these actions would result in increased costs for certain projects; as this is not likely to be common, a negligible adverse effect is likely.

Recreation (minor adverse)
Recreation management actions include allowing dispersed recreation and casual use of public lands throughout the planning area, and minimizing noise and light pollution. More dispersed recreation will result in more vehicles and people travelling across and/or temporarily occupying public lands. This would increase potential hazards to the safety of the public in general, and some project operators. About 25% of the lands in current authorized locatable minerals projects are BLM surface lands, and several operators must cross other BLM surface lands to access their project sites. This potential increased traffic at some project sites may lead to increased soil compaction, erosion, and/or trash and waste, also leading to increased operational and reclamation costs for these proponents. Minimization of noise and light pollution near recreation facilities will likely lead to increased costs for some locatable minerals projects; this is not likely to affect more than a few projects. Overall effect is likely to be minor adverse.

Lands with Wilderness Characteristics (negligible adverse)
Evaluating newly acquired lands and other parcels meeting size and naturalness requirements for wilderness characteristics could temporarily preclude these lands from experiencing locatable minerals activities. This restriction may be become permanent, if, based on the results of the evaluations, these lands are officially withdrawn from mineral entry by Congress. Given the low likelihood of the BLM acquiring any further lands that might meet such characteristics, a negligible adverse effect is likely.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock, possibly resulting in short-term loss of grazing resources in relatively small areas. This loss of grazing resource will likely be very small, and will be reversed upon completion of reclamation. Locatable minerals projects costs in areas where grazing is also occurring will increase due to fencing costs; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Currently, there are no designated ACECs in the planning area. However, should any ACECs be designated with the implementation of this RMP revision, management actions common to all include evaluating BLM-authorized activities and developing mitigation to protect the integrity of the characteristics for which the ACECs were designated. As half the authorized and pending locatable minerals projects occur in or near potential ACECs, this management may increase costs or restrict certain activities for those projects; a minor adverse effect.

Scenic or Back Country Byways (no effect)
Currently, there are no designated byways in the planning area. However, should any byways be designated after this RMP revision is approved, management actions common to all include managing byways with the objective of protecting the resource values of the area. Such designation likely will not involve instituting any restrictions to size, frequency, or timing of large truck traffic or the institution of a viewshed buffer along the byway within which few or very select disturbances may occur. Approximately 50% of current authorized and pending locatable minerals projects utilize, or are near, the roads that have been identified as potentially being designated as byways. No effect to locatable minerals activities.

Wild and Scenic Rivers (negligible adverse)
Currently, there are no designated WSRs in the planning area. Management actions common to all include continuing to implement the BLM Manual 6330 - Management of Wilderness Study Areas for the one proposed WSR (2,664 acres, 0.34%, negligible adverse), which involves restricting surface disturbance within that area until Congress acts on the designation. Although some metallurgical-grade limestone is known to occur in this area, it is not likely to be sought for development due the rugged terrain and long distance to market. In addition, Congress is not expected to act during the planning period. Negligible adverse effect.

Wilderness Study Areas (negligible adverse)
Currently, there are three WSAs in the planning area (28,931 acres, 3.72%). Management actions common to all include continuing to implement the BLM Manual 6330 - Management of Wilderness Study Areas for these WSAs, which includes restriction on certain locatable minerals activities in these areas (per 43 CFR 3802) until Congress acts on these proposals. As Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas, these areas will remain restricted from certain locatable minerals activities. None of these areas are known to contain commercial amounts of locatable minerals, and are therefore unlikely targets for exploration or development activities. The effect on the locatable minerals resource and activities is negligible adverse.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock, which would increase project costs, a negligible adverse effect.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM will utilize local and state socioeconomic plans, quantify socioeconomic effects where possible, and manage in consideration of the fact that BLM actions are integrally connected with

the socioeconomic and cultural health of the planning area. Effects on locatable minerals projects would likely be increased costs; negligible adverse.

Health and Safety (negligible beneficial)
Health and safety management actions seek primarily to ensure proper health and safety measures are included in mine plans, including proper procedures for handling spills and releases of hazardous substances. Waste minimization practices are encouraged, including reusing, recycling, and substituting when appropriate. Effects to locatable minerals projects would likely be increased costs; however, many of these measures are already included in their Wyoming DEQ Mine Permits, so few additional expenses might be added. However, the resulting increases to the health and safety of the public, and a very few operators, is incalculable. Overall negligible beneficial.

4.2.1.3. Alternative A

This section summarizes management actions under Alternative A, which is the continuation of current management, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals (minor adverse)
Currently, there are three WSAs, totaling 28,931 acres (3.72%), in the planning area where certain locatable minerals activities are allowed while under Congressional review. As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas, these areas will remain open to certain locatable minerals activities under the regulations at 43 CFR 3802, with stringent requirements. Overall a minor adverse effect on locatable mineral development is anticipated.

Physical Resources

Air Quality (negligible adverse)
The requirement for analysis of anticipated effects of proposed activities on air quality, and modeling on a project-specific basis, would likely increase locatable minerals project costs; a negligible adverse effect.

Soil (negligible adverse)
Soils management actions include prohibitions on surface-disturbing activities on slopes equal to or greater than 25% (170,590 acres, 22%), in areas with poor reclamation suitability (455,090 acres, 58%), and seasonally in areas of severe erosion hazard (215,496 acres, 28%); all these prohibitions have provision for waivers. Additionally, prohibitions on surface-disturbing activities have been applied on a project-specific basis for areas of limited reclamation potential, such as badlands, rock outcrops, biologic crusts, and slopes susceptible to mass wasting (218,928 acres, 28%). In addition, topsoil is to be salvaged during project activities and reapplied during reclamation. Approximately 50% of BLM surface lands within currently authorized and pending locatable minerals projects occur in areas of rock outcrops and steep slopes. Rock outcrops and steep slopes are typical targets for location of mining claims, and exploration and development activities, as these areas reveal the geology hidden in other areas underneath overlying rock layers and soil. As the RFA for locatable minerals is that 554 acres are expected to be disturbed during the planning period (0.07%), the effect will likely be much lower, and due almost entirely to costs associated with potential additional topsoil handling and reclamation requirements the effects are negligible adverse.

Water Resources (negligible adverse)
Prohibition on surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams may affect locatable minerals projects (19,861 acres, 2.5%). However, some mitigation measures regarding these features are already required for Wyoming DEQ Mine Permits. In addition, as these areas are usually undesirable for locatable minerals projects due to such areas' inherent issues, and other considerations (such as grazing), much of this restriction is actually already taken into account when sites are selected. In addition locatable minerals RFA is 554 acres of disturbance (0.07%); a negligible adverse effect.

Cave and Karst Resources (negligible adverse)
Prohibitions on surface disturbance within a buffer around significant cave entrances may be applied on a project-specific basis; however, none have affected locatable minerals projects. The likelihood of locatable minerals projects being proposed in cave and karst areas is quite low, although some metallurgical-grade limestone is known to occur in these areas: the terrain is generally rugged, and these areas are some distance from where the materials might be used or sold. These factors would increase mining and transportation costs beyond economic feasibility. Low probability of projects and possible increased project costs from redesigning or amending project sites. In addition, locatable minerals RFA is for 554 acres (0.07%); negligible adverse.

Mineral Resources

Leasable Minerals – Coal (negligible adverse)
The RFA for coal projects is 195,700 acres, and 554 acres for locatable. If these two resources conflicted over all 554 acres, which is unlikely as commercial quantities of locatable minerals are typically found elsewhere, this would amount to 0.07% of the locatable minerals resource; negligible adverse.

Leasable Minerals – Fluids (negligible adverse)
Although fluid mineral development could conflict with a large percentage of the locatable minerals resource, those areas most likely to experience exploration and development for locatable minerals have mostly moderate to low potential for oil and gas development. The RFA for oil and gas projects is that 10,575 acres will be developed; 554 acres for locatable minerals projects. Even if there were conflicts between the two resources over all 554 acres, this is 0.07% of the locatable minerals project resource; negligible adverse. Geothermal energy development potential in the planning area is low, therefore, conflicts with this resource are not likely during the planning period.

Salable Minerals (negligible adverse)
The RFA for salable minerals is 530 acres, and locatables is 554. Even if there were conflicts between the two resources over all 530 acres, this is 0.07% of the locatable minerals project resource; a negligible adverse effect.

Fire and Fuels Management (negligible adverse)

Inadvertent damage to property and facilities or temporary access limitations to locatable minerals project sites could occur during fire suppression or prescribed fire activities. Such effects likely would be of short duration, small in areal extent, and occur only occasionally. These limitations may increase project costs for a relatively few projects.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Timber harvest and other vegetative treatments may temporarily limit access to certain locatable minerals project sites. However, such limitations would likely be of relatively short duration, small in areal extent, and occur only occasionally, and relatively few areas with known commercial quantities of locatable minerals occur in or near wooded areas. Project costs would likely increase, but for relatively few projects; negligible adverse.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Use of non-native species in reclamation seed mixtures has been approved on a project-specific basis. The BLM reclamation policy allows the use of non-native species; a primary goal of reclamation is soil stabilization, and vegetation species are chosen towards that end. Changes in seed mix may increase project costs; however, more successful reclamation would lead to minimization of reclamation costs. Overall, the effect may likely be negligible beneficial.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may affect up to 23,831 acres (3%); however, this prohibition can be waived. In addition, some mitigation measures for such areas are already required for Wyoming DEQ Mine Permits. In addition, the locatable minerals RFA is 554 acres; negligible adverse.

Invasive Species and Pest Management (negligible beneficial)
Invasive species and pest management actions could include areas treated and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase locatable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; negligible beneficial.

Fish and Wildlife Resources – Fish (negligible adverse)
Project-specific prohibitions on surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing acceptable fish species could result in an adverse effect to locatable mineral development (51,745 acres, 1.1%). Maintenance of reservoirs and riparian areas to enhance potential fisheries could have a negligible adverse effect. Other restrictions may also apply which will likely increase project costs. However, these areas will likely be avoided for locatable minerals development; Wyoming DEQ Mine Permits should already include mitigation to avoid some of these areas. In addition, locatable minerals RFA is only 554 acres; overall negligible adverse, from increased project costs.

Fish and Wildlife Resources – Wildlife (negligible adverse)
Wildlife management actions include a number of distance and/or timing limitations or prohibitions on surface disturbance and occupancy in certain areas and habitats, and all will have adverse effects on the locatable minerals projects: within the big game wildlife habitat management area (WHMAs) (4,583 acres, 0.59%); within 0.5 mile of big game migration corridors (15,559 acres, 1.2%); within elk crucial winter range and calving areas (75,175 acres, 9.6%); year-round prohibition within 750 feet of sharp-tailed grouse leks (940 acres, 0.03%) and seasonally within 0.64 mile (7,607 acres, 0.97%); and within the biologic buffer of active raptor nests (255,129 acres, 33%). Other restrictions may also apply which will likely increase project costs. Approximately 25% of BLM surface lands within locatable minerals projects occur in these areas. With an RFA of 554 acres of disturbance for locatable minerals projects, the likely effect will be negligible adverse, from increased project costs due to amending project designs and/or areas and delays.

Special Status Species – Plants (negligible adverse)
Project-specific restrictions to protect SSS plants would have an adverse effect on the locatable minerals resource (126,811 acres of suitable habitat on BLM surface, 16%). Surface-disturbing activities would avoid SSS plant populations, leading to adjustments of some project sites and/or access roads, or temporary inaccessibility to sites. SSS plants have very specific habitat requirements and therefore tend to occur in small areas, and with an RFA of 554 acres for locatable minerals, overall likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Year-round project-specific restrictions to protect SSS fish (within 0.25 mile of any waters containing SSS fish) may have a negligible adverse effect (818 acres, 0.10%). Other restrictions may also apply which will likely increase project costs. Overall negligible adverse.

Special Status Species – Wildlife (negligible adverse)
Measures to protect SSS wildlife include a number of distance and/or timing restrictions or prohibitions for certain areas and habitats, and all will have an adverse effect on the locatable minerals resource: within prairie dog colonies (6,156 acres, 0.79%); near Greater Sage-Grouse strutting grounds (restricted [0.25 mile] – 3,594 acres, 0.46%; seasonally prohibited [2 miles] – 203,724 acres, 26%); near bald eagle winter roosts, hunting, and concentration areas (year-round – 402 acres, less than 0.05%; seasonally – 3,013 acres, 0.4%); near raptor nesting areas (17,345 acres, 2.2%). Other restrictions may also apply which will likely increase project costs. Approximately 25% of locatable minerals projects occur in or near these areas, and with an RFA of 554 acres for locatable minerals projects, the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Prohibitions of surface-disturbing activities within 0.25 mile or visual horizon of portions of the Bozeman Trail and Crazy Woman Battle Site could affect the locatable minerals resource (3,588 acres, 0.46%). Project-specific prohibitions on surface-disturbing activities in certain areas containing historic properties or sensitive or sacred sites (such as TCPs) may adversely affect locatable minerals development. Other project-specific requirements (such as archeological monitors and Native American monitors) would likely increase locatable minerals project costs. As many of these areas are already protected to a certain degree by other means, locatable mineral deposits are plentiful in other areas, and the RFA for locatable minerals is 554 acres, the effect will likely be negligible adverse.

Paleontological Resources (negligible adverse)
Project-specific prohibitions in areas identified as containing paleontological resources of high quality or importance may have a negligible adverse effect (860 acres, 0.11%). Other project-specific requirements (such as paleontological field surveys) would likely increase locatable minerals project costs. Overall, negligible adverse.

Visual Resources (negligible adverse)
Locatable minerals activities in areas with established VRM classifications would be required to conform to the objectives and characteristics of that classification, especially regarding the siting and design of facilities. Areas with BLM surface not rated will be managed to conform to the surrounding classification. Other project-specific requirements (such as visual simulation and mitigation design) may be applied. These limitations and requirements would likely increase project costs, with likely a negligible adverse effect.

Land Resources

Forest Products (negligible adverse)
Management actions include the sale of forest products and fencing of regeneration areas. Some portion of the forest product-related activity is predicted to occur on BLM-managed woodlands and noncommercial forestlands. These activities may temporarily limit access to certain locatable minerals projects; such limitations would likely be temporary, small, and occasional. As relatively few locatable minerals projects occur in wooded areas, and with an RFA of 554 acres, the likely effect would be negligible adverse.

Lands and Realty (minor adverse)
Land tenure adjustments may occur on behalf of other resources and other agencies. These could increase or decrease BLM surface and/or federal mineral acres. Neither increasing BLM surface acres nor federal mineral acres would increase the locatable minerals resource, as acquired lands are not open to mineral entry (locatable minerals activities). Decreasing BLM surface acres and federal mineral acres might decrease the locatable mineral resource, depending on the type of mineral ownership of the lands involved. Lands for which acquisition will likely be pursued are those adjacent to large blocks of BLM surface and in areas of high recreational potential (118,254 acres, 15.21%), lands likely to be disposed of include those with agricultural potential or water (76,223 acres, 9.7%), and small isolated parcels in total 120,722 acres, 15.4%. It is difficult to predict which land tenure adjustments will occur during the planning period; however, it is likely that the locatable minerals resource will decrease somewhat. Overall, likely minor adverse.

Renewable Energy (negligible adverse)
Many renewable-energy projects are long in duration, essentially removing those acres from the locatable minerals resource for many decades, unless the two projects are compatible. Other renewable-energy projects may not be as long lived, and those lands would be available again soon after the renewable-energy projects end. Although no renewable-energy projects have been received to date, it is predicted that 20,000 acres (2.5%) of BLM surface will be disturbed during the planning period for these projects; (2.5%) an adverse effect. However, due to that decreased acres available for locatable minerals projects are anticipated to be few, the level of impact would be negligible.

Rights-of-Way and Corridors (negligible adverse)
Some proposed ROW (for roads, access routes, and/or facilities) may need to be modified to be placed within existing ROW, and away from major transportation routes. As ROW for locatable minerals projects are extremely rare (most use of BLM surface would qualify as legitimate occupancy under 43 CFR 3715), these actions would likely have an overall negligible adverse effect, due to possible increased costs for extremely few projects.

Travel and Transportation Management (negligible adverse)
A number of area-specific restrictions to motor vehicle use, seasonally or year-round, may increase locatable minerals project costs for project proponents. However, these areas would not be completely inaccessible for exploration as a number of activities can be performed without motorized vehicles, a negligible adverse effect is likely.

Recreation (negligible adverse)
Surface disturbance would be prohibited within 0.5 mile of the Dry Creek Petrified Tree EEA, there are no known commercial deposits of locatable minerals within the EEA, and

with an RFA of 554 acres (0.07%) for locatable minerals, an overall negligible adverse effect is expected.

Lands with Wilderness Characteristics (no effect)
Current management does not manage any lands for wilderness characteristics; no effect.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are presently no ACECs designated; therefore, no effect.

Scenic or Back Country Byways (no effect)
There are no byways within the planning area; therefore, there is no effect.

Wild and Scenic Rivers (no effect)
There are no Alternative A management actions for WSR that affect the locatable minerals resource or activities; therefore, there is no effect.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres, 3.72%. As Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas, these areas will remain open to certain locatable minerals activities under the regulations at 43 CFR 3802, with stringent requirements. The effect on the locatable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM will recognize and consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. The effect is difficult to predict, but may result in slightly more area placed under restrictions; negligible adverse.

4.2.1.4. Alternative B

This section summarizes management actions under Alternative B, which emphasizes resource conservation, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals (major adverse)
The three WSAs (totaling 28,931 acres, 3.72%) are open to certain locatable minerals activities, per 43 CFR 3802, with stringent requirements. Conservation measures implemented for other resources under Alternative B would result in a total of 618,256 acres being recommended for withdrawal from mineral entry. If all these acres were to become withdrawn, this would leave

2,727,957 acres open to certain locatable mineral activities, a major adverse impact to locatable mineral development potential.

Physical Resources

Air Quality (negligible adverse)
Quantitative air quality modeling, and mitigation to ensure project emissions would approach or exceed emissions standards, are required. This would likely increase project costs; negligible adverse.

Soil (negligible adverse)
Management actions for soils include prohibitions on surface-disturbing activities in areas with severe erosion hazard (215,496 acres, 28%), on slopes equal to or greater than 25% (170,590 acres, 22%), in areas with poor reclamation suitability (455,090 acres, 58%), and on areas with limited reclamation potential (218,928 acres, 28%). Approximately 25% of BLM surface lands within currently authorized and pending locatable minerals projects occur in such areas; also, locatable minerals RFA is 277 acres, 0.04%; negligible adverse.

Water Resources (negligible adverse)
Surface disturbance is prohibited within 500 feet of springs, reservoirs, water wells, and perennial streams, which may affect the locatable minerals resource (19,861 acres, 2.5%). These areas are usually undesirable and avoided due to their related inherent problems, and other considerations; plus given an RFA of 277 acres, the effect will likely be negligible adverse.

Cave and Karst Resources (negligible adverse)
Surface disturbance is prohibited within cave and karst areas (101,455 acres, 13%). The likelihood of locatable minerals projects being proposed in cave and karst areas is quite low, due to rugged terrain, and long distance to market. Locatable minerals has an RFA of 277 acres. The effect to locatable minerals projects is likely to be negligible adverse from increased project costs from redesigning or amending project sites to avoid these areas.

Mineral Resources

Leasable Minerals – Coal (negligible adverse)
All coal lands outside high development potential areas would be closed to coal leasing, leaving 715,388 acres of coal resource open to coal leasing. Conflict with coal projects could potentially affect up to 173,241 acres of the locatable minerals resource, 22.29%. However, the RFA for coal projects is 186,600 acres and 277 for locatable minerals. Even if there are conflicts between these two resources over all 277 acres, that is 0.04% of the locatable minerals resource. Conflict in those areas is unlikely though, as known commercial deposits of locatable minerals are mined outside areas most likely to be developed for coal. Negligible adverse effects are anticipated due to increased project costs from delays due to possible conflicts.

Leasable Minerals – Fluids (negligible adverse)
Conflict with oil and gas projects could potentially affect up to 332,931 acres of the locatable minerals resource, 42.83%. However, the RFA for oil and gas projects is 286 acres; 277 for locatable mineral. Even if there are conflicts between these two resources over all 277 acres, that is 0.04% of the locatable minerals resource. Conflict in those areas is unlikely, though, as locatable minerals in commercial quantities are not known to occur in most areas likely to be

developed for oil and gas projects. Negligible adverse effects are expected due to increased project costs from delays due to possible conflicts.

Salable Minerals (negligible adverse)
A total of 1,663,422 acres will be closed to salable minerals activities under Alternative B, leaving 129,430 acres open. Conflicts between these two minerals could affect up to 24,232 acres of the locatable minerals resource, 3.12%. However, the RFA for salable is 114 acres, and locatable 277. It is unlikely salable minerals will be sought to be developed in the two known areas where locatable minerals occur in commercial quantities, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; negligible adverse, due to increased project costs from possible delays.

Fire and Fuels Management (negligible adverse)

Not all fires will be suppressed, likely resulting in types and extents of effects similar overall to those under Alternative A. Most affected locatable minerals projects, not likely to be many, may experience lesser extents, and a few greater if in an area that experiences a larger burn due to non-suppression. Overall negligible adverse, due to increased project costs.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Types of effects are similar to, but likely of lesser extent than, those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be less extensively used (negligible adverse).

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Requiring use of only native species for all reclamation activities may lead to increased project costs due to higher costs for some native seed species. Overall, likely negligible adverse effect.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may effect up to 23,831 acres (3%); however, an RFA of 554 acres for locatable minerals (0.07%) would likely result in negligible adverse effects, from increased project costs due to redesigning or amending projects.

Invasive Species and Pest Management (negligible beneficial)
Invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase locatable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species to project sites, resulting in likely lower planned project expenses or avoidance of additional project costs; negligible beneficial.

Fish and Wildlife Resources – Fish (negligible adverse)
Surface-disturbing and disruptive activities are prohibited within 0.25 mile of naturally occurring water bodies containing acceptable fish species (51,745 acres, 1.1%). Reservoirs and riparian areas are managed to enhance potential fisheries. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits, and

given the locatable minerals RFA is 277 acres, an overall negligible adverse effect is likely, from increased project costs.

Fish and Wildlife Resources – Wildlife (negligible adverse)
All distance and/or timing limitations or prohibitions are required in Alternative B, and all will adversely affect the locatable minerals resource or projects. These are within: big-game WHMAs (11,373 acres, 1.46%); 0.5 mile of big game migration corridors (15,559 acres, 1.02%); Elk crucial winter range and calving areas (75,175 acres, 9.6%); within 750 feet of sharp-tailed grouse leks year-round (940 acres, 0.03%) and 0.64 mile seasonally (7,607 acres, 0.97%); biologic buffers of active raptor nests (255,129 acres, 33%), and species of conservation concern (171,859 acres, 22.11%). In addition, removal of elk security habitat is restricted (132,148 acres, 17%). Other restrictions also apply which will likely increase project costs, including applying seasonal restrictions on existing projects (approximately 530 acres, 0.02%). With approximately 25% of locatable minerals projects occurring in these areas, and an RFA of 277 acres, the likely effect will be negligible adverse, from increased project costs due to amending project designs and/or areas and delays.

Special Status Species – Plants (negligible adverse)
Surface-disturbing activities are required to avoid SSS plant habitat (126,811 acres, 16%), necessitating possible modifications of some project sites and/or access roads. These habitat areas are quite small, and given an RFA of 277 acres for locatable minerals, likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Surface-disturbing and disruptive activities are prohibited 0.25 mile of any waters containing SSS fish (818 acres, 0.10%). Other prohibitions and requirements apply, likely increasing project costs. Overall negligible adverse.

Special Status Species – Wildlife (negligible adverse)
Restricted and prohibited for all projects are surface-disturbing, disruptive, and/or occupancy activities, and other management actions, to conserve SSS wildlife within following areas: prairie dog colonies (6,156 acres, 0.79%, minor adverse); Greater Sage-Grouse areas (4.0-mile perimeter around occupied and undetermined leks and winter concentration areas, regardless of habitat suitability – 510,100 acres, 65.62%; greater than 4.0 miles of occupied and undetermined leks in nesting and brood-rearing habitat seasonally – 91,528 acres, 11.77%; 4.0 miles of winter concentration areas seasonally – 346,987 acres, 44.64%; habitat greater than 4.0 miles of winter concentration areas seasonally – 79,547 acres, 10.23%); seasonally within 1.5 miles of SSS raptor nests (183,269 acres, 23.58%); biologic buffer of special status raptors (113,784 acres, 14.5%); and habitats of SSS amphibians and reptiles (246,201 acres, 31.67%). Other requirements also apply which will likely increase project costs: restoration of disturbed sagebrush communities, increasing visibility of existing fencing in Greater Sage-Grouse habitat, and anti-perching devices on powerlines. Some projects may not be approved if they would result in more than one disturbance or 3% of total surface disturbance per 640 acres within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas. Approximately 50% of locatables minerals projects occur in areas affected by SSS Wildlife management actions (approximately 265 acres), however, with an RFA of 277 acres for locatable minerals projects (0.04%), the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Surface-disturbing activities are prohibited within 5 miles or visual horizon of portions of historic properties that retain their integrity of setting (222,978 acres, 28.69%). Other requirements will likely increase locatable minerals project costs: archeological monitors for all surface-disturbing activities, and Native American monitors when requested by tribes. As many of these areas are already protected to a certain degree by other means, locatable minerals are plentiful elsewhere, and the locatable minerals RFA is 277 acres, the effect will likely be negligible adverse.

Paleontological Resources (negligible adverse)
Areas containing paleontological resources of high quality or importance are prohibited to locatable minerals activities (860 acres, 0.11%); these areas would be designated for special management, as they are identified. Other requirements would likely increase locatable minerals project costs: paleontological field surveys for all Potential Fossil Yield Classification (PFYC) Class 3, 4, and 5 formations; monitoring of surface-disturbing activities on all Class 4 and 5 formations, and Class 3 as needed. Overall, negligible adverse.

Visual Resources (negligible adverse)
Areas will be managed according to their VRM classes. Required within or viewable from areas in VRM Classes II and III are completion of a visual simulation and mitigation design; this will likely increase project costs. Negligible adverse.

Land Resources

Forest Products (negligible adverse)
Required fencing of regeneration areas increase costs to certain locatable minerals projects. As relatively few locatable minerals projects occur in wooded areas, and with an RFA of 277 acres (0.04%), the likely effect would be negligible adverse.

Lands and Realty (negligible adverse)
Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands having resource value will be retained (76,223 acres, 9.7%). Lands identified for disposal (120,722 acres, 15%) will be disposed of in an order to better manage those lands with higher resource values. Lands will be acquired as willing sellers make them available, with no priority to those adjacent to large blocks of BLM surface or of high recreational potential. It is difficult to predict which land tenure adjustments will occur during the planning period; however, it is likely that the locatable minerals resource will decrease somewhat. Overall, likely negligible adverse.

Renewable Energy (negligible adverse)
Not all renewable-energy projects are incompatible with locatable minerals activities. Although no renewable-energy projects have been received to date, it is predicted that 5,000 acres of BLM surface will be disturbed for these projects during the planning period; 0.64%, a negligible adverse effect due to decreased number of acres available for locatable minerals projects, or delays in such projects.

Rights-of-Way and Corridors (negligible adverse)
All proposed ROW will need to be placed within identified corridors, and away from major transportation routes. As ROW for locatable minerals projects are extremely rare (most crossings or use of BLM surface would qualify as legitimate occupancy under 43 CFR 3715), these actions would likely have an overall negligible adverse effect, due to possible increased costs for extremely few projects.

Travel and Transportation Management (negligible adverse)
A number of area-specific restrictions to motor vehicle use may increase locatable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicles. Projects in these areas are not likely to be common as locatable minerals are plentiful elsewhere, and given an RFA of 277 acres for locatable minerals, a negligible adverse effect is likely.

Recreation (negligible adverse)
A total of eight SRMAs are recommended for designation, totaling 55,529 acres, 7%. Withdrawals from mineral entry will be pursued for all SRMAs designated via this RMP, which would close these areas to all locatable minerals activities. Some of these potential SRMAs are already under some restrictions, and some are in areas not likely to be sought for locatable mineral activities due to ruggedness of terrain and distance to likely places of use. The RFA for locatable minerals is 277 acres. The overall effect of recreation management on the locatable minerals resource would be negligible adverse due to loss of acres available for development.

Lands with Wilderness Characteristics (negligible adverse)
One area of land with wilderness characteristics is recommended to be managed to emphasize primitive recreational opportunities and natural values, which would likely include certain requirements on locatable minerals activities. Much of the LWC area is not likely to be sought for locatable minerals activities, due to rugged terrain and long distance to where these minerals would likely be used, a negligible effect.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
A total of eight ACECs are recommended for designation, totaling 536,304 acres, 8.7%. Designation of these areas would likely result in certain requirements on locatable minerals activities. Some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for locatable mineral activities due to ruggedness of terrain and distance to likely places of use. In addition, the RFA for locatable minerals is 277 acres; negligible adverse.

Scenic or Back Country Byways (no effect)
A number of roads (up to 89 miles or more) will be evaluated during the planning period for their eligibility to be proposed as National Back Country or Scenic Byways. No effect is anticipated as designation would not preclude locatable mineral exploration and development.

Wild and Scenic Rivers (negligible adverse)
One WSR is under Congressional review, and is managed according to Manual 6400 - Wild and Scenic Rivers, which includes surface disturbance restrictions. If Congress does not designate the Middle Fork Powder River WSR, these restrictions would likely continue until Congress acts on the designation. As Congress is not expected to act during the planning period, these restrictions result in negligible adverse effects to the locatable minerals resource (2,664 acres, 0.34%). This area is not a likely target for locatable minerals activities, given its remote location and rugged terrain.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres (3.7%). As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas; these areas will remain open to certain locatable minerals activities under the regulations at 43 CFR 3802, with stringent requirements. The effect on the locatable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM will consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. In addition, mitigation strategies will be developed as needed to resolve conflicts that have detrimental effects to multiple resources. Effect is difficult to predict, but may result in slightly more area placed under restrictions; negligible adverse.

4.2.1.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals (minor adverse)
The three WSAs (totaling 28,931 acres, 3.7%) are open to certain locatable minerals activities, per 43 CFR 3802, with stringent requirements. Conservation measures implemented for other resources under Alternative C would result in a total of 28,931 acres continuing to be closed to certain locatable minerals activities; this would leave 748,379 acres open to all locatable mineral activities, 96.3% of the current resource.

Physical Resources

Air Quality (no effect)
Quantitative air quality modeling is not required. No effect.

Soil (no effect)
Surface-disturbing activities are allowed, as consistent with other resource values. These include in areas with severe erosion hazard, poor reclamation suitability, limited reclamation potential, and on slopes equal to or greater than 25%. There will be no effect to the locatable mineral resource.

Water Resources (no effect)
Surface disturbance is allowed within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams. No effect.

Cave and Karst Resources (negligible adverse)
A buffer is required around significant cave entrances (10 acres, less than 0.01%), negligible adverse.

Mineral Resources

Leasable Minerals – Coal (negligible adverse)
All coal lands would be open to coal leasing. The RFA for coal projects is 195,700 acres and 1,455 acres for locatable minerals. Even if there are conflicts between these two resources over all 1,455 acres, that is 0.19% of the locatable minerals resource. Conflict in those areas is unlikely though, as known commercial deposits of locatable minerals are mined outside areas most likely to be developed for coal.

Leasable Minerals – Fluids (negligible adverse)
A total of 30,520 acres will be administratively unavailable from fluid mineral leasing, leaving 3,356,009 acres open to oil and gas projects. Conflict with oil and gas projects could potentially effect up to the entire locatable minerals resource. However, the RFA for oil and gas projects is 22,255 acres, 1,455 acres for locatable minerals. Even if there are conflicts between these two resources over all 1,455 acres, that is 0.19% of the locatable minerals resource. Conflict in those areas is unlikely, though, as locatable minerals are not known to occur in commercial quantities in most areas likely to be developed for oil and gas projects.

Salable Minerals (negligible adverse)
A total of 57,213 acres will be closed to salable minerals activities under Alternative C, leaving 3,290,908 acres open. Conflicts between these two minerals could affect up to 24,232 acres of the locatable minerals resource, 3.12%. The RFA of salable is 2,090 acres, and locatables is 1,455 acres. It's unlikely salable minerals will be sought to be developed in the two known areas where locatable minerals occur in commercial quantities, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; negligible adverse, due to increased project costs from possible delays.

Fire and Fuels Management (negligible adverse)

Full protection strategies and tactics will be used across the entire planning area, likely resulting in types and extents of effects similar, to those discussed under Alternative A. Not likely to be many locatable minerals projects affected due to temporary inaccessibility to project areas, and those effects.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Types of effects are similar to, but likely of greater extent than those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be more extensively used. A negligible adverse effect to the locatable mineral resource.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Desirable non-native species will be allowed for initial reclamation activities, leading to possibly decreased project costs, a negligible beneficial effect.

Vegetation – Riparian/Wetland Resources (no effect)
Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains, as consistent with other resource values. There would be no effect to the locatable mineral resource.

Invasive Species and Pest Management (negligible beneficial)
Invasive species and pest management actions could include species-specific treatment strategies,

applied either in specific areas or across the planning area. These treatments may increase locatable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; negligible beneficial.

Fish & Wildlife Resources – Fish (negligible adverse)
Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species. Reservoirs and riparian areas are managed to improve or enhance other resources first and potential fisheries second. Other actions may also increase project costs, a negligible adverse effect is likely.

Fish & Wildlife Resources – Wildlife (negligible adverse)
Only two seasonal restrictions occur under Alternative C: a WHMA is proposed to be designated for the Fortification Creek elk herd, (32,602 acres, 4.2%); and a seasonal prohibition within 0.5 mile of active raptor nests (176,464 acres, 23%). With few locatable minerals projects occurring in these areas, and an RFA of 1,455 acres (0.19%), the likely effect will be negligible adverse.

Special Status Species – Plants (negligible adverse)
Surface-disturbing activities that could adversely affect SSS plant habitat are allowed, but not within known populations (126,811 acres, 16%). These habitat areas are quite small, and with an RFA of 1,455 acres for locatable minerals (0.19%), the likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Surface-disturbing and disruptive activities are prohibited are within 0.25 mile of any waters containing SSS fish, when their effects cannot be mitigated (818 acres, 0.1%). Negligible adverse.

Special Status Species – Wildlife (negligible adverse)
Restrictions occurring under Alternative C include: maintain current habitat utilized by SSS; manage traditional wildlife migration and travel corridors consistent with other resources; manage surface-disturbing and disruptive activities consistent with other resources; require anti-perching devices on new powerlines within occupied Greater Sage-Grouse habitat; restrictions/prohibitions on surface-disturbing and disruptive activities and sometimes occupancy within 0.25 mile of the perimeter of occupied leks (3,594 acres, 0.46%), seasonally within two miles of occupied leks (203,724 acres, 26%), seasonally in identified nesting and early brood-rearing habitat outside the 2-mile lek buffer, and seasonally within Greater Sage-Grouse winter concentration areas; and a year-round disturbance-free buffer of at least 0.5 mile around known bald eagle winter roosts (402 acres, 0.05%), a seasonal limited activity zone within 1 mile of known roosts (3,013 acres, 0.4%), and seasonal species-specific prohibitions for SSS raptor nests (4,855 acres, 0.6%). Approximately 50% of locatables minerals projects occur in or near these areas (approximately 265 acres), however, with an RFA of 1,455 acres for locatable minerals projects (0.19%), the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Surface disturbances are allowed in areas containing historic properties when appropriate mitigation is accomplished. Archeological monitors are required on a project-specific basis, increasing project costs. Overall a negligible adverse effect.

Paleontological Resources (negligible adverse)
Paleontological field surveys are required for all projects potentially affecting PFYC Class 4 and

5 formations, increasing project costs. Identification and designation of casual collection areas for common invertebrate, plant, and petrified wood fossils. Overall, a negligible adverse effect.

Visual Resources (negligible adverse)
Visual simulation may be utilized on a project-specific basis, increasing some projects' costs; a negligible adverse effect.

Land Resources

Forest Products (negligible adverse)
An array of forest products will be available from across the entire planning area; a negligible adverse effect is likely due to increased likelihood of temporary lack of access to certain mineral projects.

Lands and Realty (minor adverse)
Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands having agricultural potential or water will be disposed of (76,223 acres, 9.7%). Lands identified for disposal (120,722 acres, 15%) will be disposed of in an order to better manage those lands with higher resource values. It is difficult to predict which land tenure adjustments will occur during the planning period; however, it is likely that the locatable minerals resource will decrease somewhat. Overall, likely minor adverse.

Renewable Energy (negligible adverse)
Although no renewable energy projects have been received to date, it is predicted that 40,000 acres of BLM surface will be disturbed for these projects during the planning period; 5.1%. Renewable-energy projects are not necessarily incompatible with locatable minerals activities, they may result in decreased number of acres available for locatable minerals projects, or delays in such projects, but overall the impact is anticipated to be negligible.

Rights-of-Way and Corridors (negligible adverse)
Above-ground facilities such as powerlines are to be placed along major transportation routes; as no current or historic locatable minerals projects utilize powerlines, this will likely have no effect; if some future project requires installing a new powerline route, this would result in increased projects costs, likely a negligible adverse effect. Carbon capture and storage (CCS) research and projects are allowed, where consistent with other resource values. Assessing the likely level of effect on the locatable minerals resource from these opportunities is difficult, as no projects have been received to date. Much of the PRB contains rock formations currently believed to be amenable to CCS; therefore, most of the PRB may eventually be targeted for this type of project. However, CCS projects are not necessarily incompatible with locatable minerals projects; much of the surface area over CCS projects may still be available for exploitation of relatively shallow deposits, such as some locatable minerals deposits. Overall, a negligible adverse effect is likely.

Travel and Transportation Management (negligible adverse)
Some areas are restricted or closed to motorized travel, seasonally or year-round. These areas are not completely inaccessible to locatable minerals activities, but these restrictions would make exploration activities more challenging and increase costs. A negligible adverse effect is likely.

Recreation (no effect)
A total of six SRMAs are recommended for designation, totaling 30,570 acres, 3.9%, although designation of these areas would not close them to locatable mineral development if those

activities are consistent with other resource values. SRMAs would not be pursued for withdrawal from mineral entry. No effect on the locatable mineral resource is expected.

Lands with Wilderness Characteristics (no effect)
No lands will be managed for wilderness characteristics, no effect.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (no effect)
No ACECs are recommended for designation, no effect.

Scenic or Back Country Byways (no effect)
No roads will be evaluated during the planning period for their eligibility to be proposed as National Back Country or Scenic Byways. No effect.

Wild and Scenic Rivers (no effect)
One WSR is under Congressional review, and is managed according to Manual 6400 - Management of Wild and Scenic Rivers, which includes surface disturbance restrictions. If Congress does not designate the WSR, and Congress is not expected to act during the planning period, these restrictions will be lifted. This area is not a likely target for locatable minerals activities, however, given its' remote location and rugged terrain. No effect.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres (3.72%). In addition, all motorized and mechanized equipment will be prohibited in these areas. Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas. However, any WSAs released by Congress would be subject to considerations for lands with wilderness characteristics; therefore, the current surface disturbance restrictions will continue to apply until a plan amendment is completed.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM is to develop management strategies to recognize and point out conflicts expected to affect multiple resource use, and to incorporate to the extent possible local and regional economic development and land use plans. Effect is difficult to predict, but may result in slightly more area placed under restrictions; negligible adverse.

4.2.1.6. Alternative D

This section describes management actions under Alternative D, the BLM preferred alternative which strikes a balance between resource use and resource conservation, and the likely resulting effects on the federal locatable minerals resource and/or activities during the planning period due to their implementation.

Locatable Minerals (major adverse)
The three WSAs (totaling 28,931 acres, 3.72%) are open to certain locatable minerals activities, per 43 CFR 3802, with stringent requirements. Conservation measures implemented for other resources under Alternative D would result in a total of 115,614 acres being recommended for withdrawal from mineral entry (16%). If all these acres were to become withdrawn, this would leave 666,488 acres open to certain locatable mineral activities; 85% of the current resource. This would be a major adverse impact to locatable mineral development potential.

Physical Resources

Air Quality (negligible adverse)
Quantitative air quality modeling, and mitigation to ensure project emissions would approach or exceed emissions standards, are required. This would likely increase project costs; negligible adverse.

Soil (negligible adverse)
Surface-disturbing activities in areas with severe erosion hazard, poor reclamation suitability, limited reclamation potential, and on slopes equal to or greater than 25% are not prohibited unless the soil resource cannot be conserved. Less than 10% of current locatable minerals projects are in such areas on BLM surface, and soils are nearly always conserved. In addition, the locatable minerals RFA of 1,252 acres, 0.16%; likely an overall negligible adverse effect.

Water Resources (negligible adverse)
Surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams is allowed where resource objectives are met. As these areas are avoided due to their related inherent problems, and other considerations, and the locatable minerals RFA is 1,252 acres (0.16%), the effect will likely be negligible adverse.

Cave and Karst Resources (negligible adverse)
Surface-disturbing activities are prohibited are within a site-specific buffer around significant cave entrances (11 acres, 0.00%). Locatable minerals projects are not likely in these areas due to the rugged terrain and long distance to likely areas of use. Also, the locatable minerals RFA is 1,252 acres (0.16%). The effect to locatable minerals projects is likely to be negligible adverse.

Mineral Resources

Leasable Minerals – Coal (negligible adverse)
All federal coal lands would be open to coal exploration. The RFA for coal projects is 195,700 acres and 1,252 for locatable minerals. Even if there are conflicts over all 1,252 acres, that is 0.16% of the locatable minerals resource; a negligible adverse effect. Conflict in those areas is unlikely, as locatable minerals are plentiful outside areas most likely to be developed for coal.

Leasable Minerals – Fluids (negligible adverse)
A total of 101,214 acres will be administratively unavailable from fluid mineral leasing, leaving 138,558 acres open to oil and gas projects. However, the RFA for oil and gas projects is 14,187 acres and 1,252 for locatable mineral. Even if there are conflicts over all 1,252 acres, that is 0.16% of the locatable minerals resource; a negligible adverse effect. Conflict in those areas is unlikely, as locatable minerals are plentiful outside the areas likely to be developed for oil and gas projects.

Salable Minerals (negligible adverse)
A total of 390,162 acres will be closed to salable minerals activities under Alternative D, leaving 2,957,960 acres open. However, the RFA for salable is 114 acres, and locatable 277. It is unlikely salable minerals will be sought to be developed in the two known areas where locatable minerals occur in commercial quantities, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; a negligible adverse effect, due to increased project costs from possible delays.

Fire and Fuels Management (negligible adverse)

Fire response and treatment will vary to meet other resource objectives; likely types and extents of effects will be similar overall to those under Alternative A. Relatively few locatable minerals projects might be effected through temporary restriction of access to sites.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Types of effects are similar to, but likely of slightly lesser extent than, those under Alternative A; some silviculture and pest control treatments, techniques, and methods will be less extensively used and some more, a negligible adverse effect.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Desirable non-native species are allowed for short-term reclamation activities, but only with native species during final reclamation. Increased project costs are possible with requirements for native seed species, a negligible adverse effect.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems and aquatic habitats where other resource objectives are met. These ares are usually avoided for locatable mineral development and therefore would likely result in negligible adverse effects.

Invasive Species and Pest Management (negligible beneficial)
Planning and actions would be required to manage invasive species, these would increase project costs but decrease the spread and of invasive species a negligible beneficial effect.

Fish and Wildlife Resources – Fish (negligible adverse)
Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species where fish resource objectives can be met (51,745 acres, 1.1%). Fisheries enhancement in reservoir design is utilized consistent with other resources. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits, and given the locatable minerals RFA is 1,252 acres (0.16%), an overall negligible adverse effect is likely.

Fish and Wildlife Resources – Wildlife (negligible adverse)
Distance and/or timing limitations will adversely affect the locatable minerals resource. These are within: big-game WHMA (11,373 acres, 1.46%); 0.5 mile of big game priority travel corridors (15,559 acres, 1.02%); big game crucial winter range and elk calving areas (98,411 acres, 12.5%); 0.25 mile year-round of occupied sharp-tailed grouse leks (940 acres, 0.1%), and two miles of an occupied lek seasonally in potential nesting and early brood-rearing habitat (48,127 acres, 6%); and within U.S. Fish and Wildlife Service (USFWS) recommended biologic buffers of active

raptor nests of species of conservation concern (255,129 acres, 33%). In addition, retention of 85% of existing elk security habitat is required. Other restrictions also apply which will likely increase project costs, including applying seasonal restrictions on existing projects when wildlife resources are not met (approximately 530 acres, 0.02%). With approximately 25% of locatable minerals projects occurring in these areas, and an RFA of 1,252 acres (0.16%), the likely effect will be negligible adverse.

Special Status Species – Plants (negligible adverse)
Surface-disturbing activities are prohibited within SSS plant habitat when the populations would not be conserved (126,811 acres, 16%). Also, predisturbance flowering season surveys are required prior to project approval. These habitat areas are quite small, and given an RFA of 1,252 acres (0.16%) for locatable minerals, likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Surface-disturbing activities are prohibited within 0.25 mile of any waters containing SSS fish species, unless it benefits the species (818 acres, 0.10%). Other prohibitions and requirements apply, likely increasing project costs. Overall negligible adverse.

Special Status Species – Wildlife (negligible adverse)
Restricted and prohibited for all projects are surface-disturbing, disruptive, and/or occupancy activities, and other management actions, to conserve SSS wildlife within following areas: prairie dog colonies, unless suitable habitat for SSS dependent upon prairie dogs is not affected (6,156 acres, 0.79%); year-round within at least 0.5 mile (adjusted based on site-specific USFWS information) of bald eagle riparian corridors; seasonally within USFWS recommended buffer and year-round within species-specific biologic buffer of active SSS raptor nests (17,417 acres, 2%); and habitats of SSS amphibians, reptiles, and bats, unless populations and habitat can be conserved (176,636 acres, 23%).

Greater Sage-Grouse will be managed in accordance to the proposed locations of locatable mineral projects within Greater Sage-Grouse habitat, Core Population Area, Connectivity Corridor, or general habitat.

Approximately 50% of locatable minerals projects occur in or near special status species habitat (approximately 265 acres), but with an RFA of 1,252 acres for locatable minerals projects (0.16%), the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Surface disturbance is prohibited within Pumpkin Buttes, Cantonment Reno, Dull Knife Battle, Crazy Woman Battle, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, rock shelter sites, and Native American burials. Surface disturbance is allowed in within three miles of those areas, if the development is not visible or will result in a weak contrast rating to the setting (154,697 acres, 19.90%,). Prohibitions and other measures will be used to mitigate adverse effects to sensitive sites such as TCPs and or sacred sites (1,105 acres, 0.14%). Other requirements include establishing agreements to provide tribal access to Pumpkin Buttes, other TCPs, and sacred sites on BLM surface, and requiring Native American monitoring for surface-disturbing projects in accordance with agreements or on a project-specific basis. Cultural Resource Project Plans (CRPPs) will be developed for Pumpkin Buttes, sites associated with Red Cloud's War and the Great Sioux War, and the South Big Horn Mountains; it is uncertain at this

time what restrictions or requirements might be included in these CRPP. As many of such areas are already protected to a certain degree by other means, locatable minerals are plentiful in other areas, and the locatable minerals RFA is 1,252 acres (0.16%), the effect will more likely be negligible adverse.

Paleontological Resources (negligible adverse)
Areas containing paleontological resources of high quality or importance would be designated for special management as they are identified (860 acres, 0.11%); these areas are to be avoided by locatable minerals activities. Requiring paleontological field surveys for all PFYC Class 4 and 5 formations, and Class 3 as needed, with monitoring of surface-disturbing activities in such areas as based on the survey results, would increase project costs. Overall, a negligible adverse effect.

Visual Resources (negligible adverse)
Areas will be managed according to their VRM classes, except certain areas (such as SRMAs, ACECs, lands with wilderness characteristics, Powder River Breaks, Fortification Creek); some of these areas will be managed according to more scenic management. Required within VRM Class II areas is completion of visual simulation and mitigation design; these may be required on a project-specific basis within VRM Class III areas with high visual sensitivity. These will likely increase project costs. With the locatable minerals RFA being 1,252 acres (0.16%), the effect is likely to be negligible adverse.

Land Resources

Forest Products (negligible adverse)
Fencing of regeneration or treatment areas may be needed, and may temporarily limit access to certain locatable minerals projects. As relatively few locatable minerals projects occur in wooded areas, and with an RFA of 1,252 acres (0.16%), the likely effect would be negligible adverse.

Lands and Realty (negligible adverse)
Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands will be acquired and disposed of based on resource values, including but not limited to, agricultural potential and water (76,223 acres, 9.7%). BLM surface identified for disposal (120,722 acres), and other lands not identified but meeting appropriate disposal criteria would be available for disposal. Acquisition of lands from willing sellers would occur consistent with other resource values, with priority for those lands adjacent to large blocks of BLM surface. It is difficult to predict which land tenure adjustments will occur during the planning period; however, it is likely that the locatable minerals resource will decrease somewhat. Overall, likely a negligible adverse effect.

Renewable Energy (negligible adverse)
Although no renewable energy projects have been received to date, it is predicted that 75,240 acres of BLM surface will be disturbed for these projects during the planning period (9.6%). However, not all renewable-energy projects are incompatible with locatable minerals activities, and with locatable minerals RFA of 1,252 acres (0.16%), the effect is likely negligible adverse.

Rights-of-Way and Corridors (negligible adverse)
Transmission lines and above-ground facilities will be placed within existing ROW and other disturbed areas. As ROW for locatable minerals projects are extremely rare (most crossings or use of BLM surface would qualify as legitimate occupancy under 43 CFR 3715), these actions would likely have an overall negligible adverse effect, due to possible increased costs

for extremely few projects. The predicted disturbance from ROW actions is 38,762 acres of BLM surface; 4.96%. CCS proposals will be evaluated; assessing the likely level of effect on the locatable minerals resource from these opportunities is difficult, as no projects have been received to date. Much of the PRB contains rock formations currently believed to be amenable to CCS; therefore, most of the PRB may eventually be targeted for this type of project (up to the entire locatable minerals acreage). However, CCS projects are not necessarily incompatible with locatable minerals projects; much of the surface area over CCS projects may still be available for exploitation of relatively shallow deposits, such as some locatable minerals deposits. Overall, a negligible adverse effect is likely.

Travel and Transportation Management (negligible adverse)
A number of area-specific restrictions to motor vehicle and OHV use, seasonally or year-round, may increase locatable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicles; mining and transportation of product would be challenging, though, at best. These actions may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods, increasing project costs. Projects in these areas are not likely to be common as locatable minerals are plentiful elsewhere, and given an RFA of 1,252 acres (0.16%) for locatable minerals, negligible adverse effect is likely.

Recreation (negligible adverse)
The planning area is to be divided into eight Extensive Resource Management Areas (ERMAs) (349,663 acres), and a total of seven SRMAs (54,160 acres, 7%). Designation of ERMAs would not close them to locatable mineral activities, but would likely add some requirements for analysis or mitigation, increasing project costs. If all seven SRMAs are withdrawn (54,160 acres, 7%), the locatable minerals resource would be adversely affected through loss of those acres. However, the RFA for locatable minerals is 1,252 acres (0.16%) and would likely not be proposed within designated SRMAs. Therefore, the overall adverse effect would be negligible.

Lands with Wilderness Characteristics (negligible adverse)
One area of land with wilderness characteristics is recommended to be managed to emphasize ecosystem health, natural values, and primitive recreational opportunities, which would likely include certain requirements on locatable minerals activities. This area is not likely to be sought for locatable minerals activities, due to rugged terrain and long distance to where these minerals would likely be used. The area totals 6,864 acres, 0.88%. The anticipated effects would be negligible adverse.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Locatable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
A total of three ACECs are recommended for designation, totaling 35,451 acres, 4.56%. These areas would be managed under site-specific management plans, which would likely close them to locatable minerals activities. Some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for locatable mineral activities due to ruggedness of

terrain and distance to likely places of use. In addition, the RFA for locatable minerals is 1,252 acres (0.16%); negligible adverse.

Scenic or Back Country Byways (no effect)
A number of roads will be evaluated during the planning period for their eligibility to be proposed as National Back Country or Scenic Byways. No effect is anticipated as designation would not preclude locatable mineral exploration and development.

Wild and Scenic Rivers (negligible adverse)
One WSR is under Congressional review, and is managed according to Manual 6400 - Wild and Scenic Rivers, which includes surface disturbance restrictions. If Congress denies its designation, these restrictions will continue to retain the areas characteristics. As Congress is not expected to act during the planning period, these restrictions result in negligible adverse effect to the locatable minerals resource (2,664 acres, 0.34%). This area is not a likely target for locatable minerals activities, given its remote location and rugged terrain.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where locatable minerals activities are restricted while under Congressional review: the WSAs, totalling 28,931 acres, 0.86%; negligible adverse effect. In addition, all motorized and mechanized equipment will be prohibited in these areas. As Congress is not expected to act during the planning period, and the BLM's recommendation is to not officially designate these areas, these areas will remain restricted from locatable minerals activities. The effect on the locatable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM is to work with other entities (local, state, federal, private) to develop mitigation strategies for promoting a healthy and sustainable social and economic environment. The BLM is to work with all stakeholders to identify socioeconomic effects of BLM actions and develop strategies to mitigate those effects where possible to promote sustainability in a multiple resource use environment. Effect is difficult to predict, but may result in slightly more area being restricted, or more requirements that would increase project costs; negligible adverse.

4.2.1.7. Cumulative Impacts

The current total available federal locatable minerals resource (BLM-administered surface and minerals) amounts to 777,310 acres. The existence of this mineral estate does not imply the presence of locatable minerals of sufficient quality and/or quantity to make them economically viable to develop (see Chapter 3). Alternative A forecasts that approximately 554 acres of federal mineral estate will be disturbed during federally-authorized exploration and development activities (BLM), and approximately 7,789 acres of non-federal mineral estate during similar activities not involving federal authorization (non-BLM); see Appendix G (p. 1671). Under the other alternatives, these acres are: Alternative B – 277 acres BLM, 23,368 acres non-BLM; Alternative C – 1,455 acres BLM, 11,684 acres non-BLM; Alternative D – 1,252 acres BLM, 17,525 acres non-BLM. The actual current acres of federal salable minerals resource under exploration and development (current management, Alternative A) and the projected potential acres (alternatives B through D) are all less than one percent of the resource.

In general, BLM-authorized locatable minerals activities disturb far fewer acres in the planning area than do BLM-authorized oil and gas or coal activities (see Appendix G (p. 1671)). Locatable minerals demand and production has been increasing over the last several years. Bentonite production has been steadily increasing, while uranium production has made a huge comeback in the planning area with more growth yet to come. Uranium demand has been somewhat stagnant over the last few years, as the price also stagnated. However, nuclear power generation is one of the key components for meeting modern power generation needs, and the importance of this role very likely may increase over time. Overall, the forecast is that locatable minerals demand will rise during the planning period. Table 4.29, "Current Areas Withdrawn or Restricted from Mineral Entry under All Alternatives" (p. 666) identifies the current areas withdrawn or restricted from mineral entry under all alternatives. Table 4.30, " Areas Recommended for Withdrawal from Mineral Entry under All Alternatives" (p. 666) identifies areas recommended for withdrawal from mineral entry by alternative.

Table 4.29. Current Areas Withdrawn or Restricted from Mineral Entry under All Alternatives

Area Withdrawn or Restricted From Mineral Entry	Acreage
Existing Withdrawals from Mineral Entry (acres)	
Amsden Creek WHMA	523
Kerns WHMA	155
Middle Fork Canyon (aka Ed O. Taylor) WHMA	10,695
Total Acres Withdrawn	**11,373**
Existing Restrictions from Mineral Entry (acres)	
Fortification Creek WSA	12,419
Gardner Mountain WSA	6,423
North Fork WSA	10,089
Total Acres Restricted	**28,931**
Total Acres Withdrawn or Restricted from Locatable Mineral Activities	**33,299**
Source: BLM 2012f WHMA Wildlife Habitat Management Area WSA Wilderness Study Area	

Table 4.30. Areas Recommended for Withdrawal from Mineral Entry under All Alternatives

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
For Cultural Resources:				
Bozeman Trail, Crazy Woman Battle Site, and other areas containing sensitive sites (such as TCPs and/or sacred sites)	NA	128,338	NA	NA
Total Acres	**NA**	**128,338**	**NA**	**NA**
For Paleontological Resources:				
Areas containing paleontological resources of high quality or importance	NA	40	NA	NA
Total Acres	**NA**	**40**	**NA**	**NA**
For Recreation:				

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Cabin Canyon SRMA	NA	1,369	NA	NA
Burnt Hollow SRMA	NA	17,280	NA	17,280
Dry Creek Petrified Tree EEA SRMA	NA	2,567	NA	2,567
Hole-in-the-Wall SRMA	NA	11,952	NA	11,952
Middle Fork Powder River SRMA	NA	10,083	NA	10,083
Mosier Gulch SRMA	NA	1,026	NA	1,026
Welch Ranch SRMA	NA	0	NA	0
Weston Hills SRMA	NA	9,504	NA	9,504
Total Acres	**NA**	**55,529**	**NA**	**54,160**
For Wilderness Characteristics:				
Lands with Wilderness Characteristics Consideration	NA	12,237	NA	6,864
Total Acres	**NA**	**12,237**	**NA**	**6,864**
For ACECs:				
Cantonment Reno ACEC	NA	523	NA	NA
Burnt Hollow ACEC	NA	17,282	NA	NA
Dry Creek Petrified Tree EEA ACEC	NA	2,567	NA	NA
Fortification Creek Elk Area ACEC	NA	32,602	NA	32,602
Hole-in-the-Wall ACEC	NA	11,952	NA	NA
Pumpkin Buttes ACEC	NA	1,733	NA	1,733
Welch Ranch ACEC	NA	0	NA	1,116
Total Acres	**NA**	**536,304**	**NA**	**35,451**
For WSR:				
Middle Fork Powder River WSR	NA	2,664	NA	NA
Total Acres	**NA**	**2,664**	**NA**	**NA**
For WSAs:				
Fortification Creek WSA	NA	12,419	NA	NA
Gardner Mountain WSA	NA	6,423	NA	NA
North Fork WSA	NA	10,089	NA	NA
Total Acres	**NA**	**28,931**	**NA**	**NA**
Total Acres Recommended for Withdrawal	**NA**	**618,256**	**NA**	**115,614**

Source: BLM 2012f

ACEC Area of Critical Environmental Concern
EEA Environmental Education Area
NA Not Applicable
SRMA Special Recreation Management Area
TCP Traditional Cultural Property
WSA Wilderness Study Area
WSR Wild and Scenic Rivers

4.2.1.8. Conclusion

The alternatives listed in ascending order from least to most adverse in terms of effects on the locatable minerals resource are alternatives A, C, D, and B. Table 4.31, "Summary of Impacts to Locatable Mineral Development" (p. 668) summarizes anticipated effects to the locatable minerals resource due to management actions for other resources under each alternative.

Alternative A is the continuation of current management. Alternative B emphasizes resource conservation, and therefore generally places the most constraints on, and is the most restrictive to, development. Alternative C emphasizes resource use, and therefore places the least constraints on, and is the least restrictive to, development. Alternative D is the BLM preferred alternative, which strikes a middle ground between resource conservation and resource use, and therefore places a more moderate amount of constraints on development.

Table 4.31. Summary of Impacts to Locatable Mineral Development

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Soil	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Water Resources	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Cave and Karst Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Minor adverse	Major adverse	Minor adverse	Major adverse
Leasable Minerals – Coal	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Fluids	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Planned Fire (Prescribed Fire)	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Biological Resources				
Vegetation – Forests and Woodlands	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Vegetation – Grassland and Shrubland Communities	Negligible beneficial	Negligible adverse	Negligible beneficial	Negligible adverse
Vegetation – Riparian/Wetland Resources	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Invasive Species and Pest Management	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Fish and Wildlife Resources – Fish	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fish and Wildlife Resources – Wildlife	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Plants	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Special Status Species – Fish	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Wildlife	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Paleontological Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Lands and Realty	Minor adverse	Negligible adverse	Minor adverse	Negligible adverse
Renewable Energy	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Rights-of-Way and Corridors	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Travel and Transportation Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Recreation	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Lands with Wilderness Characteristics	No effect	Negligible adverse	No effect	Negligible adverse
Livestock Grazing Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible adverse	No effect	Negligible adverse
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	Negligible adverse	No effect	Negligible adverse
Wilderness Study Areas	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Socioeconomic Resources				
Social and Economic Conditions	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Health and Safety	No effect	No effect	No effect	No effect

4.2.2. Leasable Minerals – Coal

This section estimates the effects on coal resources from management actions under each alternative. The effects on coal exploration, leasing, and development under each alternative can be direct, indirect, short-term, and long-term. As appropriate, effects are described as beneficial or adverse. Direct effects result from actions that either specifically prohibit or allow coal exploration and development. An example of a direct effect would be when an area is identified as unsuitable for coal mining so as to protect another resource value. An example of an indirect effect would be a timing restriction on exploration activity in a certain area, which would delay, but not prohibit, exploration in that location. Short-term effects are limited in time, while long-term effects would generally extend over the entire planning period.

4.2.2.1. Methods and Assumptions

Methods and assumptions used in this analysis include the following:

- The coal screening process has been completed for all coal lands categorized as having high potential for coal development. These are in two defined areas, one in Campbell County and one in Sheridan County. Upon receipt of a lease-by-application, the BLM will review previous coal planning decisions using current, site-specific data, and reapplying the coal screens as necessary, before determining if those lands would be acceptable for further consideration for leasing.
- For coal lands determined acceptable for further consideration in the two defined areas, leasing could occur under Lease by Application (LBA), lease modification, emergency lease, or exchange. At present, there are 12 pending LBAs, in the Campbell County area with high potential for coal development.
- Coal lands outside the two high-potential areas are not being evaluated for acceptability for further consideration for coal leasing in this RMP. The BLM assumes interest in leasing these lands would not be likely during the planning period based on the lack of a response to the call for coal development interest during the scoping of this RMP, as well as forecasting and active management of resource depletion and replacement over the last two decades.
- Coal lands outside the two high-potential areas would be considered open for coal exploration; however the BLM also assumes that interest in exploration would not be likely during the planning period.
- Exploration operations use several pieces of equipment including one or two pickup trucks, a water truck, and a rubber-tired drill rig with a 1,000 or 1,500-foot depth rating. These vehicles travel to the drill site along existing roads, trails, or along routes that have been surveyed for archeological resources and aligned to avoid cultural sites. The rig sets up at the drill location and is not moved until drilling is completed. The water truck could make one trip out of the site and the pickup trucks several trips. Drilling of most holes can be completed in half a day or less. Four core holes are generally drilled per section, unless more detailed information is needed, such as to define an outcrop.
- Major restrictions on coal exploration include areas with occupancy prohibitions or overlapping timing requirements that leave insufficient open times to perform exploration operations.
- Moderate restrictions on coal exploration include seasonal restrictions or surface use restrictions.
- Restrictions for other resources apply to the entire planning period, but can be changed through RMP amendments.

Exploration, leasing, and development activity was estimated for the entire planning period. An analysis was performed using production forecasts for the Wyoming PRB, reserves available to current operators, and the amount of leasing necessary to replace depleted reserves during the planning period. In addition, acres of disturbance and reclamation were estimated based on production forecasts. The PRB Coal Review, Task 2 report (ESNR 2009a) was used for data to 2020, and the BLM projected these data to 2030 for this RMP. The BLM is currently updating the Task 2 report to 2030, and the report is expected to be complete at about the same time as the Buffalo RMP.

The BLM has estimated that it would issue 60 exploration licenses in the two high-potential areas over the next 20 years (the planning period). The BLM also estimates that approximately five licenses could result from interest in coal leasing outside those two areas, likely as a result of

new coal conversion technologies. Exploration activity is estimated to disturb 600 acres in the two high-potential areas, and 100 acres outside those areas. This disturbance would be very short-term (1 to 2 days), with immediate reclamation.

The BLM has estimated that it would issue 28 coal leases encompassing 106,400 acres with approximately 10.2 billion tons of coal and encompassing 106,400 acres in the two high-potential areas over the next 20 years. The majority, if not all, of these leases would be to provide reserves so that the already operating mines can continue to operate. This is the ongoing production maintenance leasing program currently in effect for the PRB Coal Production Region (see Section 3.2.2.3). The BLM also estimates that approximately three leases could result from interest in coal leasing outside the two high-potential areas, likely as a result of new coal conversion technologies.

The 28 leases issued in the two high-potential areas are expected to be needed to maintain production at operating mines in the Buffalo planning area.

The three leases issued outside the two high-potential areas are expected to be associated with new coal recovery ventures. Such ventures include the possibility of technologies to convert coal, in situ, to either natural gas or liquid hydrocarbons (gasification or liquefaction) or technology that would commercially and beneficially develop deeper or currently uneconomical coals. The BLM has estimated the disturbance to be 9,000 acres, with no reclamation by the end of the planning period.

The BLM also is aware of a potential commercial technology that employs a biogenic process that would use a portion of the coal to manufacture natural gas. This process has been called methanogenesis, but is referred to as methane farming in this section. The manufacture of the natural gas would be accomplished by injecting materials into the coal to stimulate organisms that are naturally occurring in PRB coal. These organisms biogenically consume hydrogen and carbon in the coal to manufacture hydrocarbons. These hydrocarbons would be produced or extracted for commercial use through existing wellbores. The result would be that depleted CBNG wells can be caused to yield hydrocarbons. It is likely that if this process is viable, the CBNG wells would stay active longer before being plugged and reclaimed. Another result is that the coal in place would be partially altered, primarily in terms of chemical changes that could lower the coal's commercial value.

Significance Criteria

In addition to a major effect based on the scale of effect, an adverse effect on coal resources as a result of multiple-use constraints would be considered potentially significant if the following were to occur (Table 4.32, "Coal Resources Affected" (p. 671)):

Table 4.32. Coal Resources Affected

Percent of coal resource affected	Areas with high potential for coal development	Coals presently not economical to develop by surface mining methods
Less than 1		
1 to 5	X	
5 to 10		
More than 10		X

4.2.2.2. Impacts Common to All Alternatives

Leasable Minerals – Coal (major beneficial)
Processing and consideration of LBAs and other leasing actions allowed in a decertified federal coal production region would continue in the two areas of coal lands with high potential for coal development. At present, there are 12 LBAs being processed. The impacts associated with leasing are being addressed in four EISs, combining leases similarly located. Separate RODs will be issued for each LBA, with a decision of whether each LBA tract would be offered for competitive sale. At the time of this writing, four RODs have been issued, with four LBA tracts scheduled for sale. One sale has been held (West Antelope II North tract). The 12 LBAs total approximately 32,000 acres and contain approximately four billion tons of coal reserves. It is expected that these LBAs will be completed during the period 2010 to 2013. If leased, the reserves currently under LBA would meet coal production demand until approximately 2018.

At this time, no other leasing is being considered, although because these LBAs would provide reserves to maintain operations until approximately 2018, it is expected that additional leasing will be requested in these two areas. Assuming the existing LBAs are offered and leases issued, it is estimated that approximately five billion tons of recoverable reserves (approximately 68,000 acres) in addition to the existing LBAs would need to be leased during the planning period to replace depleted reserves at operating mines.

Coal lands outside the two high-potential areas have not been screened under the requirements of the coal regulations. If a coal leasing action was proposed outside the established areas with high-potential for coal development, these areas would be screened, probably as part of a site-specific EA or EIS. Based on screening, only coal lands found acceptable for further consideration for leasing would be considered for potential lease. Given the conditions under which the decertified PRB federal coal production region operates, it would not be likely that leasing would occur outside the two high-potential areas. There has been interest shown in non-conventional coal utilization, such as *in situ* (in place) conversion of coal to hydrocarbons. Although commercial production of in situ coal gasification has not occurred in the PRB, there were two test sites for this technology in the 1970s near Gillette, Wyoming. Upon receipt of an application for in situ coal gasification or conversion outside of the areas identified for further coal leasing consideration, a land use plan amendment would be initiated and the four coal screens would be applied to the area of interest.

Physical Resources

Air Quality, Soil, and Water Resources (minor adverse)
Air management actions common to all alternatives include the implementation of mitigation measures to reduce emissions and to work cooperatively to reduce dust emissions. The coal mines are a primary emissions source within the planning area. A reclamation plan is required for the authorization of all surface-disturbing activities for the protection of soil, water and other resources. Surface-disturbing activities are managed to prevent degradation of water quality. These management actions would increase costs but would not prevent any coal operations, therefore their effect is minor adverse.

Cave and Karst Resources (no effect)
Karst formations are limited to the Big Horn Mountains portion of the planning area, outside of the PRB coal deposits. There would be no effect from cave and karst management on the coal program; therefore cave and karst will not be discussed further in this section.

Mineral Resources

Locatable Minerals and Salable Minerals (no effect)
The predominant locatable minerals within the planning area are uranium and bentonite. Uranium deposits are found primarily in south western Campbell County and south eastern Johnson County. Bentonite is found primarily in south western Johnson County. Commercial quantities of locatable minerals do not overlap with the high coal development potential areas. Salable mineral deposits are widespread throughout the planning area. Sufficient salable mineral deposits are available outside of foreseeable coal LBA areas. Neither locatable or salable minerals management would affect coal management; they will not be discussed further in this section.

Leasable Minerals – Fluids (moderate adverse)
Oil and gas fields underlie the coal lands in the Buffalo planning area. The development and production of these fields could affect the timing of leasing and development of federal coal lands. Washington Office Instruction Memorandum 2006-153, Policy and Guidance on Conflicts between CBNG and Surface Coal Mine Development in the PRB, dated May 11, 2006, provides updated direction on resolving conflicts between surface coal mining and CBNG operations on federal oil and gas leases (BLM 2006c). Conflict Administration Zones (CAZ) have been defined in areas where federal oil and gas leases are in effect on federal coal lands in the path of projected mining. Conflict resolution to optimize the production of both coal and oil and gas resources in the CAZ is the same under all alternatives. Coal leasing in producing conventional oil and gas fields could be deferred unless or until coal development would not interfere with the economic recovery of the oil and gas resource. This is determined on a project-specific (case-by-case) basis during coal lease tract processing. The effect is moderate adverse as coal mining could be delayed several years.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (no effect)
Fire and fuels management actions common to all alternatives would not effect coal exploration or development. Fire management within active coal mining areas would not differ across the alternatives and therefore will not be discussed in this section.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for the forest and woodland resources, there would be no effect on the coal program. Forest and woodland management actions by alternative predominantly relate to forest (old-growth, aspen, etc.) and mixed-shrubland management. These vegetation communities are present only within the northern Sheridan County high coal development potential area. The presence of forest and woodland communities would not affect a potential coal lease or exploration activities, therefore there would be no effect on the coal program and forest and woodland management will not be discussed further in this section.

Vegetation – Grassland and Shrubland Communities (minor adverse)
Coal operations would be required to reestablish disturbed sites to healthy plant communities, and to manage the reclaimed lands for sustainable forage levels in accordance with the Wyoming Standards for Healthy Rangelands. These management actions would not prevent or restrict mining activities but would increase operational costs, the effect is minor.

There is only one management action which varies by alternative, regarding non-native species use in reclamation efforts. Seed requirements would not effect coal exploration or development activities; therefore, grassland and shrubland communities are not discussed further in this section.

Vegetation – Riparian/Wetland Resources (minor adverse)
Management actions common to all alternatives would require coal operators to restore riparian/wetland habitats to enhance forage conditions and improve water quality as part of mine reclamation in order to achieve the Wyoming Standards for Healthy Rangelands. These actions would increase the cost of coal activities but would not prohibit coal exploration or development, the effect would be minor adverse.

Invasive Species and Pest Management (minor adverse)
Coal operations would be required to revegetate and treat invasive species on disturbed areas through an Integrated Pest Management (IPM) program using certified weed seed-free products. These management actions would not prevent or restrict mining activities but would increase operational costs, the effect is minor.

Management actions that vary by alternative further regulate invasive species and pest management but would not restrict coal exploration or development or vary substantially in their effect; therefore invasive species and pest management will not be discussed further in this section.

Fish and Wildlife Resources – Fish and Special Status Species – Plants and Fish (no effect)
There are no potential fisheries or special status species plant habitat within the high coal development potential areas, there will be no effect from fish or special status species plant management on coal exploration or development. These resources will not be discussed any further in this section.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor adverse)
Management actions common to all alternatives would require coal operators to restore wildlife habitats as part of mine reclamation. New fences would be constructed to avoid adverse wildlife impacts. These actions would increase the cost of coal activities but would not prohibit coal exploration or development, the effect would be minor adverse.

Heritage and Visual Resources

Cultural Resources (no effect)
Management actions common to all alternatives do not restrict coal exploration or development and therefore would have no effect on the coal resource.

Paleontological Resources (no effect)
Paleontological management actions common to all alternatives and management actions which vary by alternative regulate the management of important and high-quality paleontological resources. High-quality resources would most likely be found within potential fossil yield classification (PFYC) Class 4 or 5 areas which do not overlap with the high coal development potential areas, there would be no effect on coal exploration or development from paleontological resource management and it will not be discussed further in this section.

Visual Resources (no effect)
Visual resource management actions, common to all alternatives would not effect coal exploration or development, there are no WSAs or WSRs in the high coal development potential areas.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, and Lands with Wilderness Characteristics (no effect)
The high coal development potential areas do not include the commercial forest areas, areas with wind potential of good or higher, or lands with wilderness characteristics; there will be no effect from forest product, renewable energy, or wilderness characteristics management on the coal resource. Rights-of-way and corridors, and travel and transportation management actions, common to all alternatives and by alternative, would not effect the coal resource. Established coal leases and foreseeable leases do not require ROWs, utilities are managed with the lease. Transportation management regulates public access to BLM surface and does not pertain to coal management. The public is typically excluded from active mining areas. None of these resources will be discussed further in this section.

Lands and Realty (no effect)
The common to all management actions do not direct land acquisitions or disposals, only that they will be considered on a project specific basis. Since the management actions do not direct land tenure change proposals there would not be a discernible effect on the coal resource.

Recreation (no effect)
The recreation common to all management actions do not regulate other land uses and therefore would not effect coal management.

Livestock Grazing Management (no effect)
Livestock grazing is authorized on BLM surface within the high coal development potential areas. The livestock grazing management actions common to all alternatives, and by alternative, do not regulate other land uses and therefore would not effect coal management. Livestock grazing will not be discussed further in this section.

Special Designations

Areas of Critical Environmental Concern (no effect)
The Welch Ranch ACEC evaluation area is within the northern Sheridan County high coal development potential area and the Burnt Hollow ACEC evaluation area is adjacent to the Campbell County high coal development potential area. ACEC management actions common to all alternatives do not effect the on-the-ground management of the potential ACECs and therefore would not effect the coal resource.

Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas (no effect)
None of the areas evaluated for these special designations are within a high coal development potential area. There will be no effect from management actions, common to all alternatives or by alternative, for these special designations that would effect the coal resource, these special designations will not be discussed further in this section.

Socioeconomic Resources

Social and Economic Conditions (no effect)
Social and economic management actions, common to all alternatives and by alternative, do not

effect the on-the-ground exploration or development of coal and therefore would not effect the coal resource. Social and economic resources will not be discussed further in this section.

Health and Safety (minor adverse)
Health and safety management actions common to all alternatives would increase the cost of coal operations but would not prohibit exploration or development activities. The impact of increased operational costs is minor adverse. There are no health and safety management actions which vary by alternative.

4.2.2.3. Alternative A

Leasable Minerals – Coal (major beneficial)
Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This alternative would allow for coal exploration on all federal coal lands, subject to license stipulations necessary to protect other resource values. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue through the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. It is estimated that 65 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre and each reclaimed within 1 year of drilling.

Sixty licenses are expected in the two areas with high coal development potential, with 600 acres disturbed and reclaimed during the planning period.

Although possible, new exploration on unleased lands outside the areas of high coal development potential would be unlikely during the planning period. It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons will increase during the planning period. Therefore, it is assumed five exploration licenses would be applied for on coal lands outside high-potential areas during the planning period. These licenses would likely cover a larger area because of the relative scarcity of data about coal outside the high-potential areas, with 100 acres disturbed and reclaimed during the planning period.

Leasing in the two areas with high coal development potential is expected to continue. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction in coal's participation in the portfolio of electric generation sources, and conservation of electricity as a result of electricity costs.

Under Alternative A, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that surface-disturbing activities would lag leasing by five years to allow for Wyoming DEQ and Office of Surface Mining Reclamation and Enforcement (OSM) permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a ten percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, "Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives" (p. 691) lists estimates of disturbance and reclamation during the planning period. Under Alternative A, by 2030, it is expected that mining in the two areas with high coal development potential would have disturbed a total of 195,700 acres. These 195,700 acres comprise 120,700 acres that have been reclaimed, 45,500 acres in active mining areas and areas not yet recontoured or reseeded, and 75,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

There is developing interest in leasing coal lands for *in situ* coal gasification. This is a process that consumes coal that is in place underground and converts that coal by a physical process to hydrocarbons that can be recovered using wellbores. This process has been tested but not implemented commercially in the PRB; however, it has been implemented internationally. To have a project of this type on federal coal lands, a coal lease would be required.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period. Three new mine operations recovering coal for non-conventional conversion are assumed during the planning period. Therefore, under Alternative A it is estimated that during the planning period, three leases would be issued to operators developing coal outside the high-potential areas for non-conventional coal conversion processes, resulting in a net disturbance of 9,000 acres. Estimates for assumed new coal operations assume surface disturbance for mine startup and minimal reclamation of mining disturbance during the planning period.

If a coal leasing action was proposed outside the established high-potential areas, proposed areas would be screened as part of a site-specific EA or EIS. Based on screening, only coal lands found acceptable for further consideration for leasing would be considered for potential lease.

At present, there is no management or specific policy guidance for managing methane farming, the commercial manufacture of natural or hydrocarbon gases or liquids through physical or biological processes that convert coal *in situ*. Until there is such a policy, interim or permanent, the coal resource could be adversely affected if such processes are employed on federal coal lands. For federal coal lands that also have federal oil and gas leases, there would be a minor effect from methane farming. On these lands, if a federal well's productive life is extended by methane farming, it might not be depleted and abandoned as normally occurs as coal mining approaches and available gas is depleted. However, the public could receive a royalty on the manufactured gas where a federal oil and gas lease is in effect. For federal coal lands where the oil and gas rights are non-federal, the effect of methane farming could be significant because there would be no authorization to provide a mechanism for addressing conflicts between methane farming and federal coal leases. Furthermore, if coal value is diminished, there is no mechanism to recover this lost value for the public benefit, except to pursue damages through trespass or similar actions. The BLM is expected to pursue policy resolution during the development of this RMP.

Physical Resources

Air Quality (minor adverse)
There is one management action that varies by alternative regarding air quality modeling. Alternative A would require air quality monitoring on a project specific basis, typically when there could be an air quality standard exceedance. Modeling has regularly been performed for the PRB coal mines collectively and this holistic approach is anticipated to continue throughout the planning period. Modeling increases the cost for coal operations but it

does not prohibit coal activities. Mitigation resulting from air quality modeling may also increase operational costs but is not anticipated to prevent coal mining. The modeling and costs would be a minor adverse effect to coal exploration and development. Since air quality monitoring for coal development is anticipated to occur in all alternatives there is no difference between alternatives in regards to coal and therefore air quality will not be discussed further in this section.

Soil and Water Resources (minor adverse)
Current management prohibits surface-disturbing activities on sensitive soils and near water resources with exception provisions. These management actions would not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can likely avoid sensitive soils and water resources when planning their projects therefore the effect of these management actions would be minor adverse.

Mineral Resources

Leasable Minerals – Fluids (minor beneficial)
Under Alternative A, coal development experiences a minor beneficial effect from lease stipulations on oil and gas leases for leased coal lands that are permitted for mining. Oil and gas operations that interfere with permitted mining do not adversely affect coal production as a result of these lease stipulations. However, this alternative does not provide for placing similar stipulations on oil and gas leases in areas not yet leased for coal development but that have high potential for coal leasing.

Under this alternative, the PRB CAZ would remain in effect. The CAZ is a defined area established by the BLM and based on the area that is expected to be mined over the next ten years. In that area, oil and gas lessees are notified of the expected mining and offered royalty incentives to expedite CBNG recovery in advance of mining. The CAZ is modified annually to reflect the progress of mining activities.

Biological Resources

Vegetation – Riparian/Wetland Resources (minor adverse)
Current management prohibits surface-disturbing activities near riparian and wetland resources with exception provisions. These management actions would likely not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can avoid riparian and wetland resources when planning their projects therefore the effect of these management actions would be minor adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate adverse)
Current management prohibits surface-disturbing activities near important wildlife sites (WGFD WHMAs, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and seasonally within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites). Exceptions are provided for. A portion of one Greater Sage-Grouse Core Population Area is within the Campbell County high coal development potential area and bald eagle nest and roost sites are present within the Sheridan County high coal development potential area. The presence of sensitive wildlife habitats is unlikely to effect coal mine siting as the high coal development potential areas have already been screened accounting for these wildlife resources. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents may not

be able to avoid all wildlife protection areas when planning their projects therefore the effect of these management actions would be moderate adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Current management stipulates fluid mineral leases for the protection of the Bozeman Trail and the Crazy Woman Battle Site. The Bozeman Trail passes through the Sheridan County high coal development potential area. Although the current management action is fluid mineral specific, exploration and non-conventional coal conversion operations would likely be mitigated on a project specific basis for the protection of cultural resources. Cultural sites can typically be avoided or mitigated so that the effect on coal operations would be negligible.

Visual Resources (minor adverse)
The high coal development potential areas contain VRM Classes II, III, IV, and V. The objective of VRM Class II is to retain the existing character of the landscape, management activities may be seen but should not attract attention. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Classes IV and V. Coal exploration and development activities particularly within VRM Classes II and III would be affected as projects would be required to include design features to comply with the appropriate VRM objectives. This could include limiting the size and placement of pits and infrastructure. The level of impact would be minor as there is little VRM Class II in the Campbell County high coal development potential area and although VRM Class II makes up a large component of the Sheridan County high coal development potential area less development is forecasted and the rough topography could be used to screen coal activities.

Land Resources

Lands and Realty (no effect)
The current program for land tenure adjustments is proponent driven, the BLM is not actively pursuing potential acquisitions or disposals. There are parcels of BLM surface within both high coal development potential areas identified for disposal and BLM surface within the Campbell county high coal development potential area identified for acquisition. It is most likely that realty actions would include only the surface estate and not the mineral estate; therefore there would be no effect to the coal resource.

Recreation (negligible adverse)
Welch Ranch in northern Sheridan County is the only recreation site completely within a high coal development potential area. Burnt Hollow is adjacent to, and Weston Hills lies in close proximity to, the Campbell County high coal development potential area. Mineral activities would be managed on a project specific basis within the recreation areas, which could include prohibiting coal exploration and development. Because a coal proposal is unlikely at Welch Ranch, the effect of recreation management on coal activities would be negligible adverse.

Special Designations

Areas of Critical Environmental Concern (no effect)
The Welch Ranch ACEC evaluation area is within the northern Sheridan County high coal

development potential area and the Burnt Hollow ACEC evaluation area is adjacent to the Campbell County high coal development potential area. There presently are no ACECs within the planning area therefore ACEC management would not affect the coal resource.

4.2.2.4. Alternative B

Leasable Minerals – Coal (major adverse)
Alternative B emphasizes resource conservation, and would allow for coal exploration only on federal coal lands in the two high-potential areas, subject to license stipulations necessary to protect other resource values. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue during the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. Under Alternative B, it is estimated that 60 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre, and each reclaimed within one year of drilling, with 600 acres disturbed and reclaimed during the planning period.

Leasing in the two areas of high coal development potential is expected to continue under this alternative. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction of coal participation as a generation fuel, and conservation of electricity as a result of electricity costs.

Under Alternative B, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that surface-disturbing activities would lag leasing by five years to allow for Wyoming DEQ and OSM permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a ten percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, “Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives” (p. 691) lists estimates of disturbance and reclamation during the planning period. Under this alternative, by 2030 it is expected that mining in the two areas with high coal development potential could disturb a total of 186,600 acres. These 186,600 acres comprise 120,600 acres that have been reclaimed, 36,500 acres in active mining areas, and 66,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons will increase during the planning period. Under Alternative B, lands outside the two high-potential areas would be closed to exploration and leasing. As a result of these constraints, no exploration, leasing or development for new coal recovery ventures would be expected during the planning period. This is considered a major effect, because it would remove an extensive portion of the national coal resource from non-conventional conversion. However the commercial feasibility of this technology is uncertain.

As noted under Alternative A, there is no existing management or specific policy guidance for managing methane farming. Under Alternative B, all coal lands in the Buffalo planning area would be closed to methane farming. For federal coal lands that also have federal oil and gas leases, there would be a major effect as these lands become closed to potential gas manufacture. For federal coal lands where the oil and gas rights are non-federal, the effect of methane farming could be significant because there would be no authorization to provide a mechanism for addressing conflicts between methane farming and federal coal leases. Furthermore, if coal value is diminished, there is no mechanism to recover this lost value for the public benefit, except to pursue damages through trespass or similar actions.

Physical Resources

Soil and Water Resources (moderate adverse)
Alternative B prohibits surface-disturbing activities on sensitive soils and near water resources. These management actions could influence the siting of new coal mines but is unlikely to prevent their authorization. Exploration and non-conventional conversion operations would be prohibited for the protection of soil and water resources. Proponents of exploration and non-conventional conversion operations should be able to avoid sensitive soils and water resources when planning their projects. The effect of these management actions would be moderate adverse as the siting of coal exploration and development activities would be affected on more than ten percent of the planning area but proponents would be able to find suitable project locations.

Mineral Resources

Leasable Minerals – Fluids (major adverse)
Under Alternative B, new leases would be delineated to avoid active oil and gas operations in cases where it is demonstrated that reasonably foreseeable coal operations would interfere with economic recovery of conventional oil and gas resources, and new leases would be stipulated with a requirement that coal development would accommodate preexisting oil and gas recovery operations. Existing coal leases would not be adversely affected under this alternative, unless these leases are stipulated with a requirement that coal development would accommodate preexisting oil and gas recovery operations when the existing leases are readjusted. The requirement to avoid oil and gas operations would have a major effect on coal recovery because there would be extensive areas of coal left in place to avoid oil and gas activity.

Under this alternative, the BLM policy established for the PRB that provides for a CAZ would remain in effect.

Biological Resources

Vegetation Resources – Riparian/Wetland (moderate adverse)
Alternative B prohibits surface-disturbing activities near riparian and wetland areas. These management actions could influence the siting of new coal mines but is unlikely to prevent their authorization. Exploration and non-conventional conversion operations would be prohibited for the protection of riparian and wetland resources. Proponents of exploration and non-conventional conversion operations would be able to avoid riparian and wetland communities when planning their projects. The effect of these management actions would be moderate adverse as the siting of coal exploration and development activities would be affected on more than ten percent of the planning area but proponents would be able to find suitable project locations.

Fish and Wildlife Resources – Wildlife and **Special Status Species – Wildlife** (major adverse)
Alternative B prohibits surface-disturbing activities near important wildlife sites (WGFD WHMA, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and seasonally within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites). Greater Sage-Grouse nesting habitat and herptile breeding habitat are present within both high coal development potential areas and bald eagle nest and roost sites are present within the Sheridan County high coal development potential area. The presence of special status species wildlife habitats could influence coal mine leasing and siting. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents would be unable to avoid all wildlife protection areas when planning their projects and projects or certain activities could be prohibited therefore the effect of these management actions would be major adverse.

Heritage and Visual Resources

Cultural Resources (major adverse)
Areas containing historic properties that retain their historic setting would be closed to mineral leasing, including coal. This management actions would prohibit coal leasing within five miles of the Bozeman Trail and other historic sites and would effect both high coal development potential areas. This management action would prohibit coal mine leasing, exploration, and non-conventional coal operations in more than ten percent of the high coal development potential areas, a major adverse effect.

Visual Resources (minor adverse)
The Sheridan County high coal development potential areas contains VRM Classes II, III, and IV; the Campbell County high coal development potential area is largely comprised of VRM Class IV with some VRM Class III. The objective of VRM Class II is to retain the existing character of the landscape, management activities may be seen but should not attract attention. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Class IV. Coal exploration and development activities particularly within VRM Classes II and III would be affected as projects would be required to include design features to comply with the appropriate VRM objectives. This could include limiting the size and placement of mine pits and infrastructure. The level of impact would be minor as there is no VRM Class II in the Campbell County high coal development potential area and although VRM Class II makes up approximately one-third of the Sheridan County high coal development potential area little development is forecasted and the rough topography could be used to screen coal activities.

Land Resources

Lands and Realty (major beneficial)
Alternative B would retain all lands identified for disposal having resource value, mineral estate would be considered a resource value. The parcels identified for disposal within both high coal development potential would be retained. Acquisition actions would likely include acquisition of the mineral estate. Retaining all federal coal and the acquisition of additional federal coal lands would be a major benefit to the coal program.

Recreation (minor adverse)
Welch Ranch in northern Sheridan County is the only SRMA completely within a

high coal development potential area. Three SRMAs lie partially within (Cabin Canyon), adjacent to (Burnt Hollow), or in close proximity to (Weston Hills) the Campbell County high development potential area. Mineral leasing and exploration activities would be prohibited within and one-half mile surrounding the SRMAs. The effect of the prohibition would be minor as the Campbell County SRMAs are along the eastern edge of the high coal development potential area and would likely impact few proposals. Coal activities are even less likely near the Welch Ranch SRMA in Sheridan County.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
The Welch Ranch ACEC is within the northern Sheridan County high coal development potential area and the Burnt Hollow ACEC is adjacent to the Campbell County high coal development potential area. Mineral activities would be prohibited within the ACECs. There is no management buffer surrounding the ACECs. Coal activity is not likely at the Welch Ranch therefore the prohibition effect would be negligible.

4.2.2.5. Alternative C

Leasable Minerals – Coal (major beneficial)
Alternative C would emphasize resource use. This alternative would allow for coal exploration on all federal coal lands. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue during the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. It is estimated that 65 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre and each reclaimed within one year of drilling. Sixty licenses are expected in the two areas with high coal development potential, with 600 acres disturbed and reclaimed over the life of the plan.

New exploration on unleased lands outside the areas with high coal development potential is possible, but unlikely, during the planning period. It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period. Therefore, during the planning period, it is assumed that five new licenses would be submitted on coal lands outside the areas of high coal development potential. It is assumed these licenses would cover a larger area, due to the relative scarcity of coal data outside the high-potential areas, with 100 acres disturbed and reclaimed during the planning period.

Leasing in the two areas with high coal development potential is expected to continue. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction of coal participation as a generation fuel, and conservation of electricity as a result of electricity costs.

Under Alternative C, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that surface-disturbing activities would lag leasing by five years to allow for Wyoming DEQ and OSM permitting timeframes. Surface disturbance

estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a 10% increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, "Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives" (p. 691) lists estimates of disturbance and reclamation during the planning period. Under this alternative, by 2030 it is expected that mining in the two high-potential areas would have disturbed a total of 195,700 acres. These 195,700 acres comprise 120,700 acres that have been reclaimed, 45,500 acres in active mining areas, and 75,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

There is developing interest in leasing coal lands for *in situ* coal gasification. This is a process that consumes coal in place underground and converts that coal by a physical process to hydrocarbons that can be recovered using wellbores. This process has not been implemented commercially in the PRB; however, it has been implemented internationally. To have a project of this type on federal coal lands, a coal lease would be required.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons will increase during the planning period. Three new mine operations recovering coal for non-conventional conversion are estimated during the planning period. Therefore, under this alternative, it is estimated that during planning period, three leases would be issued to operators developing coal outside the areas with high coal development potential. These leases would be for reserves for non-conventional coal conversion processes, resulting in a net disturbance of 9,000 acres. Estimates for assumed new mining operations assume surface disturbance for mine startup and minimal reclamation of mining disturbance during the planning period.

If a coal leasing action was proposed outside the established areas of high coal development potential, these areas would be screened, probably as part of a site-specific EA or EIS. Based on screening, only coal lands found acceptable for further consideration for leasing would be considered for potential lease. Decisions outside the high coal development potential areas would likely require an RMP amendment.

Under this alternative, the BLM would implement a policy or mechanism designed to authorize methane farming on federal coal lands, regardless of the ownership of the oil and gas estate. This authorization would likely not be a coal lease, because the coal is only partially altered by methane farming. The authorization could be an agreement, contract, or lease that would provide for compensation to the public for the reduced value of the federal coal or for the royalty value of the manufactured hydrocarbons produced. In addition, under this alternative, these authorizations would be stipulated to provide a requirement to methane farm operators to cease their operations when the coal is leased for conventional mining. This policy would have a major beneficial effect on coal resource management by establishing a mechanism to manage conflicts between methane farming and mining, by ensuring some return to the public for use of the coal resource, and by establishing an authorization process requiring appropriate NEPA analyses and mitigation measures.

Physical Resources

Soil and Water Resources (negligible adverse)
Alternative C provides for surface-disturbing activities on sensitive soils and near water resources with adequate consideration of all resources. These management actions would not effect active

coal mines but would regulate the location of exploration and non-conventional conversion operations. Project proponents can likely avoid sensitive soils and water resources, but would not necessarily be required to, when planning their projects therefore the effect of these management actions would be negligible adverse.

Mineral Resources

Leasable Minerals – Fluids (major beneficial)
Under Alternative C, coal development would experience a major beneficial effect from lease stipulations on oil and gas leases for coal lands that are permitted for mining. Oil and gas operations that interfere with permitted mining would not adversely affect coal production as a result of these lease stipulations. Furthermore, this alternative provides for similar stipulations on oil and gas leases in areas not yet leased for coal development but that have high potential for coal leasing. This has a beneficial effect on the coal resource by increasing the bonus value of the coal resource through reductions in future mining costs that would be required as compensation to operators that had established oil and gas operations. Under this alternative, the BLM policy established for the PRB that provides for a CAZ would remain in effect.

Biological Resources

Vegetation Resources – Riparian/Wetlands (negligible adverse)
Alternative C provides for surface-disturbing activities within and near riparian and wetland habitats with adequate consideration of all resources. These management actions would not effect active coal mines but would regulate the location of exploration and non-conventional conversion operations. Project proponents can likely avoid riparian and wetland communities, but would not necessarily be required to, when planning their projects therefore the effect of these management actions would be negligible adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor adverse)
Alternative C allows surface-disturbing activities near important wildlife sites (WGFD WHMA, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites) when all resources are adequately considered. Greater Sage-Grouse leks are present within both high coal development potential areas and bald eagle nest and roost sites are present within the Sheridan County high coal development potential area. The presence of sensitive wildlife habitats is unlikely to effect coal mine siting. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents may not be able to avoid all wildlife protection areas when planning their projects but wildlife can be considered and mitigated in project designs, and no projects would likely be prohibited, so that the effect of these management actions on coal activities would be minor adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative C allows surface-disturbing activities near historic sites that retain their historic setting. Coal mine siting would not be effected by this management action. Exploration and non-conventional coal conversion operations would be mitigated on a project specific basis.

Cultural sites can typically be avoided or mitigated so that the effect on coal operations would be negligible.

Visual Resources (negligible adverse)
The Sheridan County high coal development potential areas contains VRM Classes III, and IV; the Campbell County high coal development potential area is entirely VRM Class IV. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Class IV. Coal exploration and development activities particularly within VRM Class III would be affected as projects would be required to include design features to comply with the VRM objectives. This could include limiting the size and placement of pits and infrastructure. The level of impact would be negligible as there is no VRM Class III in the Campbell County high coal development potential area. Although VRM Class III makes up approximately one-fourth of the Sheridan County high coal development potential area, activities can be seen but they should not dominate the view. Rough topography can also be used to screen coal activities. It is anticipated that all proposals could be modified to meet VRM objectives.

Land Resources

Lands and Realty (major adverse)
Alternative C would seek to dispose of all lands identified for disposal, realty actions would also seek to dispose of the mineral estate. Additional federal acreage, surface or mineral, would not be acquired. Disposing of federal coal without the acquisition of additional federal coal lands would have a major adverse effect on the coal program.

Recreation (negligible adverse)
Welch Ranch in northern Sheridan County is the only SRMA completely within a high coal development potential area. Burnt Hollow is adjacent to, and Weston Hills lies in close proximity to, the Campbell County high coal development potential area. Mineral activities would be managed within, and adjacent to, SRMAs in consideration of other resource values. Such management would be unlikely to prohibit any coal activities. Because a coal proposal is unlikely at Welch Ranch, the effect of recreation management on coal activities would be negligible adverse.

Special Designations

Areas of Critical Environmental Concern (no effect)
The Welch Ranch ACEC evaluation area is within the northern Sheridan County high coal development potential area and the Burnt Hollow ACEC evaluation area is adjacent to the Campbell County high coal development potential area. No ACECs would be designated under Alternative C therefore ACEC management would not effect the coal resource.

4.2.2.6. Alternative D

Leasable Minerals – Coal (major beneficial)
Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

This alternative would allow for coal exploration on all federal coal lands, subject to license stipulations necessary to protect other resource values. Coal exploration involves the use of truck-mounted drill rigs and support vehicles to drill shallow core holes. Historically, exploration has been active, averaging six licenses open (active) at any time, with three new licenses approved annually. This trend is expected to continue during the planning period. Restrictions on coal exploration are consistent with resource protection requirements for other short-term surface-disturbing activities. It is estimated that 65 exploration licenses would be issued during the planning period. The average license is assumed to authorize 20 exploration locations (wells), each disturbing 0.5 acre, and each reclaimed within 1 year of drilling. Sixty licenses are expected in the two areas with high coal development potential, with 600 acres disturbed and reclaimed during the planning period.

New exploration on unleased lands outside the high-potential areas is possible, but unlikely, during the planning period. It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons would increase during the planning period. Therefore, 5 exploration licenses during the planning period would be on coal lands outside the areas of high coal development potential. These licenses would likely cover a larger area, due to the relative scarcity of coal data outside the high-potential areas, with 100 acres disturbed and reclaimed during the planning period.

Leasing in the two high-potential areas is expected to continue. Leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study. From 2020 to 2030, the rate of production increase is conservatively forecast at one percent per year, approximately half the rate of the present electric power demand forecast. The reduced rate of coal demand is predicated on an increased emphasis on non-fossil fuels and a corresponding reduction of coal participation as a generation fuel, and conservation of electricity as a result of electricity costs.

Under Alternative D, it is estimated that 28 new leases would be issued to existing operators during the planning period. It is assumed that initiation of surface-disturbing activities would lag coal lease issuance by five years to allow for Wyoming DEQ and OSM permitting timeframes. Surface disturbance estimates assume roughly contemporaneous reclamation at existing mines, with reclamation assumptions accounting for long-term mine facilities, and a ten percent increase in mine disturbance footprints to account for larger laybacks as coal depth increases.

Table 4.33, "Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives" (p. 691) lists estimates of disturbance and reclamation during the planning period. Under this alternative, by 2030 it is expected that mining in the two high-potential areas would have disturbed a total of 195,700 acres. These 195,700 acres comprise 120,700 acres that have been reclaimed, 45,500 acres in active mining areas and not yet recontoured or reseeded, and 75,000 acres occupied by facilities, stockpiles, ponds, haul roads, and other long-term structures.

There is developing interest in leasing coal lands for *in situ* coal gasification. This is a process that consumes coal in place underground and converts that coal by a physical process to hydrocarbons that can be recovered using wellbores. This process has not been implemented commercially in the PRB; however, it has been implemented internationally. To have a project of this type on federal coal lands, a coal lease would be required.

It is assumed that coal demand for non-conventional conversion to liquid or gas hydrocarbons will increase during the planning period. Three new mine operations recovering coal for non-conventional conversion are estimated during the planning period. Therefore, under this

alternative, it is estimated that during planning period, three leases would be issued to operators developing coal outside the areas of high coal development potential. These leases would provide reserves for non-conventional coal conversion processes, resulting in a net disturbance of 9,000 acres. Estimates for assumed new mining operations assume surface disturbance for mine startup and minimal reclamation of mining disturbance during the planning period.

If a coal leasing action was proposed outside the established areas with high coal development potential, these areas would be screened, probably as part of a site-specific EA or EIS. Based on screening, only coal lands found acceptable for further consideration for leasing would be considered for potential lease. Decisions outside the high coal development potential areas would likely require an RMP amendment.

At present, there is no management or specific policy guidance for managing methane farming. Under Alternative D, the BLM would implement an authorization requirement when federal coal lands are requested for methane farming. This coal use authorization would likely not be an exclusive use of the coal resource, but would allow for concurrent coal leasing with a condition in the authorization that would provide a mechanism for methane farming cessation when necessary for coal mining operations. The authorization also would provide public compensation for the reduction in coal value resulting from methane farming, especially on those lands where the coal and oil and gas mineral estate have been severed.

Physical Resources

Soil and Water Resources (minor adverse)
Alternative D provides for surface-disturbing activities on sensitive soils and near water resources when these resources are adequately protected. These management actions would likely not effect coal mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can avoid or mitigate sensitive soils and water resources when planning their projects therefore the effect of these management actions would be minor adverse.

Mineral Resources

Leasable Minerals – Fluids (major beneficial)
Under Alternative D, during the planning period, new fluid mineral leases in areas identified as highly likely to be considered for LBAs would stipulate that oil and gas operations defer to coal development. The stipulation would serve to regulate fluid mineral operations that would interfere with potential coal mining. Lease stipulations in oil and gas leases in effect on leased, permitted coal lands would have a major beneficial effect on coal development. Oil and gas operations that interfere with permitted mining would not adversely affect coal production as a result of these lease stipulations. This provides a further beneficial effect on the coal resource by increasing the bonus value of the coal resource through reductions in future mining costs that would be required as compensation to operators that had established oil and gas operations. Under this alternative, the BLM policy established for the PRB that provides for a CAZ would remain in effect.

Biological Resources

Vegetation Resources – Riparian/Wetlands (minor adverse)
Alternative D provides for surface-disturbing activities near riparian and wetland areas when these resources are adequately protected. These management actions would likely not effect coal

mine siting but would regulate the location of exploration and non-conventional conversion operations. Project proponents can avoid or mitigate riparian and wetland communities when planning their projects therefore the effect of these management actions would be minor adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate adverse)
Alternative C allows surface-disturbing activities near important wildlife sites (WGFD WHMA, grouse breeding sites, raptor nests, bald eagle nest and communal roost sites) and within sensitive habitats (big-game crucial winter range and calving areas, raptor nests, grouse nesting habitat, bald eagle nest and communal roost sites) when the wildlife resources are adequately protected. A portion of one Greater Sage-Grouse Core Population Area is within the Campbell County high coal development potential area and bald eagle nest and roost sites are present within the Sheridan County high coal development potential area. The presence of sensitive wildlife habitats is unlikely to effect coal mine siting as the high coal development potential areas have already been screened accounting for these wildlife resources. These management actions would regulate the location of exploration and non-conventional conversion operations. Project proponents may not be able to avoid all wildlife protection areas when planning their projects therefore the effect of these management actions would be moderate adverse.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Alternative D allows surface-disturbing activities within three miles of identified historic sites that retain their historic setting with adequate mitigation. Coal mine siting would likely not be effected by this management action. Exploration and non-conventional coal conversion operations would be mitigated and potentially prohibited for the protection of historic sites. Because few coal proposals are likely to be prohibited, most can be adequately mitigated, the effect on coal operations would be minor adverse.

Visual Resources (minor adverse)
The Sheridan County high coal development potential areas contains VRM Classes II, III, and IV; the Campbell County high coal development potential area is largely comprised of VRM class IV with some VRM Class III. The objective of VRM Class II is to retain the existing character of the landscape, management activities may be seen but should not attract attention. VRM Class III provides for moderate landscape change, activities may attract attention but should not dominate the view. Management activities may dominate the view in VRM Class IV. Coal exploration and development activities particularly within VRM Classes II and III would be affected as projects would be required to include design features to comply with the appropriate VRM objectives. This could include limiting the size and placement of mine pits and infrastructure. The level of impact would be minor as there is no VRM Class II in the Campbell County high coal development potential area. Although VRM Class II makes up approximately one-third of the Sheridan County high coal development potential area little development is forecasted and the rough topography could be used to screen coal activities.

Land Resources

Lands and Realty (moderate beneficial)
Alternative D would pursue land acquisitions and disposals for the public benefit. There are parcels identified for disposal within both high coal development potential areas and parcels identified for acquisition in the Campbell County high coal development potential area. Realty

actions would seek to include the mineral estate in order to simplify management, prevent the creation of split estate. An active program to consolidate federal estate and dispose of small difficult to manage parcels would be a moderate benefit to the coal program.

Recreation (negligible adverse)
Welch Ranch in northern Sheridan County is the only SRMA completely within a high coal development potential area. Three SRMAs lie partially within (Cabin Canyon), adjacent to (Burnt Hollow), or in close proximity to (Weston Hills) the Campbell County high coal development potential area. Mineral leasing and exploration activities would be prohibited within, but not adjacent to, Burnt Hollow and Welch Ranch. Mineral leasing and activities would be allowed but managed to protect the recreation resources at Cabin Canyon and Weston Hills. The effect of the prohibition would be negligible as mineral activities would not be regulated outside of the SRMAs, Cabin Canyon would be available for coal leasing, and coal activities are unlikely to be proposed at Welch Ranch.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
The Welch Ranch ACEC lies within the northern Sheridan County high coal development potential area. Burnt Hollow adjacent to the Campbell County high coal development potential area would not be designated. Mineral activities would managed under ACEC specific management plans which could include a prohibition on mineral exploration and development. Coal activity is not likely at the Welch Ranch therefore the prohibition effect would be negligible.

4.2.2.7. Cumulative Impacts

During the planning period, under any of the alternatives, it is expected that approximately 9 to 12 billion tons of coal will be produced by existing mines. This production will be in response to a national demand and a national preference for PRB coal due to lower mining costs, more environmentally compliant use, and demonstrated successful reclamation. The BLM preliminary work on the 2030 forecast for the PRB Coal Review indicates a slower rate of increase in PRB coal demand than occurred from 1990 through 2010, primarily due to new natural gas discoveries, a greater national priority on nuclear and renewable-energy generation, and potential effects on coal-fired electric generation as a result of possible regulation of greenhouse gases. A more realistic annual growth rate in PRB coal production through 2030 is between 0.25% and two percent. This forecast is consistent with the Energy Information Administration's 2010 Energy Outlook Report (Energy Information Administration 2010). Therefore, by 2030, the BLM would expect PRB coal production to be between 500 and 700 million tons annually.

Coal produced is expected to be used almost entirely as steam coal for electric generation and other industrial applications. This coal will be used across the entire United States and internationally as demand and prices dictate.

Table 4.33, "Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives" (p. 691) lists cumulative disturbance and reclamation as a result of continuing production at existing mines under all alternatives. Approximately five percent of this cumulative disturbance and reclamation is estimated to occur on non-federal coal lands. Because the fee and state lands are scattered, it is not likely that these lands would be disturbed if the federal coal lands are not leased and permitted.

Table 4.33. Cumulative Disturbance and Reclamation from Coal Mining at Existing Mines under All Alternatives

Year	Total Cumulative Disturbance	=	Total Cumulative Reclamation	+	Area Available to Reclaim[1]	+	Area Unavailable to Reclaim[2]
2010	102,500		46,800		30,000		25,700
2020	148,800		86,200		34,400		28,200
2030	195,700		120,700		45,500		75,000

Source: ENSR 2005b

[1]Includes active mining area
[2]Includes facilities, stockpiles, ponds, haul roads, etc.

A small amount of acreage would be disturbed by exploration activity each year under all alternatives (600 acres), with slightly more exploration (100 acres) allowed under Alternative D in response to expected interest in *in situ* gasification of deeper PRB coals. All exploration disturbances would be reclaimed immediately following exploration. Because the United States retained most of coal lands in the PRB, an insignificant amount (up to 100 acres) of exploration could occur off of federal coal lands.

Coal leasing in advance of existing mining is expected under all alternatives. The BLM will manage the pace of leasing to ensure a fair return to the public, through bonus bids, for those coal reserves leased. The BLM paces individual lease offerings to coincide with leased reserve depletion. This avoids potential private speculation in federal coal reserves, while providing existing coal mines with adequate reserves to compete for coal sales. If a lease application is received for areas outside of those areas currently acceptable for further coal leasing consideration, a RMP amendment will be prepared.

Under Alternative D, the BLM expects that interest in *in situ* coal gasification would result in coal leasing in the deeper PRB coals. It is estimated that approximately three leases could result from this interest, and that during the planning period, approximately 9,000 acres could be disturbed. The 9,000 acres of disturbance is projected to occur on federal coal lands, although depending on areas of interest, some of the 9,000 acres could be on state or private coal lands.

Under Alternative D, the BLM expects to manage methane farming on federal coal lands. The activity will occur on lands already disturbed for conventional CBNG recovery. Methane farming, while it would not cause new disturbance, would result in a delay in reclaiming these disturbed lands.

4.2.2.8. Conclusion

Federal coal resources will be managed under all alternatives consistent with the specific coal planning criteria as required at 43 CFR 3420.1 and 43 CFR 3460. These requirements include identifying federal coal lands as unsuitable for coal leasing that fall under any of the coal unsuitability criteria, managing multiple use conflicts, and not leasing federal coal lands where there is a qualified surface owner that denies consent to lease.

All alternatives provide for replacing reserves depleted by existing mines. Leasing would be for production maintenance. Production at existing mines is in response to demand, and leasing would be in response to production. All exploration activities under any alternative are subject to development restrictions in place under that alternative.

Alternative B would restrict coal exploration and development to the two designated high-potential areas, potentially restricting *in situ* gasification, underground mining, and long-term future surface coal mining. This i would remove an extensive portion of the national coal resource from non-conventional conversion. However, the commercial feasibility of this technology is uncertain. All other alternatives would allow coal exploration throughout the planning area, with leasing subject to a land use plan amendment during which all of the coal planning requirements would be applied.

Methane farming is seen to be a beneficial use of federal coal resources when properly managed. Methane farming would provide for a possible use of coals at depths where coal mining is cost prohibitive. However, many unanswered operational and legal questions persist. Pilot projects to test this process will be considered on a case-by-case basis; however, the operational and legal questions must be answered before methane farming projects can proceed to commercial development in the BFO area.

Table 4.34, "Summary of Impacts to Coal Resource Development " (p. 692) summarizes effects to the coal resource.

Table 4.34. Summary of Impacts to Coal Resource Development

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Soil	Minor adverse	Moderate adverse	Negligible adverse	Minor adverse
Water Resources	Minor adverse	Moderate adverse	Negligible adverse	Minor adverse
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	Major beneficial	Major adverse	Major beneficial	Major beneficial
Leasable Minerals – Fluids	Minor beneficial	Major adverse	Major beneficial	Major beneficial
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	Minor adverse	Moderate adverse	Negligible adverse	Minor adverse
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Fish and Wildlife Resources – Wildlife	Moderate adverse	Major adverse	Minor adverse	Moderate adverse
Special Status Species – Plants	No effect	No effect	No effect	No effect
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	Moderate adverse	Major adverse	Minor adverse	Moderate adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Major adverse	Negligible adverse	Minor adverse
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Minor adverse	Minor adverse	Negligible adverse	Minor adverse
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	No effect	Major beneficial	Major adverse	Moderate beneficial
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	No effect	No effect	No effect	No effect
Recreation	Negligible adverse	Minor adverse	Negligible adverse	Negligible adverse
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible adverse	No effect	Negligible adverse
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.2.3. Leasable Minerals – Fluids

Management actions to protect other resource values could directly and indirectly impact new oil and gas leases, exploration, and development. A direct impact is one that specifically prohibits or allows oil and gas leasing, exploration, or development. An example of a direct impact is the decision to identify areas as administratively unavailable for new oil and gas leasing. Management actions that do not explicitly allow or prohibit oil and gas exploration and development activity, but could influence a company's decision whether to proceed with a given project, are considered an indirect impact on oil and gas leasing, exploration, or development. Indirect impacts are the result of management actions that place restrictions on oil and gas exploration and development.

An example of an indirect impact is a CSU stipulation restricting certain activities to protect a wildlife habitat area. Short-term impacts have a duration of fewer than five years. For example, a Timing Limitation Stipulation (TLS) or other seasonal restriction could result in short-term impacts. Long-term impacts have a duration of at least five years and perhaps for the duration of the planning period. Decisions to identify areas as administratively unavailable for oil and gas leasing result in long-term impacts when the decision covers more than five years. Refer to Maps 13 through 16 for leasable fluid minerals alternatives.

4.2.3.1. Methods and Assumptions

Impacts analysis and conclusions are based on interdisciplinary team knowledge of resources and the project area, review of existing literature, and information provided by other agencies. Impacts are quantified where possible. Spatial analysis was performed using the ESRI ArcGIS computer software. In the absence of quantitative data, best professional judgment was used. Impacts are sometimes described using ranges or are described in qualitative terms, if appropriate. Reductions in the number of well locations (and potential surface disturbance) from the baseline RFD scenario for each alternative are a result of proposed management actions, mitigation measures, and BMPs presented in Chapter 2 and various appendices. Those measures can affect oil and gas development activities by not allowing leasing, restricting surface occupancy, controlling surface use, or adding restrictive mitigation to Conditions of Approval (COAs) on federal Applications for Permit to Drill (APDs). After the acres of federal oil and gas resources were calculated for each classification by alternative, the percent reduction in well numbers for each classification by alternative was estimated. This estimate is a percentage of the well numbers and surface disturbance that may not occur under each alternative. The impacts of the various restrictions are shown using the change in oil and gas production that results from all management actions.

The number of wells projected to be drilled under each alternative is used to estimate potential effects on other resources. These well numbers provide an easy, but incomplete, basis for estimating effects because multiple wells can be drilled from the same surface location. Well locations (as opposed to well numbers) are an indicator of human presence or disruptive activities and related impacts. The other major component of the fluid minerals RFD scenario is surface disturbance related to the construction of exploration and development wells and associated infrastructure. Surface disturbance associated with oil and gas development activity is the primary indicator of effects on other resources. Surface disturbance varies by type of well (conventional versus CBNG) because well pad size can vary and multiple wells can be drilled from one surface location. The estimate of surface disturbance by alternative is included in the BFO final RFD report; these estimates are included in Appendix G (p. 1671). Many variables may increase or decrease the level of drilling activity and associated surface disturbance acreage during the planning period. If the projections in the RFD prove to be inaccurate, the BLM will evaluate the RMP when the well numbers or surface disturbances in the RFD are approached to determine if a plan amendment or revision is warranted. Every subsequent action must be consistent with the RMP, and that consistency is checked in every NEPA document the BLM completes.

In addition to the number of oil and gas wells and the surface disturbance estimated for each alternative, the locations of the oil and gas activity are important to the analysis of effects on other resources. Most of the oil and gas exploration and development is projected to occur in areas currently experiencing oil and gas development, based on high and moderate oil and gas potential. Current oil and gas field development project areas and current oil and gas well locations are depicted on Map 17, along with the high and moderate oil and gas potential areas.

Map 17 identifies the areas in the Buffalo planning area most likely to experience future oil and gas development activity.

Oil and gas leasing, exploration, and development can occur throughout the entire Buffalo planning area, except where it is restricted.

The RFD and RFA tables can be found in Appendix G (p. 1671).

Assumptions

- The analysis began with the baseline total unconstrained oil and gas development potential taken from the RFD scenario for oil and gas (Stilwell et al. 2012) as summarized in Chapter 3, and applied the constraints from the other resource programs in Chapter 2. Constraints under each resource may affect oil and gas development.
- Most of the planning area has a high potential for the occurrence of oil and gas (Stilwell et al. 2012).
- There will be low or no potential interest in developing geothermal resources during the planning period.
- The RFD was updated in 2012 to reflect the increased interest in horizontal drilling.
- The CBNG potential is 51.8% federal fluid minerals.
- The conventional potential is 51.5% federal fluid minerals.
- Constraints greater than 160 acres are not reachable by CBNG technologies.
- Constraints greater than 1,300 acres are not reachable by conventional technologies.

The following terms are used to define the extent of environmental consequences:

- Negligible – The impact on the resource is barely detectable; less than 1% of the resource is affected. This level of impact is not considered to be significant to the fluid mineral resource.
- Minor – The impact on the resource is slight but detectable; there is a small change in the resource. This includes impacts on 1% to 5% of the resource. This level of impact is not considered to be significant to the fluid mineral resource.
- Moderate – The impact on the resource is readily apparent; there is a measurable change in the resource. This includes impacts to between 5 and 10% of the resource.
- Major – The impact on the resource is great; there is a highly noticeable, long-term, or permanent measurable change in the resource. This includes impacts on more than 10% of the resource.
- In this section impact is used instead of effect for describing what may happen to the fluid mineral resource. The reason for this is that impact describes an action that has an adverse effect on the fluid minerals resource. The impact can be described as anything that would cause the fluid minerals resource to not be developed or would add time and cost to the project.

Significance Criteria

Impacts on leasable fluid minerals are considered significant if management actions affects 250 or more CBNG wells and 50 or more conventional wells.

4.2.3.2. Impacts Common to All Alternatives

Leasable Minerals – Fluids (minor adverse)
Geothermal leasing and geophysical exploration would be allowed in the same areas as oil and

gas leasing under all alternatives; this action would treat all fluid mineral activities equally. The deferral of fluid mineral leasing in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as the fluid mineral resources would still be present but their availability would be delayed until the coal operation is completed. The remaining management actions common to all alternatives are incorporated into policy or Oil and Gas Onshore Order #1.

Physical Resources

Air Quality (no effect)
The air quality management actions common to all alternatives have no impact on the fluid minerals resource.

Soil (no effect)
Authorized surface-disturbing activities will include plans for reclamation; site-specific reclamation actions should reflect the complexity of the project, environmental concerns, and the reclamation potential of the site. This management action is already a requirement of Oil and Gas Onshore Order #1. Therefore, it has no additional impact to the fluid minerals resource.

Water Resources (no effect)
The water management actions common to all alternatives have no impact on the fluid minerals resource.

Cave and Karst Resources (no effect)
The cave and karst management actions common to all alternatives have no impact on the fluid minerals resource.

Mineral (other than Fluid Mineral) Resources (negligible adverse)

Under all alternatives, the development of other mineral resources may have a negligible impact on fluid mineral resources. In these situations, conflicts between fluid minerals development and other minerals development would generally be addressed on a case-by-case basis. Regulations preclude the waste of any public resource, and in most situations compromises are reached that affirm the ability of minerals developers to produce the mineral resources.

Fire and Fuels Management (no effect)

Fire and fuels management prioritizes fire suppression in areas with high resource values and high values to humans, including oil and gas development areas and infrastructure. Wildland fires generally have little impact on the development and production of oil and gas resources, but they can be devastating when they occur. Health and safety impacts for oil and gas personnel can be significant. Fuel treatments designed to reduce fuels and meet other multiple-use resource objectives may benefit oil and gas production by reducing the sizes and intensities of wildland fires, thereby reducing the threat of loss of oil and gas facilities to wildland fire. The individual alternatives have no impact on the federal minerals resource and are therefore not discussed further in the fluid minerals section.

Biological Resources

Vegetation – Forest and Woodlands (no effect)
There are no impacts common to all alternatives for forest and woodlands management actions. There are no impacts to the oil and gas resource from forest and woodlands and are therefore not discussed further in the fluid minerals section.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Grassland and shrubland communities management may influence the location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. These are the only impacts to the oil and gas resource from grassland and shrubland communities and are therefore not discussed further in the fluid minerals section.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Riparian/Wetland resources management actions common to all alternatives may influence the location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Invasive Species and Pest Management (no effect)
There are no impacts common to all alternatives for invasive species and pest management actions. There are no impacts to the oil and gas resource from invasive species and pest management and are therefore not discussed further in the fluid minerals section.

Fish and Wildlife Resources – Fish (negligible adverse)
Fish resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Fish and Wildlife Resources – Wildlife (negligible adverse)
Wildlife resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Special Status Species – Plants (negligible adverse)
Special status species plants resource management actions common to all alternatives may influence the location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Special Status Species – Fish (negligible adverse)
Special status species fish resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Special Status Species – Wildlife (minor adverse)
Special status species wildlife resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Upland game birds management actions common to all alternatives may influence the timing, location and size of oil and gas facilities, but would not preclude the development or completion of oil and gas activities. However, the management actions for each alternative have a varying degree of impact and are discussed in depth in their respective sections.

Raptors resource management actions common to all alternatives may influence the timing, location and size of oil and gas facilities. Surface disturbance is prohibited within 0.5 mile for known active bald eagle nests, and would have a negligible impact because this affects 7,710 acres or 0.22% of the fluid mineral resource. This impact may affect 32 CBNG wells and may preclude them from being drilled. In some cases the surface disturbance prohibition and the addition of the 1 mile CSU from February 1 to August 15 could lead to the fluid minerals resource not being developed.

Heritage Resources

Cultural Resources (no effect)
The cultural resources management actions common to all alternatives have no impact on the fluid minerals resource.

Paleontological Resource (no effect)
The paleontological resources management actions common to all alternatives have no impact on the fluid minerals resource.

Visual Resources (moderate adverse)
Visual resources manage WSAs under VRM Class I objectives. Any facilities or structures proposed in WSAs will be designed so as not to impair wilderness suitability. As fluid mineral development would be largely precluded within a WSA, there would be no effect from VRM Class I management. Elsewhere, visual resources management would require non-temporary facilities and structures to be screened, painted, and designed to blend with the surrounding landscape except where safety indicates otherwise. These management actions may influence the timing, location, size, and coloration of oil and gas facilities, but rarely preclude the development or completion of oil and gas activities. Visual resources management may have a minor to moderate impact on the fluid minerals resource depending on the location and intensity of the oil and gas activity.

Land Resources

Forest Products (no effect)
There are no impacts to the fluid minerals resource from common to all alternatives for forest products management actions. There are no impacts from each alternative to the fluid minerals resource from forest products management and are therefore not discussed further in fluid minerals section.

Lands and Realty (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for lands and realty management actions. There are no impacts from each alternative to the fluid minerals resource from lands and realty management and are therefore not discussed further in fluid minerals section.

Renewable Energy (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for renewable energy management actions. There are no impacts from each alternative to the fluid minerals resource from renewable energy management and are therefore not discussed further in the fluid minerals section.

Rights-of-Way and Corridors (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for ROW and corridor management actions. There are no impacts from each alternative to the fluid minerals resource from ROW and corridor management and are therefore not discussed further in fluid minerals section.

Travel and Transportation Management (no effect)
Travel and transportation management actions for maintenance of the public land transportation system would provide for public safety and adequate access for minerals development tasks. In most cases, developers would use the existing state, county, or BLM transportation network for initial access to potential oil and gas exploration sites, access for geophysical exploration, and similar activities. Once the BLM approves oil and gas exploration and development activities, developers may be required to improve and maintain existing BLM roads or develop new roads and remove them when they are no longer needed. There are no impacts to the fluid minerals resource common to all alternatives for travel and transportation management actions. There are no impacts from each alternative to the fluid minerals resource from transportation access management and are therefore not discussed further in fluid minerals section.

Recreation (negligible adverse)
Recreation management actions may utilize the best available technology to minimize noise and light pollution potentially affecting recreation facilities and sites, and may have a negligible impact on the fluid minerals resource. This management action would not preclude the development or completion of oil and gas activities but it could influence the size, color and equipment of oil and gas facilities.

Lands with Wilderness Characteristics (no effect)
There is no development forecasted for CBNG or conventional development within the southern Big Horn Mountains, the region of the planning area that includes the area possessing wilderness characteristics. Therefore there will be no impact on fluid minerals management and wilderness characteristics will not be discussed further in the fluid minerals section.

Livestock Grazing Management (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for livestock grazing management actions. There are no impacts from each alternative to the fluid minerals resource from livestock grazing management and are therefore not discussed further in the fluid minerals section.

Special Designations

Areas of Critical Environmental Concern (no effect)
ACEC management actions common to all alternatives will have no impact on the fluid minerals resource. However, the management actions within each alternative may have varying degrees of impact on the fluid minerals resource.

Scenic or Back Country Byways (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for scenic or national BCBs management actions. There are no impacts from each alternative to the fluid minerals resource from scenic or national BCBs management and are therefore not discussed further in the fluid minerals section.

Wild and Scenic Rivers (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for Wild and Scenic Rivers management actions. There are no impacts from each alternative to the fluid minerals resource from Wild and Scenic Rivers management and are therefore not discussed further in the fluid minerals section.

Wilderness Study Areas (minor adverse)
If Congress acts on the WSAs (Fortification Creek, Gardner Mountain, and North Fork) (Map 63), the RMP will be amended. BLM Manual 6330 – Management of Wilderness Study Areas guidelines would continue to be followed during the RMP amendment. The BLM manages WSAs for the preservation of natural conditions and processes, and to provide opportunities for solitude or a primitive and unconfined type of recreation. Under the guidance of BLM Manual 6330 – Management of Wilderness Study Areas, the BLM manages WSAs to emphasize primitive, nonmotorized activities to maintain the current natural values. These actions may have a minor impact on fluid minerals development, because the total area of the WSAs is small compared to the area of potential oil and gas development.

Socioeconomic Resources

Social and Economic Conditions (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for socioeconomics management actions. There are no impacts from each alternative to the fluid minerals resource from socioeconomics management and are therefore not discussed further in the fluid minerals section.

Health and Safety (no effect)
There are no impacts to the fluid minerals resource common to all alternatives for health and safety management actions. There are no impacts from each alternative to the fluid minerals resource from health and safety management and are therefore not discussed further in the fluid minerals section.

4.2.3.3. Alternative A

Leasable Minerals – Fluids (minor adverse)
Stipulating fluid mineral leases in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as it affects 1.3% of the fluid minerals resource which would still be present but the availability would be delayed until the coal operation is completed.

Physical Resources

Air Quality (no effect)
The air management action, modeling on a project specific basis, will have no effect on the fluid minerals resource.

Soil (major adverse)
Alternative A applies an NSO stipulation for minerals leases on slopes equal to or greater than 25%. This covers 412,145 acres and may have a major impact because it affects 12% of the fluid minerals resource and may affect 416 CBNG wells and 23 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells.

Surface-disturbing activities are restricted on soils with poor reclamation suitability. This covers 1,514,445 acres and may have a major impact because it affects 45% of the fluid minerals resource and may affect 3,598 CBNG wells and 599 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO stipulation for minerals leases in areas with severe erosion hazard covers 669,739 acres. This may have a major impact because it affects 20% of the fluid minerals resource and may affect 3,780 CBNG wells and 383 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Under Alternative A, surface-disturbing activities on badlands, rock outcrops, and slopes susceptible to mass movement are restricted on a project-specific basis. This management action has been inconsistently applied. This management approach may have a moderate impact on the fluid minerals resource, depending on how much area may be affected and how prevalent the action may be.

Overall the management actions for soil for Alternative A would have a major impact on the fluid minerals resource.

Water Resources (minor adverse)
Alternative A prohibits surface-disturbing activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams. This applies to 95,172 acres and may have a minor impact because it affects 2.8% of the fluid minerals resource and may affect 777 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Cave and Karst Resources (no effect)
The cave and karst management action will have no effect on the fluid minerals resource.

Mineral Resources

Leasable Minerals – Coal (minor adverse)
On coal leases for which mining and reclamation plans have been approved, oil and gas leases under Alternative A would stipulate that oil and gas operations not interfere with approved coal mining. There are 45,500 acres administratively unavailable for leasing due to coal mining activity. This may have a minor impact because it affects 1.3% of the fluid minerals resource.

Biological Resources

Vegetation – Riparian/Wetland Resources (minor adverse)
Alternative A prohibits surface-disturbing activities within 500 feet of springs, non-CBNG

reservoirs, water wells, and perennial streams. This applies to 144,045 acres and may have a minor impact because it affects 4.2% of the fluid minerals resource and may affect 777 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Fish (minor adverse)
Under Alternative A, mineral leasing activities near fish-bearing waters may be considered on a case-by-case basis. This management action has been inconsistently applied. This may have a minor impact on the fluid minerals resource, depending on how much area may be affected and how prevalent the action may be.

Fish and Wildlife Resources – Wildlife (major adverse)
Under Alternative A, surface disturbance and occupancy are prohibited unless waived by the authorized officer within Ed O. Taylor, Kerns, Bud Love and Amsden Creek big game winter ranges. This applies to 14,216 acres and may have a negligible impact because it affects 0.4% of the fluid minerals resource and may affect one CBNG well and one conventional well.

Alternative A prohibits surface disturbance and disruptive activities in crucial elk winter range between November 15 and April 30 and in elk calving areas from May 1 to June 30, when necessary, a total of 67,537 acres). This may have a minor impact on fluid minerals development because activities would be allowed during other periods.

Alternative A prohibits surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks at any time. This applies to 1,159 acres and may have a negligible impact because it affects less than 0.1% of the fluid minerals resource and may affect one CBNG well and one conventional well.

Alternative A prohibits surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30 unless the authorized officer waives the prohibition (35,736 acres). This may have minor impacts on fluid minerals development because the duration of the constraint is less than six months.

Alternative A prohibits surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of high federal interest unless the authorized officer waives the prohibition. This applies to 1,195,815 acres and may have a major impact because it would affect 35% of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative A precludes new surface-disturbing activities within 0.5 mile of raptor nests during critical periods from February 1 to July 31 (2,298,687 acres). This may have a major impact on fluid minerals development due to the size and duration of the timing stipulation.

Overall the management actions for Fish and Wildlife Resources – Wildlife would have a major impact on the fluid minerals resource.

Special Status Species – Plants (minor adverse)
Under Alternative A, minerals leasing in habitat for special status plant species is considered on a case-by-case basis. This management action has been inconsistently applied. This may have a minor impact on fluid minerals development, depending on how much area may be affected and how prevalent the action may be.

Special Status Species – Fish (minor adverse)
Under Alternative A, surface-disturbing activities near waters with special status fish are considered on a case-by-case basis. This management action has been inconsistently applied. This may have a minor impact on fluid minerals development, depending on how much area would be affected and how prevalent the action may be.

Special Status Species – Wildlife (major adverse)
Alternative A manages special status species wildlife on a case-by-case basis. This management action has been inconsistently applied. This management may have a minor impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Alternative A prohibits or restricts surface-disturbing activities or surface occupancy within a 0.25-mile radius of the perimeter of occupied Greater Sage-Grouse leks. This covers 22,777 acres and may have a negligible impact on fluid minerals development because it affects 0.7% of the fluid minerals resource and may affect 8 CBNG wells and 1 conventional well.

This alternative prohibits surface disturbance within Greater Sage-Grouse nesting habitat from March 1 to June 15, unless the authorized officer waives the prohibition, and affects 1,685,563 acres of the fluid minerals resource. This may have a moderate impact due to the size and duration of the timing stipulation.

Alternative A requires a 0.5-mile year-round disturbance free buffer zone for known active bald eagle nests and bald eagle winter roosts. This applies to 7,710 acres, and may have a negligible impact because it affects 0.23% of the fluid minerals resource and may affect 32 CBNG wells and 1 conventional well.

Applying a TLS within 1 mile of known active bald eagle nests and bald eagle winter roosts covers 24,171 acres and may have a negligible impact because it affects 0.5% of the fluid minerals resource.

Alternative A prohibits surface disturbance or occupancy within a biological buffer zone around active nests of special status raptor species unless waived by the authorized officer. This covers 433,635 acres, and may have a major impact because it affects 13% of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative A manages special status species amphibians, reptiles, and bats on a case-by-case basis. This management action has been inconsistently applied. This management may have a minor impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Overall the management actions for Special Status Species – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Alternative A applies NSO stipulations on mineral leases for the Crazy Woman Battle Site and potentially eligible or significant segments of the Bozeman Trail (0.25 mile or the visual horizon, whichever is closer). This applies to 27,233 acres, and may have a negligible impact

because it affects 0.6% of the fluid minerals resource, and may affect 61 CBNG wells and 20 conventional wells.

Minerals activities in areas with sensitive or sacred sites are considered on a case-by-case basis. This management action has been inconsistently applied. This management action may have a minor impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Overall the management actions for cultural resources would have a minor impact on the fluid minerals resource.

Paleontological Resources (negligible adverse)
Minerals activities in areas with paleontological sites are considered on a case-by-case basis. This management action has been inconsistently applied. This management action may have a negligible impact on oil and gas development, depending on how much area is affected and how prevalent the action may be.

Visual Resources (negligible adverse)
Visual resources are managed in accordance with objectives for VRM classes that have been assigned to the planning area. This may have a negligible impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources

Recreation (negligible adverse)
Under Alternative A, oil and gas leasing and development are not allowed in the Mosier Gulch Recreation Area and surface disturbance or occupancy is prohibited within 0.5 mile of the site unless waived by the authorized officer. This action may have a negligible impact because it affects less than 0.01% of the fluid minerals resource and may not affect oil and gas development since it is outside the RFD scenario.

Prohibiting surface disturbance or occupancy within 0.5 mile of Dry Creek Petrified Tree Environmental Education Area, unless waived by the authorized officer, may have a negligible impact because it affects less than 0.01% of the fluid minerals resource and may affect 6 CBNG wells and 1 conventional well.

Overall the management actions for Recreation would have a negligible impact on the fluid minerals resource.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are presently no ACECs within the planning area; ACEC management actions will have no impact on the fluid minerals resource.

Wilderness Study Areas (negligible adverse)
Under Alternative A wilderness study areas will continue to be unavailable for fluid mineral leasing and development. The Fortification Creek WSA has high potential for CBNG resources and as high as moderate potential for conventional resources. Gardner Mountain and North

Fork WSAs have no fluid mineral potential. WSA management may have a negligible adverse impact on oil and gas development.

4.2.3.4. Alternative B

Leasable Minerals – Fluids (minor adverse)
Suspending fluid mineral leases in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as it affects 1.3% of the fluid minerals resource which would still be present but the availability would be delayed until the coal operation is completed.

Physical Resources

Air Quality (negligible adverse)
Alternative B's requirement for air quality modeling may have a negligible impact on the fluid minerals resource as it would increase operator costs.

Soil (major adverse)
Under Alternative B, NSO stipulations for mineral leases in areas with severe erosion hazard covers 669,739 acres. This may have a major impact because it affects 20% of the fluid minerals resource and may affect 1,958 CBNG wells and 168 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO stipulation for mineral leases on slopes equal to or greater than 25% covers 412,145 acres. This may have a major impact because it affects 12% of the fluid minerals resource and may affect 280 CBNG wells and 15 conventional wells.

Applying an NSO stipulation on surface-disturbing activities on soils with poor reclamation suitability covers 1,514,445 acres. This may have a major impact because it affects 45% of the fluid minerals resource and may affect 3,598 CBNG wells and 600 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO stipulation on badlands, rock outcrops, biological crusts, and slopes susceptible to mass movement covers 685,950 acres and may have a major impact because it affects 20% of the fluid minerals resource and may affect 1,280 CBNG wells and 108 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for soil would have a major impact on the fluid minerals resource.

Water Resources (minor adverse)
Alternative B prohibits surface-disturbing activities within 500 feet of springs, reservoirs, water wells, perennial streams, and associated riparian habitat to prevent stream bank and soil erosion. The 500-foot buffer covers 95,172 acres of the soils in the planning area, which may have a minor impact because it affects 2.8% of the fluid minerals resource and may affect 778 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Prohibiting on-channel reservoirs covers 397,753 acres, and may have a negligible impact because it may not preclude oil and gas development, rather it limits one option of water disposal.

Overall the management actions for water resources would have a minor impact on the fluid minerals resource.

Cave and Karst Resources (negligible adverse)
Alternative B prohibits all surface- and subsurface-disturbing activities in cave and karst areas. This covers 212,626 acres and may have a negligible impact because the cave and karst resources do not overlap the RFD for CBNG or conventional wells, but it may affect whether or not a lease for fluid minerals is leased and what the bid for that lease might be.

Mineral Resources

Leasable Minerals – Coal (moderate beneficial)
Under Alternative B, coal leases in areas with identified high potential for coal development include a stipulation to regulate any coal operations that may interfere with ongoing fluid minerals operations. Coal tracts are delineated to defer leasing where established fluid minerals operations are determined to have an extended economic life. The impact may be moderate beneficial.

Biological Resources

Vegetation – Riparian/Wetland Resources (moderate adverse)
Alternative B applies an NSO stipulation and prohibits surface-disturbing activities for mineral leasing within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This covers 144,045 acres and may have a moderate impact because it affects 4.2% of the fluid minerals resource and may affect 1,218 CBNG wells and 233 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Fish (moderate adverse)
Alternative B applies an NSO stipulation to fluid minerals leases within 0.25 mile of naturally occurring waterbodies containing native and desirable non-native fish species. This covers 261,869 acres and may have a moderate impact because it affects 7.7% of the fluid minerals resource and may affect 1,263 CBNG wells and 308 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Wildlife (major adverse)
Under Alternative B, surface disturbance and occupancy are prohibited within Ed O. Taylor, Kerns, Bud Love and Amsden Creek winter ranges for big game. This applies to 14,216 acres and may have a negligible impact because it affects 0.4% of the fluid minerals resource and may affect one CBNG well and one conventional well.

Alternative B applies a CSU stipulation to leases in elk crucial winter range and calving areas. This may have a minor impact because the CSU is more than 40 acres.

Requiring fluid minerals production and by-products to be piped out of crucial elk winter range and calving areas may have a minor impact because it may add cost to the oil and gas project.

Prohibiting surface-disturbing and disruptive activities with 0.5 mile of big-game migration and travel corridors covers 85,462 acres. This may have a minor impact because it affects 2.5% of the fluid minerals resource and may affect 102 CBNG wells and 20 conventional wells.

Applying an NSO stipulation to mineral leases within 0.25 mile of sharp-tailed grouse leks covers 3,601 acres. This may have a negligible impact because it affects 0.05% of the fluid minerals resource and may affect 14 CBNG wells and one conventional well.

Applying a timing limitation stipulation (TLS) to minerals leases within an additional 2 miles radius of sharp-tailed grouse leks from April 1 through July 15 may have a minor impact due to the size and duration of the timing restriction.

Applying an NSO stipulation to mineral leases within a biologic buffer zone around active nests of raptor species of high federal interest covers 1,195,815 acres. This may have a major impact because it affects 35% of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying a TLS to mineral leases with 1.5 miles of active raptor nests may have a moderate impact due to the size and duration of the timing restriction.

Overall the management actions for Fish and Wildlife Resources – Wildlife would have a major impact on the fluid minerals resource.

Special Status Species – Plants (minor adverse)
Alternative B applies an NSO stipulation on mineral leases in habitat for special status plant species. This covers 243,929 acres and may have a minor impact because the plant habitat is mostly outside the area of the RFD, even though it affects five percent of the fluid minerals resource and may affect 5 CBNG wells and 5 conventional wells.

Special Status Species – Fish (negligible adverse)
Alternative B applies an NSO stipulation on mineral leases within 0.25 mile of any waters containing special status fish species. This covers 2,481 acres and may have a negligible impact on the fluid minerals resource because it affects less than 0.01% of the fluid minerals resource and is outside the area of the RFD.

Special Status Species – Wildlife (major adverse)
Alternative B locates and manages facilities to minimize noise impacts on special status species. This rarely precludes the development or completion of oil and gas activities and may have a minor impact to the fluid minerals resource.

Managing surface-disturbing and disruptive activities to minimize impacts on special status wildlife species and their habitats rarely precludes the development or completion of oil and gas activities and may have a minor impact to the fluid minerals resource.

Applying an NSO stipulation to mineral leases containing prairie dog habitat covers 47,702 acres and may have a minor impact because it affects 1.4% of the fluid minerals resource and may affect 142 CBNG wells and 16 conventional wells.

Alternative B leases minerals in Greater Sage-Grouse habitat dependent upon Greater Sage-Grouse habitat suitability, population density, and development density. Leasing is administratively unavailable in within 4.0 miles of Greater Sage-Grouse leks and winter

concentration areas and covers 2,248,685 acres. This may have a major impact because it affects 66% of the fluid minerals resource and may eliminate 4,468 CBNG wells and 1,294 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying an NSO prohibiting surface disturbing activities, disruptive activities, and occupancy within 4 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks covers 2,248,685 acres. This may have a major impact because it affects 66% of the fluid minerals resource and may affect 4,468 CBNG wells and 1,294 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying a TLS prohibiting surface disturbance and disruptive activities within nesting and early brood-rearing habitat greater than 4 miles of an occupied or undetermined Greater Sage-Grouse lek, from March 1 to July 15, may have a major impact due to the size and duration of the timing stipulation.

Applying a TLS prohibiting surface disturbance and disruptive activities, from November 15 to March 14, for Greater Sage-Grouse winter concentration areas may have a major impact due to the size and duration of the timing stipulation.

Applying a CSU that allows no more than one disturbance and three percent total surface disturbance per 640 acres within the Disturbance Density Calculation Tool (DDCT) analysis area covers 3,117,708 acres or 92% of the fluid minerals resource. This may have a major impact on CBNG because the restrictions effectively eliminate CBNG development since CBNG is developed on 80 acre spacing and is shallow enough geologically that directional drilling techniques may not allow full development of this resource. This same CSU may also have a major impact on conventional development because of the size of the pads and access roads along with the existing disturbance that would exceed the 3% disturbance cap which may severely restrict conventional development on federal minerals.

Alternative B applies an NSO stipulation to mineral leases within 0.5 mile of the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. This covers 54,439 acres and may have a minor impact because it affects 1.6% of the fluid minerals resource and may affect 536 CBNG wells and 69 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. This buffer may be adjusted to 1.0 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors, which covers 147,321 acres. This may have a minor impact because it affects 4.3% of the fluid minerals resource and may affect 1,447 CBNG wells and 186 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Prohibiting surface-disturbing and disruptive activities within 1.5 miles of a special status species raptor nest may be a major impact because of the size and duration of the management action.

Applying an NSO stipulation to mineral leases within a biologic buffer zone around active nests of special status raptor species covers 433,635 acres. This may have a major impact because it affects 13% of the fluid minerals resource and may affect 1,580 CBNG wells and 687

conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative B prohibits surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats in the following areas: identified 100-year floodplains, areas within 1,640 feet (500 meters) of perennial waters, springs, playas, wells, and wetlands, areas within 100 feet of ephemeral channels, and areas within 1,640 feet (500 meters) of south-facing rock outcrops. This covers 1,217,959 acres and may have a major impact because it affects 36% of the fluid minerals resource and may affect 3,956 CBNG wells and 1,265 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for Special Status Species – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources (major adverse)
Alternative B recommends withdrawals from minerals leasing and closes fluid minerals leasing in areas with historic properties that retain their historic settings. This covers 759,449 acres and may have a major impact because it affects 22% of the federal mineral estate and may eliminate 1,440 CBNG wells and 519 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Prohibiting surface disturbance in areas containing historic properties, within 5 miles or the visual horizon (whichever is closer) of historic properties that retain their integrity of setting covers 1,854,954 acres and may have a major impact because it affects 55% of the fluid minerals resource and may affect 2,246 CBNG wells and 888 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Recommending withdrawals and closing mineral leasing in areas with sensitive sites such as TCPs and sacred sites to protect their settings covers 4,642 acres. This may have a negligible impact because it affects only 0.14% of the federal mineral estate and may affect 30 CBNG wells and 4 conventional wells.

Overall the management actions for cultural resources would have a major impact on the fluid minerals resource.

Paleontological Resources (negligible adverse)
Alternative B closes mineral leasing in areas containing paleontological resources of high importance and affects 860 acres. This may have a negligible impact because it would affect 0.02% of the fluid minerals resource and may eliminate six CBNG wells and one conventional well.

Visual Resources (minor adverse)
Visual resources manages all Visual Resource Inventory (VRI) Class II areas and special emphasis areas as VRM Class II. All VRI Class III areas outside special emphasis areas are managed as VRM Class III. This may have a minor impact on the fluid minerals resource as it influences the

timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources

Recreation (minor adverse)
Under Alternative B, closing areas to leasing and prohibiting surface disturbance in SRMAs and within a 0.5-mile buffer around SRMAs covers 55,529 acres. This may have a minor impact because it affects 1.6% of the fluid minerals resource and may eliminate 17 CBNG wells and 11 conventional wells.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Closures to mineral leasing in the Cantonment Reno, Burnt Hollow, Dry Creek Petrified Tree, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch ACECs covers 536,304 acres. This may have a minor impact because it affects 1.9% of the fluid minerals resource and may eliminate 193 CBNG wells and 29 conventional wells.

Wilderness Study Areas (negligible adverse)
Alternative B prohibits all motorized and mechanized equipment in WSAs. The Fortification Creek WSA has high potential for CBNG resources and low to moderate potential for conventional resources. Gardner Mountain and North Fork WSAs have no fluid mineral potential. This covers 28,931 acres, and may have a negligible impact because it affects 0.6% of the fluid minerals resource.

4.2.3.5. Alternative C

Leasable Minerals – Fluids (minor beneficial)
Stipulating coal leases in areas with leased fluids would benefit the fluid mineral resources, as the fluid mineral development would take preference over the coal lease on 1.3% of the fluid minerals resource.

Physical Resources

Air Quality (no effect)
Air quality monitoring is not required, the air management action will have no effect on the fluid minerals resource.

Soil (no effect)
The soils management actions will have no effect on the fluid minerals resource.

Water Resources (no effect)
The water management action will have no effect on the fluid minerals resource.

Cave and Karst Resources (negligible adverse)
Under Alternative C, cave and karst management actions may have a negligible impact on the fluid minerals resource. A CSU stipulation in cave and karst areas covers 11 acres and affects less than 0.01% of the fluid minerals resource and may not affect any wells.

Mineral Resources

Leasable Minerals – Coal (minor adverse)
Under Alternative C, fluid mineral leases in areas with identified high potential for coal development are stipulated to regulate any fluid mineral operations that may interfere with potential coal mining. This may have a minor impact on the fluid minerals resource. Since oil and gas leasing would still be possible in these areas, the acreage is irrelevant and any additional constraint on the lease may be a minor impact.

Biological Resources

Vegetation – Riparian/Wetland Resources (no effect)
The riparian and wetland communities management action will have no effect on the fluid minerals resource.

Fish and Wildlife Resources – Fish (no effect)
The fish management actions will have no effect on the fluid minerals resource.

Fish and Wildlife Resources – Wildlife (moderate adverse)
The big game and upland game birds management actions will have no effect on the fluid minerals resource.

Under Alternative C, a TLS is applied within 0.5 mile of active raptor nest. This affects 757,733 acres and may have a moderate impact due to the size of the timing stipulation.

Special Status Species – Plants (no effect)
Alternative C applies an NSO stipulation to mineral leases in areas with known populations of special status plant species. This may have no effect on the fluid minerals resource since there are no special status plant species that currently overlay the RFD.

Special Status Species – Fish (negligible adverse)
Alternative C applies an NSO stipulation within 500 feet of any waters containing special status fish species. This covers 821 acres, and may have a negligible impact because it affects 0.02% of the fluid minerals resource and may affect 11 CBNG wells and 1 conventional well.

Special Status Species – Wildlife (major adverse)
Alternative C manages as follows within occupied Greater Sage-Grouse habitat:

- CSU prohibiting surface-disturbing and disruptive activities and occupancy within 0.25 mile of the perimeter of occupied or undetermined Greater Sage-Grouse leks. This affects 22,777 acres and may have a negligible impact because it affects 0.7% of the fluid minerals resource and may affect 7 CBNG wells and one conventional well.
- Prohibit surface-disturbing and disruptive activities in all areas within 2 miles of occupied leks from March 1 to July 15. This may have a moderate impact due to the size and duration of the timing stipulation.
- Prohibit surface-disturbing and disruptive activities and occupancy within Greater Sage-Grouse winter concentration areas from November 15 to March 14. This may have a moderate impact due to the size and duration of the timing stipulation.

Alternative C requires a 0.5 mile year round disturbance free buffer zone for known bald eagle winter roosts. This applies to 7,710 acres, and may have a negligible impact because it affects 0.22% of the fluid minerals resource and may affect 32 CBNG wells and 1 conventional well.

Applying a TLS within 1 mile of known bald eagle winter roosts covers 24,171 acres and may have a negligible impact because it affects 0.5% of the fluid minerals resource.

Applying a TLS within 0.25 mile of a special status raptor nest affects 75,276 acres. This may have a minor impact due to the size and duration of the timing stipulation.

Applying a CSU stipulation to mineral leases within a biologic buffer around active nests of special status raptor species year-round covers 433,635 acres. This may have a major impact because it affects 13% of the fluid minerals resource and may affect 1580 CBNG wells and 687 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative C special status amphibians, reptiles, and bats species management actions will have no effect on the fluid minerals resource.

Overall the management actions for Special Status Species – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources (major adverse)
Alternative C allows mineral leasing in areas containing historic properties that retain their historic setting, when appropriate mitigation is accomplished. Mitigate through appropriate stipulations such as NSO or CSU to protect the setting. This covers 759,449 acres and may have a major impact because it affects 22% of the fluid minerals resource and may affect 1,440 CBNG wells and 519 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative C allows mineral leasing in areas with sensitive sites such as TCPs and sacred sites, and may apply mitigation through appropriate stipulations such as NSO or CSU to protect the settings of such sites. This covers 92,494 acres, and may have a minor impact because it affects 2.7% of the fluid minerals resource and may affect 641 CBNG wells and 214 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for Cultural Resources would have a major impact on the fluid minerals resource.

Paleontological Resources (no effect)
Alternative C paleontologic resource management actions will have no effect on the fluid minerals resource.

Visual Resources (negligible adverse)
Alternative C visual resources manage all VRI Class II areas as VRM Class III. All VRI Class III areas are managed as VRM Class IV. This may have a negligible impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources

Recreation (negligible adverse)
Alternative C allows leasing in the Burnt Hollow, Petrified Tree, Middle Fork, Mosier Gulch, Welch Ranch, and Weston Hills SRMAs in accordance with the surrounding management, which covers 30,896 acres. This may have a negligible impact because it affects only 0.6% of the fluid minerals resource.

Special Designations

Areas of Critical Environmental Concern (no effect)
The ACEC management action will have no effect on the fluid minerals resource.

Wilderness Study Areas (negligible adverse)
Alternative C prohibits all motorized equipment in WSAs. This covers 28,931 acres, and may have a negligible impact because it affects 0.6% of the fluid minerals resource. The Fortification Creek WSA has high potential for CBNG resources and as high as moderate potential for conventional resources. Gardner Mountain and North Fork WSAs have no fluid mineral potential.

4.2.3.6. Alternative D

Leasable Minerals – Fluids (minor adverse)
Suspending fluid mineral leases in areas with leased coal would impact the availability of fluid mineral resources. This would be a minor impact as it affects 1.3% of the fluid minerals resource which would still be present but the availability would be delayed until the coal operation is completed.

Physical Resources

Air Quality (no effect)
The air quality management actions will have no effect on the fluid minerals resource.

Soil (major adverse)
Alternative D applies a CSU stipulation on soils with a severe erosion hazard with an approved reclamation and stabilization plan. This covers 669,739 acres and may have a major impact because it affects 20% of the fluid minerals resource and may affect 1,959 CBNG wells and 168 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Applying a CSU on all slopes 25% or greater covers 412,145 acres. This may have a major impact because it affects 12% of the fluid minerals resource and may affect 280 CBNG wells and 15 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells.

Applying a CSU stipulation on limited reclamation potential areas such as badlands, rock outcrops, biological crusts, and slopes susceptible to mass movement covers 685,950 acres. This may have a major impact because it affects 20% of the fluid minerals resource and may affect 1,280 CBNG wells and 108 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for soil would have a major impact on the fluid minerals resource.

Water Resources (minor adverse)
Alternative D applies a CSU stipulation to any fluid mineral lease within 500 feet of any spring, non-CBNG reservoir, water well, or perennial stream based on other resource values, including, but not limited to soil, slope, and vegetation. This covers 95,172 acres and may have a minor impact because it affects 2.8% of the fluid minerals resource and may affect 778 CBNG wells and 59 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Cave and Karst Resources (negligible adverse)
Alternative D applies a CSU stipulation within cave and karst areas. This covers 212,626 acres (4.4%) and may have a negligible impact because the cave and karst resources do not overlap the RFD for CBNG or conventional wells.

Mineral Resources

Leasable Minerals – Coal (moderate adverse)
For coal leases which mining and reclamation plans have been approved, fluid mineral leases will stipulate oil and gas operations not interfere with approved coal mining. This may have a moderate impact on the fluid minerals resource and could affect the resources throughout the planning period.

Biological Resources

Vegetation – Riparian/Wetland Resources (moderate adverse)
Alternative D applies a CSU stipulation to any fluid mineral lease within 500 feet of riparian/wetlands systems, and aquatic habitats. This covers 144,045 acres and may have a moderate impact because it affects 4.2% of the fluid minerals resource and may affect 1,216 CBNG wells and 233 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Fish (moderate adverse)
Alternative D applies a CSU stipulation within 0.25 mile of naturally occurring waterbodies containing native and desirable non-native fish species. This covers 261,870 acres and may have a moderate impact because it affects 5.5% of the fluid minerals resource and may affect 1,263 CBNG wells and 308 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Fish and Wildlife Resources – Wildlife (major adverse)
Alternative D prohibits surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game. This covers 14,216 acres and may have a negligible impact because it affects 0.3% of the fluid minerals resource and no CBNG wells or conventional wells as these area are located outside the RFD.

Applying a CSU and TLS stipulation to leases within big game crucial winter range and elk calving areas covers 334,366 acres. This may have a minor impact because it affects 9.8% of the fluid minerals resource and may affect 253 CBNG wells and 43 conventional wells. This

management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells.

Requiring fluid mineral production and byproducts to be piped out of crucial elk winter range and calving areas unless operator proposes and acceptable alternative may have a minor to moderate effect based on the type of production and the additional equipment required to pipe the fluids. This requirement does not grant approval for off-lease measurement and/or commingling.

Applying a CSU stipulation to mineral leases within 0.25 mile of sharp-tailed grouse leks covers 3,601 acres. This may have a negligible impact because it affects 0.05% of the fluid minerals resource and may affect 14 CBNG wells and 1 conventional well.

Applying a TLS to minerals leases within an additional 2-mile radius of sharp-tailed grouse leks from April 1 through July 15 may have a minor impact due to the size and duration of the timing restriction.

Alternative D applies a CSU stipulation to fluid mineral leases within the USFWS recommended biologic buffer zone around active nests of raptor species of conservation concern. This covers 1,195,815 acres and may have a major impact because it affects 35% of the fluid minerals resource and may affect 5,040 CBNG wells and 1,327 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative D applies a TLS to fluid mineral leases within USFWS recommended spatial buffer of an active raptor nest for the following time periods:

- February 1 to July 15 for golden eagles, barn owls, and great horned owls. This covers 111,962 acres and affects 3.3% of the fluid minerals resource.
- April 1 to July 31 for ospreys, merlins, sharp-shinned hawks, kestrels, prairie falcons, northern harriers, Swainson's hawks, and Cooper's hawks. This covers 19,708 acres and affects 0.6% of the fluid minerals resource.
- March 1 to July 31 for red tailed hawks, short eared owls, long eared owls, and screech owls. This covers 79,644 acres and affects 2.4% of the fluid minerals resource.
- Overall the TLS may have a moderate impact due to the size and durations of the stipulations.

Overall the management actions for Fish and Wildlife Species – Wildlife would have a major impact on the fluid minerals resource.

Special Status Species – Plants (minor adverse)
Alternative D applies a CSU stipulation to mineral leases in habitat for special status plant species. This covers 243,929 acres and may have a minor impact because it affects 7.2% of the fluid minerals resource and may affect 15 CBNG wells 5 conventional wells.

Applying an NSO stipulation to fluid mineral leases within known special status plant populations may have a negligible impact because the current populations are outside the RFD.

Special Status Species – Fish (negligible adverse)
Alternative D prohibits surface-disturbing activities within 0.25 mile of fish-bearing waters when special status fish species are present. This covers 2,481 acres, and may have a negligible

impact because it affects 0.1% of the fluid minerals resource and may affect 15 CBNG wells and 2 conventional wells.

Special Status Species – Wildlife (major adverse)
Alternative D locates and manages facilities to mitigate noise impacts on special status wildlife species. This rarely precludes the development or completion of oil and gas activities and may have a minor impact on the fluid minerals resource.

Managing surface-disturbing and disruptive activities to minimize impacts on special status wildlife species and their habitats rarely precludes the development or completion of oil and gas activities and may have a minor impact on the fluid minerals resource.

Applying a CSU stipulation to mineral leases in areas with active prairie dog colonies to provide suitable habitat to special status species that depend on prairie dog colonies covers 47,702 acres. This may have a minor impact because it affects 1.4% of the fluid minerals resource and may affect 143 CBNG wells and 16 conventional wells.

Greater Sage-Grouse Core Population Area

Alternative D applies an NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks. This covers 30,754 acres and may have a negligible impact because it affects 0.9% of the fluid minerals resource and may affect 84 CBNG wells and 1 conventional well.

Applying a CSU that allows on average no more than one disturbance and no more than five percent total disturbance per 640 acres within the DDCT analysis area and, where technologically feasible, prohibits facilities with motion, light sources, noise (10 decibels above ambient), and heights greater than 4.5 feet covers 519,945 acres. This may have a major impact because it affects 15.3% of the fluid minerals resource and may eliminate 803 CBNG wells and affect 150 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. CBNG resources need to be developed on 80 acre spacing which cannot be accomplished with only 1 disturbance per 640 acres and current technology. Due to directional and horizontal technologies, the conventional oil and gas resource may be accessed up to 1 mile under the Core Population Area boundary without the surface location being within Core Population Area. This may cause an increased density of conventional wells on the boundary of the Core Population Area.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Core Population Area from March 15 to June 30, covers 440,114 acres. This may have a major impact due to the size and duration of the stipulation.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14, may have a minor to moderate impact due to the size and duration of the stipulation.

Greater Sage-Grouse Connectivity Corridor

Alternative D applies an NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks. This covers 7,359 acres and may have a negligible impact because it affects 0.2% of the fluid minerals resource and may affect 45 CBNG wells and 15 conventional wells.

Applying a CSU stipulation that allows no more than five percent total surface disturbance per 640 acres within the DDCT analysis area and avoids facilities with motion, light sources, noise (10 decibels above ambient), and height greater than 4.5 feet covers 150,006 acres. This may have a moderate impact because it affects 4.4% of the fluid minerals resource and may affect 763 CBNG wells and 70 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. The management for Connectivity Corridor is significantly different from the management of Core Population Area. Within Connectivity Corridor the disturbance is not limited to 1 per 640 acres. This allows for the possibility of CBNG and conventional oil and gas development within Connectivity Corridor dependant on existing surface disturbance. While it is more likely that development will occur in Connectivity Corridor then in Core Population Area, because of the restrictions, CBNG development will probably not happen within Connectivity Corridor.

Applying a TLS prohibiting surface-disturbing and disruptive activities within 4 miles of an occupied Greater Sage-Grouse lek, from March 15 to June 30, covers 131,849 acres. This may have a minor impact due to the size and duration of the timing stipulation.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14, may have a minor to moderate impact due to the size and duration of the stipulation.

Greater Sage-Grouse Habitat Outside Core Population Area and Connectivity Corridor

Alternative D applies an NSO prohibiting surface-disturbing activities, disruptive activities, and occupancy within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. This covers 16,103 acres and may have a negligible impact because it affects 0.5% of the fluid minerals resource and may affect 8 CBNG wells and 1 conventional well.

Applying a TLS prohibiting surface-disturbing and disruptive activities within 2 miles of occupied Greater Sage-Grouse leks, from March 15 to July 30, covers 779,734 acres. This may have a major impact due to the size and duration of the timing stipulation.

Applying a TLS prohibiting surface-disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14, may have a minor to moderate impact due to the size and duration of the stipulation.

Alternative D requires a 0.5 mile year round disturbance free buffer zone for known active bald eagle winter roosts. This applies to 11,848 acres, and may have a negligible impact because it affects 0.28% of the fluid minerals resource and may affect 32 CBNG wells and 1 conventional well.

Alternative D applies a CSU stipulation to mineral leases within 0.5 mile of the following riparian corridors consistently used by bald eagles: Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River. This covers 54,439 acres and may have a minor impact because it affects 1.6% of the fluid minerals resource and may affect 536 CBNG wells and 69 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells. This buffer may be adjusted to 1 mile or greater based on topographic features, visibility, disturbance and human activity levels, and other factors, which covers 147,321 acres. This may have a moderate impact because it affects 4.3% of the fluid minerals resource and may affect 1,447 CBNG wells and 186

conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Alternative D applies a TLS to mineral leases within a species specific spatial buffer using USFWS recommendations containing nests for an active special status species raptor nest for the following time periods:

- March 1 to July 31 for ferruginous hawks and peregrine falcons. This covers 670,652 acres and may have a major impact due to the size and duration of the timing stipulation.
- April 15 to September 15 for burrowing owls. This covers 11,316 acres and may have a minor impact due to the size and duration of the timing stipulation.
- April 1 to August 31 for northern goshawk. Currently there are no mapped nests for this species though they would likely be found in the area. Therefore, the impact may be none.

Applying an NSO stipulation to mineral leases within a biologic buffer zone using USFWS recommendations around active nests of special status raptor species covers 211,756 acres. This may have a moderate impact because it affects 6% of the fluid minerals resource and may affect 803 CBNG wells and 313 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Under Alternative D, a CSU stipulation is applied to mineral leases for the protection of special status amphibian, reptile, and bat species and their habitats where special status species occur in areas within 1,640 feet (500 meters) of perennial waters, vernal pools, playas, and wetlands, and within 1,640 feet of south-facing rock outcrops. This covers 1,217,959 acres, and may have a major impact because it affects 36% of the fluid minerals resource and may affect 3,956 CBNG wells and 1,265 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for Special Status Species – Wildlife would have a major impact on the fluid minerals resource.

Heritage and Visual Resources

Cultural Resources (major adverse)
Alternative D applies an NSO stipulation to fluid mineral leases for Pumpkin Buttes, Cantonment Reno, Dull Knife Battle Site, Crazy Woman Battle Site, contributing and unevaluated segments of the Bozeman Trail, all rock art sites, all rock shelter sites, and all Native American burial sites. This covers 24,461 acres, and may have a negligible impact because it affects 0.7% of the fluid minerals resource and may affect 58 CBNG wells and 15 conventional wells.

Applying a CSU stipulation to protect the setting within three miles of the above sites covers 613,601 acres. This may have a major impact on the fluid minerals resource because it affects 16% of the fluid minerals resource and may affect 1,440 CBNG wells and 519 conventional wells. This management action is considered a significant impact on leasable fluid minerals because it affects 250 or more CBNG wells and 50 or more conventional wells.

Overall the management actions for Cultural Resources would have a major impact on the fluid minerals resource.

Paleontological Resources (negligible adverse)
Alternative D applies an NSO stipulation to mineral leases in areas containing paleontological resources of high quality or importance. This covers 860 acres and may have a negligible impact because it affects 0.02% of the fluid minerals resource and may affect 6 CBNG wells and 1 conventional well.

Visual Resources (minor adverse)
Visual resources manage all VRI Class II areas (except Powder River Breaks and Fortification Creek) and special emphasis areas as VRM Class II. All VRI Class III areas, plus Powder River Breaks and Fortification Creek, outside special emphasis areas are managed as VRM Class III. This may have a minor impact on the fluid minerals resource as it influences the timing, location, size, and coloration of oil and gas facilities, but rarely precludes the development or completion of oil and gas activities.

Land Resources

Recreation (minor adverse)
Alternative D does not allow fluid mineral leasing within the boundary of Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Hole in the Wall, and Welch Ranch SRMAs. This may have a minor impact because it affects 1.5% of the fluid mineral resource and may eliminate 22 CBNG wells and 10 conventional wells.

Applying a CSU stipulation to Weston Hills SRMA covers 9,504 acres. This may have a negligible impact because it affects 0.3% of the fluid minerals resource and may affect six CBNG wells and nine conventional wells.

Overall the management actions for recreation would have a minor impact on the fluid minerals resource.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Alternative D designates three ACECs and manages them under site specific management plans. This covers 35,451 acres and may have a minor impact because it affects one percent of the fluid minerals resource and may affect 87 CBNG wells and 10 conventional wells.

Wilderness Study Areas (negligible adverse)
Alternative D prohibits all motorized and mechanized equipment in WSAs. This covers 28,931 acres, and may have a negligible impact because it affects 0.6% of the fluid minerals resource.

4.2.3.7. Cumulative Impacts

Oil and gas leasing, exploration and production continue under all alternatives in this RMP. The extent of the activity will be limited by each of the alternatives, with Alternative B imposing the most restrictions and Alternative C imposing the least, the prices of oil and gas commodities and the available technology for extraction of the fluid minerals. However, restrictions imposed on the resource can preclude the resource from being developed regardless of how valuable the oil and gas may be. For instance, where overlapping timing stipulations are present the operation window for drilling for oil and gas may be 3 months. Typically CBNG wells are drilled, completed and producing with 45 days. For the deeper conventional wells the drilling alone may take 30-60 days

with another 30 days for completion and production activities. If anything occurs to extend these timeframes the operator may have to postpone the activities until the following year thereby increasing the cost of the well. Other restrictions, such as VRM, may not prohibit the project but may add to the cost of the project. These costs may cause a marginally economic project to be tabled until the future or may cause it to be dropped altogether.

4.2.3.8. Conclusion

Table 4.35, "Summary of Impacts to Fluid Mineral Development" (p. 720) summarizes impacts to fluid minerals.

Table 4.35. Summary of Impacts to Fluid Mineral Development

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	Negligible adverse	No effect	No effect
Soil	Major adverse	Major adverse	No effect	Major adverse
Water Resources	Minor adverse	Minor adverse	No effect	Minor adverse
Cave and Karst Resources	No effect	Negligible adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	Minor adverse	Moderate beneficial	Minor adverse	Moderate adverse
Leasable Minerals – Fluids	Minor adverse	Minor adverse	Minor beneficial	Minor adverse
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	Minor adverse	Moderate adverse	No effect	Moderate adverse
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	Minor adverse	Moderate adverse	No effect	Moderate adverse
Fish and Wildlife Resources – Wildlife	Major adverse	Major adverse	Moderate adverse	Major adverse
Special Status Species – Plants	Minor adverse	Minor adverse	No effect	Minor adverse
Special Status Species – Fish	Minor adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Wildlife	Major adverse	Major adverse	Major adverse	Major adverse
Heritage and Visual Resources				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Cultural Resources	Minor adverse	Major adverse	Major adverse	Major adverse
Paleontological Resources	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Visual Resources	Negligible adverse	Minor adverse	Negligible adverse	Minor adverse
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Transportation and Travel Management	No effect	No effect	No effect	No effect
Recreation	Negligible adverse	Minor adverse	Negligible adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	Minor adverse	No effect	Minor adverse
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.2.4. Leasable Minerals – Other

The likelihood of other leasable minerals (i.e., leasable minerals other than coal, oil, and gas) being explored for, or developed, in the planning areas is remote (see Chapter 3, Other Leasable Minerals section). Therefore, these minerals are not discussed further, and potential effects on other leasable minerals due to management actions for other resources are not analyzed. To date, the BFO has not received applications to lease a leasable mineral other than coal, oil, or gas in the planning area. If the office receives a lease application for leasing of an other leasable mineral, the BLM solid minerals team in the High Plains District Office likely would process the application.

4.2.5. Salable Minerals

The BLM manages salable minerals to make them available for the mineral consumption needs of the nation. Salable minerals are the most common varieties of minerals, and include aggregate (such as sand and gravel), clinker (locally called “scoria”), common clay, stone, decorative rock, rip rap, and boulders; other minerals may also fall under this category. Scoria and sand and gravel comprise nearly all salable minerals disposals in the planning area. This section describes potential effects on the salable minerals resource from management actions for other resources

and other management programs. The *Salable Minerals* section of Chapter 3 describes existing salable minerals resource conditions.

4.2.5.1. Methods and Assumptions

This section describes potential effects on the salable minerals resource in the planning area from BLM management of resources and resource uses under the alternatives. The *Salable Minerals* section of Chapter 3 describes existing salable minerals resource conditions. Actions that limit the acres of salable minerals resource are considered adverse. Actions that increase the acres of salable minerals resource are considered beneficial. In general, the greater the number of acres effected, the greater the effect on the resource. Other actions may effect the accessibility of the salable minerals resource, and these will likely lead to increased project costs by delaying operations or production during certain times. However, these actions would not effect the salable minerals resource itself, and not discussed in detail. Even in the extreme example that a number of such limitations resulted in such high projects costs that the project became uneconomic, those acres of salable minerals resource would still be available.

Assumptions

The assumptions may include, but are not limited to:

- The occurrence of a salable mineral does not imply that the mineral can be economically developed. Mineral occurrence potential includes both exploitable and potentially exploitable occurrences.
- The potential for occurrence of salable minerals exists across almost the entire planning area.
- A number of common variety minerals, such as sand, gravel, decorative stone, common clay, shale, borrow material, and clinker, occur in the planning area. Some varieties (such as sand, gravel, and clinker) have a high potential for development.
- The potential for development of sand, gravel, and clinker is expected to continue to be high throughout the planning period.
- Current demand for and production of decorative stone (e.g., building stone and moss rock) is low and expected to remain low throughout the planning period.
- The administration of salable minerals and related surface-disturbing activities would involve BLM cooperation with the Wyoming DEQ, as outlined in the current BLM Wyoming DEQ MOU for salable minerals. This MOU (dated August 8, 1984) is entitled “Supplement to Memorandum of Understanding No. WY-19 between the DOI, BLM, and the Wyoming DEQ, Land Quality Division, for Management of Surface Mining and Exploration for Mineral Materials (Salable [sic] Minerals) on BLM Lands.”
- The salable minerals resource discussed and analyzed in this document consists of only those acres of mineral ownership type “All Mins” with BLM, private, or State of Wyoming surface ownership (not USFS surface; see Chapter 3). Not included are lands in the Bighorn National Forest and the Thunder Basin National Grasslands, as the USFS administers the salable minerals resource on those lands. Also not included are lands under Department of Defense jurisdiction (e.g., the lands attached to the Veteran's Hospital northwest of Sheridan), as the mineral estate of those lands was transferred to the Department of Defense.
- Any alternative that limits salable minerals activities or acres would have an adverse effect on the potential exploration and development of salable minerals.
- Restrictions on salable minerals activities apply for the duration of the planning period. However, there could be changes through RMP amendments or changes in regulations.
- The disposal of salable mineral resources is discretionary.

Significance Criteria

In addition to the scale of effects identified at the beginning of Chapter 4, an adverse effect on the salable minerals resource as a result of management actions would be considered potentially significant if any of the following were to occur:

- An action would violate objectives associated with salable minerals resource management (including the *Materials Act of 1947*, as amended), and its magnitude would be such that special mitigation would be warranted.
- An action would violate the decisions, resolutions, and goals outlined in the BLM/Wyoming DEQ MOU for salable minerals activities, and its magnitude would be such that special mitigation would be warranted.
- An approved salable minerals project became restricted to the point it would not be feasible to continue operations.
- An approved salable minerals project became restricted to the point it would not be feasible to begin operations.
- New opportunities for salable minerals exploration and/or development on BLM-administered lands would be substantially reduced.

4.2.5.2. Impacts Common to All Alternatives

This section summarizes management actions common to all alternatives and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation. The acres of salable minerals resource that could be effected, and the percent of the salable minerals resource they represent, indicate the likely possible maximum number of acres effected by the given management actions; the actual acres effected could be fewer.

Salable Minerals (major beneficial)
All lands in the planning area not restricted (prohibited) from salable minerals activities are open for the exploration and development of salable minerals.

Physical Resources

Air Quality (negligible adverse)
Air quality management actions include implementing mitigation measures, such as dust suppression and cooperative efforts, to reduce dust emissions. These actions could require ongoing monitoring for compliance, which would have a negligible adverse effect on salable minerals projects through increased costs.

Soil (negligible adverse)
Soils management actions include an onsite evaluation of proposed projects, mitigation of possible adverse effects on soils, and site-specific reclamation plans. These actions would have a negligible adverse effect on salable minerals projects through increased costs, for additional soil-handling and reclamation steps, and/or amending project site areas or access routes.

Water Resources (negligible adverse)
Water management actions include managing surface-disturbing activities to prevent degradation of water quality, managing water to meet Wyoming Standards for Healthy Rangelands, and reducing channel and bank erosion. Similar types of mitigation measures are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals development

projects. The very occasional project that needs all these measures added, plus any additional measures BLM would require for other Wyoming DEQ approved projects, would increase those projects costs; an overall negligible adverse effect.

Cave and Karst Resources (no effect)
The cave and karst resources management actions common to all alternatives will not affect the salable minerals resource.

Mineral Resources

Nearly the entire planning area is available for exploration and development of locatable, leasable, and salable minerals. Existing and future mining of other minerals in areas currently open and to become open to those activities could affect the salable minerals resource by increasing the acres where conflicts with other minerals projects might occur. In addition, multiple mineral resource uses in the same area are not always physically incompatible. Most potential incompatibility issues would likely result from differences in timing between the projects. This would likely result in increased project costs for one or both projects, due to delays in approval as timing issues are worked out between proponents. If timing cannot be worked out satisfactorily, it's likely one or more proponents would pursue similar projects in another or nearby area.

Locatable Minerals (minor adverse)
All lands except those formally withdrawn are open to locatable minerals projects. A total of 11,373 acres were withdrawn, leaving 777,310 acres of BLM surface open. Conflicts with locatable minerals projects could affect up to that entire acreage of the salable minerals resource, 23%. The two main areas where locatable minerals projects are currently developed also contain potentially exploitable salable minerals. However, it is unlikely salable minerals will be developed in these areas during the planning period, as they are plentiful elsewhere. Therefore, the potential effect is likely to be much smaller; minor adverse.

Leasable Minerals - Coal (minor adverse)
Effect to the salable minerals resource could be major adverse (476,261 acres, 14%) by making all unleased federal coal lands with high development potential in central Campbell and north-central Sheridan counties open to coal leasing. These areas also contain potentially exploitable salable minerals; however, salable minerals are plentiful across the planning area. Therefore, the potential effect is likely to be much smaller as salable mineral proponents can relocate their projects; minor adverse.

Leasable Minerals - Fluids (minor adverse)
Effects to the salable minerals resource could be minor adverse (90,261 acres, 2.7%) by opening all unleased federal fluid mineral estate to leasing. Geothermal energy development potential in the planning area is low; therefore, conflicts with this resource are not likely during the planning period.

Fire and Fuels Management (negligible adverse)

Fire and fuels management actions could result in increased costs for some salable minerals projects by temporarily limiting access to certain areas. However, these effects will likely be of short duration, small in areal extent, occur only occasionally, and impact very few projects.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for forests and woodlands.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
To reduce effects on grasslands and shrublands, which cover most of the planning area, salable minerals projects and access roads may need to be sited or redesigned to reduce adverse effects to vegetation. This would increase project costs; a negligible adverse effect.

Vegetation – Riparian/Wetland Resources (negligible adverse)
To reduce effects on riparian and wetlands areas, which are not uncommon in the planning area, salable minerals projects and access roads may need to be sited or redesigned to prevent the degradation, loss, or reduction of these resources. Similar types of mitigation measures are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals development projects. The very occasional project that needs all these measures added, plus any additional measures BLM would require, would increase those projects' costs; an overall negligible adverse effect.

Invasive Species and Pest Management (negligible beneficial)
Salable minerals projects would be required to limit surface disturbance to prevent weed spread, use certified seed during reclamation, and treat reclaimed areas for invasive species, all likely to increase project costs. However, as these treatments should limit the spread of undesirable species, and assist in achieving more successful reclamation, proponents may more likely see decreased overall project costs through avoidance of some planned or additional expenses. An overall negligible beneficial effect is expected.

Fish and Wildlife – Fish (negligible adverse)
Barriers to fish passage and activities potentially affecting native and desirable non-native fish species are to be managed with WGFD and other stakeholders. Possible increased project costs through redesign of water crossings; negligible adverse.

Fish and Wildlife – Wildlife (negligible adverse)
A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas including: maintain or improve important wildlife habitats through various treatments and methods; consult with WGFD when applying mitigation, and before allowing exceptions to, or modifying wildlife-related land use restrictions; provide suitable habitat to support WGFD wildlife population objectives; manage access to protect crucial habitats; construct new fences to avoid adverse effects to wildlife; and promote maintenance and improvement of habitat for migratory birds of conservation concern consistent with national, regional, and statewide conservation priorities. Overall a negligible adverse effect is anticipated.

Special Status Species – Plants (negligible adverse)
Management actions common to all alternatives include the following: implement actions in recovery plans, conservation measures, terms and conditions, and BMPs, and reasonable and prudent measures within biological opinions for T&E plant species; and allow treatments within habitat and known populations proven to benefit the species. These management actions may temporarily or permanently affect access to, and/or increase project costs in, certain areas. Overall the effect should be negligible as SSS plants are typically rare and their populations area small and so can be easily avoided.

Special Status Species – Fish (negligible adverse)
A number of management actions may lead to temporary or permanent inaccessibility to, and/or

increase project costs in, certain areas: require modification of projects that may affect SSS fish; require the BLM to assist in the restoration, reintroduction, augmentation, or reestablishment of SSS populations and habitats; and implement actions in recovery plans, conservation measures, terms and conditions, and BMP, and reasonable and prudent measures within biological opinions for special status fish species. Overall, a negligible adverse effect.

Special Status Species – Wildlife (negligible adverse)
A number of management actions may lead to temporary or permanent inaccessibility to, and/or increase project costs in, certain areas: utilize current research, management, and conservation plans and similar related documents to guide SSS habitat management; implement actions in recovery plans, conservation measures, terms and conditions, and BMP, and reasonable and prudent measures within biological opinions for special status wildlife species; maintain seeps, springs, wet meadows, and riparian vegetation in a functional condition; restore Greater Sage-Grouse brood-rearing habitats; manage vegetation composition, diversity, and structure to achieve Greater Sage-Grouse habitat management objectives; minimize disturbance that would alter springs and riparian Greater Sage-Grouse habitat, and develop water sources to replace destroyed natural sources; and design water facilities and fences to reduce effects to Greater Sage-Grouse and habitat. Year-round disturbance-free buffer of at least 0.5 mile of known active bald eagle nests (329 acres, 0.04%), and seasonal limited access buffer of known active nests (1,366 acres, 0.2%). Some of these areas fall within areas likely to be developed for salable minerals, but are not expected to prohibit development. Therefore, the overall effect would be negligible.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Management actions common to all alternatives include: maintain and develop relationships with tribes to identify important sites, incorporate this information in planning documents, and manage these to minimize disturbance. A negligible adverse effect to salable minerals activities, from increased costs for some projects due to needing to adjust project areas, and also some temporary inaccessibility to project areas.

Paleontological Resources (negligible adverse)
Retaining public lands with significant paleontological resources would mean retention of salable minerals acres. However, as these lands would likely be restricted from salable minerals activities to conserve the paleontological resource, this would decrease the acres available for these activities. Negligible adverse.

Visual Resources (negligible adverse)
Salable minerals activities in areas with established VRM classifications would be required to conform to the facility siting and design criteria for that classification, such as blending with the surrounding landscape. Mitigation for adverse effects on visual resources would increase costs for some salable minerals projects in areas of certain VRM classifications (II, and sometimes III); a negligible adverse effect.

Land Resources

Forest Products and **Renewable Energy** (no effect)
There are no management actions common to all alternatives for forest products or renewable energy that would effect the salable minerals resource.

Lands and Realty (minor adverse)
Management actions include the prohibiting of subsequent uses of R&PP lands if not compatible with that authorization, withdrawals of surface and/or mineral lands, disposing of lands meeting certain criteria, and modifying, revoking, or terminating certain withdrawals and segregations. Any of these actions could result in decreasing or increasing the acres of, or restrictions on, the salable minerals resource. It is difficult to predict precisely what cumulative effects all these actions will have on the salable minerals resource, as many of the aspects of such projects are unknown at this time. However, it is likely that more lands will become unavailable or restricted from salable minerals activities due to such actions; a minor adverse effect is likely.

Rights-of-Way and Corridors (negligible adverse)
Management actions include the siting of new ROWs adjacent to existing disturbances to minimize surface disturbance, which may necessitate modifying the siting of some roads and access routes. As ROW for salable minerals projects are relatively rare, these actions would likely have an overall negligible adverse effect, due to possible increased costs.

Travel and Transportation Management (negligible adverse)
Management actions include minimizing surface disturbance and erosion, closing roads temporarily or permanently where resource damage is occurring, reclaiming roads if they are heavily eroded, and prohibiting motorized travel if soils would be damaged. These actions may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods. All these actions would result in increased costs for certain projects; as this likely would not be common, a negligible adverse effect is likely.

Recreation (minor adverse)
Recreation management actions include allowing dispersed recreation and casual use of public lands throughout the planning area, and minimizing noise and light pollution potentially affecting recreation facilities and sites. More dispersed recreation will result in more vehicles and people travelling across and/or temporarily occupying public lands. About 20% of current authorized salable minerals projects are on BLM surface, and several other operators must cross BLM surface to access their project sites. This potential increased traffic at some project sites may lead to increased soil compaction, erosion, and/or trash and waste, also leading to increased operational and reclamation costs for these proponents. Requiring minimization of noise and light pollution near recreation facilities will likely lead to increased costs for some salable minerals projects; this is not likely to affect more than a few projects. Overall effect is likely to be minor adverse.

Lands with Wilderness Characteristics (negligible adverse)
Evaluating newly acquired lands and other parcels meeting size and naturalness requirements for wilderness characteristics would temporarily restrict these lands from experiencing salable minerals activities. Given the low likelihood of BLM acquiring any lands that might meet such characteristics, a negligible adverse effect is likely.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals projects costs will increase due to fencing costs; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
Currently, there are no designated ACECs in the planning area. However, should any ACECs be designated with the implementation of this RMP revision, management actions common to all include evaluating BLM-authorized activities and developing mitigation to protect the integrity of the characteristics for which the ACECs were designated. As only a small number of salable minerals projects occur in potential ACECs, this management may increase costs for relatively few projects; an overall negligible adverse effect.

Scenic or Back Country Byways (no effect)
Currently, there are no designated byways in the planning area. However, should any byways be designated after this RMP revision is approved, management actions common to all include managing byways with the objective of protecting the resource values of the area. Such designation likely will not involve instituting any restrictions to size, frequency, or timing of large truck traffic or the institution of a viewshed buffer along the byway within which few or very select disturbances may occur. Approximately 40% of current salable minerals projects utilize the roads that have been identified as potentially being designated as byways. No effect to salable minerals activities is expected.

Wild and Scenic Rivers (negligible adverse)
Currently, there are no designated WSR in the planning area. Management actions common to all include continuing to implement Manual 6400 - Wild and Scenic Rivers for the Middle Fork Powder River that is suitable and eligible for WSR designation, which involves restricting surface disturbance within that area until Congress acts on the designation. As Congress is not expected to act during the planning period, this restriction results in a negligible adverse impact to the salable minerals resource (2,664 acres, 0.34%).

Wilderness Study Areas (negligible adverse)
Currently, there are three WSAs (28,931 acres, 3.7%) in the planning area. Management actions common to all include continuing to implement the BLM Manual 6330 - Management of Wilderness Study Areas for these WSAs, which includes restriction on salable minerals activities in these areas until Congress acts on these proposals. As Congress is not expected to act during the planning period, the BLM recommends not officially designating these areas; these areas will remain restricted from salable minerals activities. The effect on the salable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM will utilize local and state socioeconomic plans, quantify socioeconomic effects where possible, and manage in consideration of the fact that BLM actions are integrally connected with the socioeconomic and cultural health of the planning area. Effect on salable minerals projects would likely be increased costs; negligible adverse.

Health and Safety (negligible beneficial)
Health and safety management actions seek primarily to ensure proper health and safety measures are included in mine plans, including proper procedures for handling spills and releases of hazardous substances, and mitigation for coal seam fires. Waste minimization practices are encouraged, including reusing, recycling, and substituting when appropriate. Effects to salable minerals projects would likely be increased costs; however, many of these measures are already included in their Wyoming DEQ Mine Permits. The PRB is well-known for coal seam fires,

and one salable minerals project occurs adjacent to such an area; risks were minimized to the operator and his personnel through education and discussions of risks and safety prior to approval. Although, the resulting increases to the health and safety of the public, and a very few operators, is incalculable. Overall these actions would produce a negligible beneficial effect.

4.2.5.3. Alternative A

This section summarizes management actions under Alternative A, which is the continuation of current management, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals (negligible adverse)
Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres, 3.7%. As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas, these areas will remain restricted from salable minerals activities. Since these areas have not been available for development their effect on potential salable minerals is negligible.

Physical Resources

Air Quality (negligible adverse)
The requirement for analysis of anticipated effects of proposed activities on air quality, and modeling on a project-specific basis, would likely increase salable minerals project costs, a negligible adverse effect.

Soil (negligible adverse)
Soils management actions include prohibitions on surface-disturbing activities on slopes equal to or greater than 25% (170,590 acres, 22%), in areas with poor reclamation suitability (455,090 acres 58%), and seasonally in areas of severe erosion hazard (215,496 acres, 28%); all these prohibitions have provision for waivers. Additionally, prohibitions on surface-disturbing activities have been applied on a project-specific basis for areas of limited reclamation potential (218,928 acres, 28%). In addition, topsoil is to be salvaged during project activities and reapplied during reclamation. Less than 10% of salable minerals projects are currently authorized in such areas with BLM surface, and that percentage is not likely to increase due to the related problems inherent at these sites. As the RFA for salable minerals is that 530 acres are expected to be disturbed during the planning period (0.02%), the effect will likely be negligible adverse.

Water Resources (negligible adverse)
Prohibition on surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams may affect the salable minerals resource (19,861 acres, 2.5%). However, some mitigation measures regarding these features are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals projects. In addition, as these areas are usually undesirable for salable minerals projects due to such areas' inherent issues, and other considerations, much of this restriction is actually already taken into account when sites are selected. In addition the salable minerals RFA is 530 acres of disturbance (0.02%); negligible adverse.

Cave and Karst Resources (negligible adverse)
Prohibitions on surface disturbance within a buffer around significant cave entrances could be applied on a project-specific basis (11 acres). The likelihood of salable minerals projects being

proposed in cave and karst areas is quite low; the terrain is generally rugged, and these areas tend to be some distance from where the materials might be used. These factors would increase mining and transportation costs beyond economic feasibility. In addition, salable minerals RFA is for 530 acres (0.02%); negligible adverse.

Mineral Resources

Locatable Minerals (negligible adverse)
All lands except those formally withdrawn are open to locatable minerals projects. A total of 11,373 acres were withdrawn, leaving 777,310 acres of BLM surface open. The two main areas where locatable minerals projects are currently developed also contain potentially exploitable salable minerals. It's unlikely though that salable minerals will be developed in these areas during the planning period, as they are plentiful elsewhere. The RFA for locatable minerals projects is that 554 acres will be developed, and 530 acres for salable minerals. Even if these two resources conflicted over all 530 acres, this is 0.02% of the salable minerals resources; a negligible adverse effect.

Leasable Minerals - Coal (negligible adverse)
Effect to the salable minerals resource could be major by making all unleased federal coal lands open to coal leasing. These areas also contain potentially exploitable salable minerals; however, these minerals are plentiful across the planning area. The RFA for coal projects is 195,700 acres, and 530 acres for salable. If these two resources conflicted over all 530 acres, which is unlikely as salable minerals are plentiful elsewhere, this would amount to 0.02% of the salable minerals resource; negligible adverse.

Leasable Minerals - Fluids (negligible adverse)
Effects to the salable minerals resource would be adverse by opening all unleased federal fluid mineral estate to leasing. Although fluid mineral development could conflict with nearly the entire salable minerals resource, exploration and development for oil and gas would occur mostly in areas with high and moderate potential for those minerals. The maximum RFA for oil and gas projects is that 10,575 acres will be developed; 530 acres for salable minerals projects. Even if there were conflicts between the two resources over those entire 530 acres, this is 0.02% of the salable minerals project resource. This amount of conflict is unlikely, as salable minerals are plentiful elsewhere, a negligible adverse effect. Geothermal energy development potential in the planning area is low, therefore, conflicts with this resource are not likely during the planning period.

Fire and Fuels Resources (negligible adverse)

Inadvertent damage to property and facilities or temporary access limitations to salable minerals project sites could occur during fire suppression or prescribed fire activities. Such effects likely would be of short duration, small in areal extent, and occur only occasionally. These limitations may increase project costs for only a relatively few projects, at most a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Timber harvest and other vegetative treatments may temporarily limit access to certain salable minerals project sites. However, such limitations would likely be of relatively short duration,

small in areal extent, and occur only occasionally, and relatively few salable mineral projects occur in or near wooded areas. Project costs would likely increase, but for relatively few projects; negligible adverse.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Use of non-native species in reclamation seed mixtures has been approved on a project-specific basis. BLM reclamation policy allows the use of non-native species; a primary goal of reclamation is soil stabilization, and vegetation species are chosen towards that end. Changes in seed mix may increase project costs; however, more successful reclamation would lead to minimization of reclamation costs. Overall, the effect would be negligible beneficial.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may effect up to 23,831 acres (3.0%); however, this prohibition can be waived. In addition, some mitigation measures for such areas are already required for Wyoming DEQ Mine Permits, which are required for nearly all salable minerals projects. In addition, the salable minerals RFA is 530 acres; negligible adverse.

Invasive Species and Pest Management (negligible beneficial)
Invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase salable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species from project sites, resulting in likely lower planned project expenses or avoidance of additional project costs, a negligible beneficial effect.

Fish and Wildlife Resources – Fish (negligible adverse)
Project-specific prohibitions on surface-disturbing and disruptive activities within 0.25 miles of naturally occurring water bodies containing acceptable fish species could result in an adverse effect to the salable minerals resource (51,745 acres, 1.1%). Project- and/or site-specific maintenance of reservoirs and riparian areas to improve potential fisheries could have a negligible adverse effect (13,102 acres, 0.39%). Other restrictions may also apply which will likely increase project costs. However, these areas will likely be avoided for salable minerals development; Wyoming DEQ Mine Permits should already include mitigation to avoid some of these areas. In addition, salable minerals RFA is only 530 acres; negligible adverse.

Fish Wildlife Resources – Wildlife (negligible adverse)
Wildlife management actions include a number of project- and non-project-specific distance and/or timing limitations or prohibitions on surface disturbance and occupancy in certain areas and habitats, and all will have adverse effects on the salable minerals resource: within the three big game winter ranges (WHMA) (4,583 acres, 0.58%); within 0.5 mile of big game migration corridors (15,559 acres, 1.2%); within elk crucial winter range and calving areas (75,175 acres, 9.6%); removal of elk security habitat (132,148 acres, 17%). Year-round prohibition within 750 feet of sharp-tailed grouse leks (940 acres, 0.03%) and seasonally within 0.64 mile (7,607 acres, 0.97%); and within a biologic buffer of active raptor nests (255,129 acres, 33%). Other restrictions may also apply which will likely increase project costs. Approximately 25% of salable minerals projects occur in these areas, however, with an RFA of 530 acres of disturbance for salable minerals projects, the likely effect will be negligible adverse.

Special Status Species – Plants (negligible adverse)
Year-round project-specific restrictions to protect SSS plants would have an adverse effect on

the salable minerals resource. Surface-disturbing activities would avoid SSS plant populations, leading to adjustments of some project sites and/or access roads, or temporary inaccessibility to sites. SSS plants have very specific habitat requirements and therefore tend to occur in small areas, and with an RFA of 530 acres for salable minerals, the overall likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Year-round project-specific restrictions to protect SSS fish (within 0.25 mile of any waters containing SSS fish) may have a negligible adverse effect (818 acres, 0.1%). Other restrictions may also apply which will likely increase project costs.

Special Status Species – Wildlife (negligible adverse)
Measures to protect SSS wildlife include a number of distance and/or timing restrictions or prohibitions within certain areas and habitats, and all will have an adverse effect on the salable minerals resource: within prairie dog colonies (6,156 acres, 0.8%); within Greater Sage-Grouse strutting grounds (restricted – 3,594 acres, 0.45%, seasonally prohibited – 203,724 acres, 26%); near bald eagle nests, winter roosts, hunting, and concentration areas (year-round – 402 acres, 0.05%; seasonally – 3,013, 0.4%); Near raptor nesting areas (17,345 acres, 2.2%); and within habitats of SSS amphibians and reptiles (176,636 acres, 23%). Other restrictions may also apply which will likely increase project costs. Approximately 25% of salable minerals projects occur in these areas, however with an RFA of 530 acres for salable minerals projects, the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Prohibitions of surface-disturbing activities within 0.25 mile or visual horizon of portions of the Bozeman Trail and Crazy Woman Battle Site could affect the salable minerals resource (3,588 acres, 0.46%). Project-specific prohibitions on surface-disturbing activities in or near certain areas containing historic properties or sensitive or sacred sites (such as TCPs) have an adverse effect to the salable minerals resource. Other project-specific requirements (such as archeological monitors and Native American monitors) would likely increase salable minerals project costs. As many of these areas are already protected to a certain degree by other means, salable mineral deposits are plentiful in other areas, and the RFA for salable minerals is 530 acres, the effect will more likely be negligible adverse.

Paleontological Resources (negligible adverse)
Project-specific prohibitions in areas identified as containing paleontological resources of high quality or importance may have a negligible adverse effect (860 acres, 0.10%). Other project-specific requirements (such as paleontological field surveys) would likely increase salable minerals project costs.

Visual Resources (negligible adverse)
Salable minerals activities in areas with established VRM classifications would be required to conform to the objectives and characteristics of that classification, especially regarding the siting and design of facilities. Areas with BLM surface not rated will be managed to conform to the surrounding classification. Other project-specific requirements (such as visual simulation and mitigation design) may be applied. These limitations and requirements would likely increase project costs, with a negligible adverse effect.

Land Resources

Forest Products (negligible adverse)
Management actions include the sale of minor forest products from woodlands and noncommercial forestlands on BLM surface throughout the planning area, and fencing of regeneration areas. These activities may temporarily limit access to certain salable minerals projects; such limitations would likely be temporary, small, and occasional. As relatively few salable minerals projects occur in wooded areas, and with an RFA of 530 acres, the likely effect would be negligible adverse.

Lands and Realty (minor adverse)
Land tenure adjustments may occur often on behalf of other resources and other agencies. These could increase or decrease BLM surface and/or federal mineral estate. Increasing or decreasing federal mineral acres would effect the salable minerals resource, depending on the type of mineral ownership of the lands involved. Lands for which acquisition will likely be pursued are those adjacent to large blocks of BLM surface and in areas of high recreational potential; lands likely to be disposed of include those with agricultural potential or water (76,223 acres, 9.7%), and small isolated parcels, in all totaling 117,427 acres, 14%. It is difficult to predict which land tenure adjustments will occur during the planning period; however, it may be more likely that the salable minerals resource will decrease somewhat. Overall, likely minor adverse.

Renewable Energy (negligible adverse)
Many renewable-energy projects are long in duration, essentially removing those acres from the salable minerals resource for many decades, unless the two projects are compatible. Other renewable-energy projects may not be as long lived, and those lands would be available again soon after the renewable-energy projects end. Although no renewable energy projects have been received to date, it is predicted that 20,000 acres of BLM surface (2.5%), will be disturbed for these projects during the planning period; an adverse effect due to decreased number of acres available for salable minerals projects.

Rights-of-Way and Corridors (negligible adverse)
Some proposed ROW (for roads, access routes, and/or facilities) may need to be modified to be placed within existing ROW, and away from major transportation routes. As ROW for salable minerals projects are relatively rare, these actions would likely have an overall negligible adverse effect, due to possible increased costs for very few projects.

Travel and Transportation Management (negligible adverse)
A number of area-specific restrictions to motor vehicle and OHV use, seasonally or year-round, may increase salable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicles; mining and transportation of product would be challenging, though, at best. If a project proceeds, motorized vehicle access might be granted; but for designated Recreation Areas, WHMA, or other special management areas, motorized access likely would not be granted. These actions may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods, increasing project costs. Projects in these areas are not likely to be common as salable minerals are plentiful elsewhere, and given an RFA of 530 acres for salable minerals (0.02%), negligible adverse effect is likely.

Recreation (negligible adverse)
Surface disturbance would be prohibited within 0.5 mile of the Dry Creek Petrified Tree EEA. Salable mineral development would be allowed on a project-specific basis. As there

are plentiful deposits outside developed recreation areas, and with an RFA of 530 acres for salable minerals, an overall, negligible adverse effect is expected.

Lands with Wilderness Characteristics (negligible adverse)
Acquired lands would be evaluated for wilderness characteristics. It is unlikely any acquisitions would contain wilderness characteristics therefore the effect is negligible adverse.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern and **Scenic or Back Country Byways** (no effect)
No ACECs or byways are designated, therefore no effect.

Wild and Scenic Rivers (no effect)
There are no Alternative A management actions for WSR that affect the salable minerals resource.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, totaling 28,931 acres, 3.7%. As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas, these areas will remain restricted from salable minerals activities. The effect on the salable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM will recognize and consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result of the implementation of this action. Effect is difficult to predict, but may result in slightly more area being restricted; negligible adverse.

4.2.5.4. Alternative B

This section summarizes management actions under Alternative B, which emphasizes resource conservation, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals (major adverse)
The three WSAs (totalling 28,931 acres, 0.86%) are restricted to salable minerals activities. Conservation measures implemented for other resources under Alternative B would result in a total of 1,663,422 acres being closed to or restricted from salable minerals activities; 97%. This would leave 129,430 acres open to salable mineral activities; 3% of the resource.

Physical Resources

Air Quality (negligible adverse)
Quantitative air quality modeling, and mitigation to ensure project emissions would

approach or exceed emissions standards, are required. This would likely increase project costs; negligible adverse.

Soil (negligible adverse)
Management actions for soils include prohibitions on surface-disturbing activities in areas with severe erosion hazard (215,496 acres, 28%), on slopes equal to or greater than 25% (170,590 acres, 22%), in areas with poor reclamation suitability (455,090 acres 58%), and on areas with limited reclamation potential (218,928 acres, 28%). Less than 10% of salable minerals projects are currently authorized in such areas on BLM surface; also, salable minerals RFA is 114 acres, less than 0.01%. The effect on the salable minerals resource will likely be negligible adverse.

Water Resources (negligible adverse)
Surface disturbance is prohibited within 500 feet of water resources. These areas are typically avoided due to their related inherent problems, and other considerations. The salable minerals RFA is 114 acres, less than 0.01%. The effect on the salable minerals resource will likely be negligible adverse.

Cave and Karst Resources (negligible adverse)
Prohibited is surface disturbance within cave and karst areas (101,455 acres, 13%). Salable minerals projects proposed in these areas are not likely, due to the rugged terrain and long distance to where the materials would likely be used; also, salable minerals has an RFA of 114 acres. The effect to salable minerals projects is likely to be negligible adverse.

Mineral Resources

Locatable Minerals (negligible adverse)
A total of 11,373 acres were withdrawn for three WHMAs, and this acreage remains withdrawn. A total of 618,256 acres (this includes the three WSAs) are recommended for withdrawal under various management actions for other resources, leaving 2,727,957 acres open to locatable minerals activities. Conflict with locatable minerals projects could potentially affect up to 2,727,957 acres of the salable minerals resource. However, the RFA for locatable minerals is 277 acres and 114 for salable minerals. Even if there are conflicts between these two resources over all 114 acres, that is less than 0.01% of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful on lands outside the areas likely to be developed for locatable minerals. The effect to salable minerals projects is likely to be negligible adverse.

Leasable Minerals - Coal (negligible adverse)
All coal lands outside high development potential areas would be closed to coal leasing, leaving 715,388 acres of coal resource open to coal leasing. Conflict with coal projects could potentially affect up to that number of acres of the salable minerals resource, 21%. However, the RFA for coal projects is 186,600 acres and 114 for salable minerals. Even if there are conflicts between these two resources over all 114 acres, that is less than 0.01% of the salable minerals resource. Conflict in those areas is unlikely though, as salable minerals are plentiful outside areas most likely to be developed for coal. The effect to salable minerals projects is likely to be negligible adverse.

Leasable Minerals - Fluids (negligible adverse)
A total of 2,612,920 acres will be administratively unavailable from fluid mineral leasing, leaving 1,225 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to that number of acres of the salable minerals resource. However, the RFA for oil and gas projects is 286 acres and 114 acres for salable mineral. Even if there are conflicts between

these two resources over all 114 acres, that is less than 0.01% of the salable minerals resource; a negligible adverse effect. Conflict in those areas is unlikely, though, as salable minerals are plentiful outside the areas likely to be developed for oil and gas projects.

Fire and Fuels Resources (negligible adverse)

Not all fires will be suppressed, likely resulting in types and extents of effects similar overall to those under Alternative A. Most affected salable minerals projects, which is likely to be not many, may experience adverse effects if in an area experiences a larger burn due to non-suppression. Overall a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Types of effects are similar to, but likely of lesser extent than, those under Alternative A, as silviculture and pest control treatments, techniques, and methods will be less extensively used. The effect to salable minerals projects is likely to be negligible adverse.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Requiring use of only native species for all reclamation activities may lead to increased project costs due to higher costs for some native seed species. Overall, likely negligible adverse effect.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Prohibitions on surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams may affect up to 23,831 acres (3.0%); however, an RFA of 114 acres for salable minerals (less than 0.01%) would likely result in negligible adverse effects as little of this development would be likely within riparian or wetland areas.

Invasive Species and Pest Management (negligible beneficial)
Invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. These treatments may increase salable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; a negligible beneficial effect.

Fish and Wildlife Resources – Fish (negligible adverse)
Prohibited are surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies containing acceptable fish species (51,745 acres, 1.1%). Reservoirs and riparian areas are managed to improve potential fisheries. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits, and given the salable minerals RFA is 114 acres, an overall negligible adverse effect is likely as it is unlikely a project would be proposed in the restricted area.

Fish and Wildlife Resources – Wildlife (negligible adverse)
Timing limitations and prohibitions required in Alternative B will adversely affect the salable minerals resource, including: the three WHMAs (4,583 acres, 0.58%); 0.5 mile of big game migration corridors (15,559 acres, 1.2%); elk crucial winter range and calving areas (75,175 acres, 9.6%); 750 feet year-round of sharp-tailed grouse leks (940 acres, 0.03%) and 0.64 mile seasonally (7,607 acres, 0.97%); and the biologic buffer of active raptor nests (255,129 acres,

33%). In addition, removal of elk security habitat is prohibited (132,148 acres, 17%). Although approximately 25% of salable minerals projects occur in these protected areas, with an RFA of 114 acres, projects should be easily relocated to avoid the restricted areas. Therefore, the likely effect will be negligible adverse.

Special Status Species – Plants (negligible adverse)
Surface-disturbing activities are required to avoid SSS plant habitat (126,811 acres, 16%), necessitating possible modifications of some project sites and/or access roads. These habitat areas are quite small, and given an RFA of 114 acres for salable minerals project locations can be adjusted, the likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Surface-disturbing and disruptive activities are prohibited are within 0.25 mile of any waters containing SSS fish (818 acres, 0.1%). Other prohibitions and requirements also apply which increase project costs. However, due to the small area where SSS fish are found the overall effect is negligible adverse.

Special Status Species – Wildlife (negligible adverse)
Surface-disturbing, disruptive, and/or occupancy activities are restricted or prohibited to conserve SSS wildlife within the following areas: prairie dog colonies (6,156 acres, 0.8%); Greater Sage-Grouse habitat (within 4 miles of leks and winter concentration areas - 467,897 acres, 60%); greater than 4 miles of leks in suitable habitat seasonally prohibited; seasonally within 1.5 miles of SSS raptor nests (113,784 acres, 14.5%); biologic buffer of SSS raptors (28,437 acres, 3.6%); and habitats of SSS amphibians and reptiles (176,636 acres, 23%). Other requirements also apply which will likely increase project costs: restoration of disturbed sagebrush communities on BLM surface; increasing visibility of existing fencing in Greater Sage-Grouse habitat; and anti-perching devices on powerlines in occupied Greater Sage-Grouse habitat. Some projects may not be approved if they would result in more than 1 disturbance or 3% of total surface disturbance per 640 acres. Approximately 50% of salable minerals projects occur in these areas; however with an RFA of 114 acres for salable minerals projects (0.02%), salable mineral proposals can be modified so that the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Surface-disturbing activities are prohibited within five miles or visual horizon of historic properties that retain their integrity of setting (330,592 acres, 42%). Other requirements will likely increase salable minerals project costs: archeological monitors for all surface-disturbing activities, and Native American monitors when requested by tribes. As many of these areas are already protected to a certain degree by other means and salable minerals are plentiful elsewhere, combined with that the salable minerals RFA is 114 acres, salable mineral projects can be modified so that the effect will be negligible adverse.

Paleontological Resources (negligible adverse)
Salable mineral activity would be prohibited within areas containing paleontological resources of high quality or importance (860 acres, 0.1%). Requiring paleontological field surveys for all PFYC Class 3, 4, and 5 formations would increase project costs. As many of these areas are already protected to a certain degree by other means, salable minerals are plentiful elsewhere, and the salable minerals RFA is 114 acres, the effect will more likely be negligible adverse.

Visual Resources (negligible adverse)
Visual simulation and mitigation design are required within or viewable from areas in VRM Classes I to III; this will increase project costs. Salable minerals are plentiful outside VRM Class II areas and with a salable minerals RFA of 114 acres, salable mineral projects can be modified so that the effect will most likely be negligible adverse.

Land Resources

Forest Products (negligible adverse)
Required fencing of regeneration areas may temporarily limit access to certain salable minerals projects. As relatively few salable minerals projects occur in wooded areas, and with an RFA of only 114 acres (0.02%), the likely effect would be negligible adverse.

Lands and Realty (minor beneficial)
Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands having resource value will be retained (76,223 acres, 9.7%). Lands identified for disposal will be disposed of in an order to retain those with higher resource values longest (120,722 acres, 15%). Lands will be acquired as willing sellers make them available, with no priority to those adjacent to large blocks of BLM surface or of high recreational potential. It is difficult to predict which land tenure adjustments will occur during the planning period; however, it may be more likely that the salable minerals resource will increase somewhat. Overall, likely minor beneficial.

Renewable Energy (negligible adverse)
Not all renewable-energy projects are incompatible with salable minerals activities. Although no renewable energy projects have been received to date, it is predicted that 5,000 acres of BLM surface will be disturbed during the planning period; 0.6%, a negligible adverse effect due to decreased number of acres available for salable minerals projects.

Rights-of-Way and Corridors (negligible adverse)
All proposed ROW will need to be placed within identified corridors, and away from major transportation routes. The predicted disturbance from ROW actions is 18,011 acres of BLM surface; 2.3%. As ROW for salable minerals projects are relatively rare, these actions would likely have a negligible adverse effect, due to possible increased costs for very few projects. CCS research and projects are prohibited, which few if any are anticipated. Overall a negligible adverse effect on the availability of salable minerals.

Travel and Transportation Management (negligible adverse)
A number of area-specific restrictions to motor vehicle use may increase salable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicle. Projects in restricted areas are not likely to be common as salable minerals are plentiful elsewhere, and given an RFA of 114 acres for salable minerals projects can be moved, a negligible adverse effect is likely.

Recreation (negligible adverse)
A total of eight SRMAs are designated in Alternative B, totalling 55,529 acres, 1.66%. Designation of these areas would close them to salable mineral development, except for administrative use only. Some of these potential SRMAs are already under some restrictions, and some are in areas not likely to be sought for salable mineral activities due to ruggedness of

terrain and distance to likely places of use. In addition, the RFA for salable minerals is 114 acres; overall a negligible adverse effect.

Lands with Wilderness Characteristics (negligible adverse)
One area of land with wilderness characteristics is recommended to be managed to emphasize primitive recreational opportunities and natural values, including closing to salable minerals activities. The area is 12,237 acres, 1.6%. Much of this area is not likely to be sought for salable minerals activities, due to rugged terrain and long distance to where these minerals would likely be used. The prohibition on mineral material sales in this area would be a negligible adverse effect to the overall salable mineral availability.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
A total of eight ACECs are recommended for designation, totaling 536,304 acres, 8.7%. Designation of these areas would close them to salable minerals activities. Some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for salable mineral activities due to ruggedness of terrain and distance to likely places of use. In addition, the RFA for salable minerals is 114 acres. Salable mineral proposals can be modified to avoid any ACECs; therefore the effect on salable mineral availability is negligible adverse.

Scenic or Back Country Byways (no effect)
A number of roads will be evaluated during the planning period for their eligibility to be proposed as National BCBs or Scenic Byways; possibly up to 89 miles of road or more. No effect is expected to salable mineral availability.

Wild and Scenic Rivers (negligible adverse)
One WSR is under Congressional review, and is managed according to Manual 6400 - Wild and Scenic Rivers, which includes surface disturbance restrictions. If Congress does not designate the WSR, these restrictions would likely continue until Congress acts on the designation. As Congress is not expected to act during the planning period, these restrictions result in negligible adverse effect to the salable minerals resource (2,664 acres, 0.34%). This area is not a likely target for salable minerals activities, given its remote location and rugged terrain.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, total 28,931 acres, 3.7%. As Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas; these areas will remain restricted from salable minerals activities. The effect on the salable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM will consider local and regional economic development and land use plans. BLM management could further restrict or limit certain lands, or not limit or restrict others, as a result

of the implementation of this action. In addition, mitigation strategies will be developed as needed to resolve conflicts that have detrimental effects to multiple resources. Effect is difficult to predict, but may result in slightly more area being restricted; negligible adverse.

4.2.5.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals (minor adverse)
The three WSAs (totalling 28,931 acres, 3.7%) are restricted to salable minerals activities. Conservation measures implemented for other resources under Alternative C would result in a total of 57,213 acres being closed to or restricted from salable minerals activities; 1.71%. This would leave 3,290,908 acres open to salable mineral activities; 98.29% of the resource.

Physical Resources

Air Quality (no effect)
Quantitative air quality modeling is not required. No effect.

Soil (no effect)
Surface-disturbing activities are allowed, as consistent with other resource values. These include in areas with severe erosion hazard, poor reclamation suitability, limited reclamation potential, and on slopes equal to or greater than 25%; no effect to salable mineral availability.

Water Resources (no effect)
Allowed is surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams; no effect to salable mineral availability.

Cave and Karst Resources (negligible adverse)
A buffer is required around significant cave entrances (11 acres, less than 0.01%). A salable mineral proposal near a significant cave is unlikely. The effect on salable mineral activity would be negligible.

Mineral Resources

Locatable Minerals (negligible adverse)
A total of 11,373 acres were withdrawn for three big-game WHMAs, and this acreage remains withdrawn. A total of 28,931 acres (comprising the three WSAs) are restricted to prevent wilderness impairment. There are no additional areas recommended for withdrawal. This leaves 3,319,535 acres open for locatable minerals activities and therefore could potentially effect that number of acres of the salable minerals resource. However, the RFA for locatable minerals is 1,455 acres and 2,090 for salable minerals. Even if there are conflicts between these two resources over all 1,455 acres, that is 0.04% of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful on lands outside the areas likely to be developed for locatable minerals. Salable mineral projects could be relocated, overall a negligible adverse effect.

Leasable Minerals - Coal (negligible adverse)
All coal lands would be open to coal leasing. Conflict with coal projects could potentially effect

up to the entire salable minerals resource. However, the RFA for coal projects is 195,700 acres and 2,090 for salable minerals. Even if there are conflicts between these two resources over all 195,700 acres, that is 0.06% of the salable minerals resource; a negligible adverse effect. Conflict in those areas is unlikely though, as salable minerals are plentiful outside areas most likely to be developed for coal.

Leasable Minerals - Fluids (negligible adverse)
A total of 30,520 acres will be administratively unavailable from fluid mineral leasing, leaving 3,356,009 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to the entire salable minerals resource. However, the RFA for oil and gas projects is 22,255 acres, 2,090 for salable minerals. Even if there are conflicts between these two resources over all 2,090 acres, that is 0.06% of the salable minerals resource. Conflict in those areas is unlikely, though, as salable minerals are plentiful outside the areas likely to be developed for oil and gas projects.

Fire and Fuels Resources (negligible adverse)

Full protection strategies and tactics will be used across the entire planning area, likely resulting in types and extents of effects similar, although greater, overall to those under Alternative A. Not likely to be many salable minerals projects affected due to temporary inaccessibility to project areas, and those effects would be negligible adverse.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Silviculture and pest control treatments will be extensively used. However, salable mineral activities within these vegetation communities are rare so that any conflicts between the two uses should be negligible.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Desirable non-native species will be allowed for reclamation activities leading to decreased project costs, a negligible beneficial effect.

Vegetation – Riparian/Wetland Resources (no effect)
Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains, as consistent with other resource values. There will be no effect to the salable mineral availability.

Invasive Species and Pest Management (negligible beneficial)
Invasive species and pest management actions could include area- and/or species-specific treatment strategies. These treatments may increase salable minerals project costs due to temporary access delays to project sites. However, successful treatments will likely also decrease the spread of undesirable species, resulting in likely lower planned project expenses or avoidance of additional project costs; a negligible beneficial effect.

Fish and Wildlife Resources – Fish (negligible adverse)
Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species. Reservoirs and riparian areas are managed to improve other resources first and potential fisheries second. Other actions may increase project costs. Therefore a negligible adverse effect is likely.

Fish and Wildlife Resources – Wildlife (negligible adverse)
Two seasonal restrictions occur under Alternative C: a WHMA is proposed to be designated for the Fortification Creek elk herd (32,602 acres, 4.2%); and a seasonal prohibition within 0.5 mile of active raptor nests (4,855 acres, 0.6%). With few salable minerals projects occurring in these areas, and an RFA of 2,090 acres (0.06%), the likely effect will be negligible adverse.

Special Status Species – Plants (negligible adverse)
Surface-disturbing activities that could adversely affect SSS plant habitat are allowed, but not within known populations. These habitat areas are quite small, and with an RFA of 2,090 acres for salable minerals (0.06%), the likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Surface-disturbing and disruptive activities are prohibited within 500 feet of any waters containing SSS fish, when their effects cannot be mitigated (308 acres, 0.04%). With salable minerals plentiful, SSS fish areas can be avoided, therefore the effect on salable mineral activity is negligible adverse.

Special Status Species – Wildlife (negligible adverse)
Restrictions occur under Alternative C include: maintain current habitat utilized by SSS; manage traditional wildlife migration and travel corridors consistent with other resources; manage surface-disturbing and disruptive activities consistent with other resources; require anti-perching devices on new powerlines within occupied Greater Sage-Grouse habitat; restrictions on surface-disturbing and disruptive activities within 0.25 mile of the perimeter of leks (3,594 acres, 0.45%); seasonal prohibitions within 2 miles of occupied leks (203,724 acres, 26%) and within Greater Sage-Grouse winter concentration areas; a year-round disturbance-free buffer of at least 0.5 mile around known bald eagle nests and winter roosts (402 acres, 0.05%); a seasonal limited activity zone within one mile of known nests and eagle roosts (3,013 acres, 0.4%); and seasonal species-specific prohibitions within 0.25 mile of SSS raptor nests (75,276 acres, 9.6%). Approximately 50% of salable minerals projects occur in these areas (approximately 265 acres), however with an RFA of 2,090 acres for salable minerals projects (0.06%), salable mineral proposals can be modified so that the likely effect would be negligible.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Surface disturbances are allowed in areas containing historic properties when appropriate mitigation is accomplished. Archeological monitors are required on a project-specific basis. There should be negligible effect to salable mineral activities.

Paleontological Resources (negligible adverse)
Paleontological field surveys are required for all projects potentially affecting PFYC Class 4 and 5 formations, adding some cost to salable mineral proposals. Overall, a negligible adverse effect.

Visual Resources (negligible adverse)
Visual simulation may be utilized on a project-specific basis which would increase project costs. Salable minerals are plentiful and able to be accommodated even with any VRM Class II restrictions. So that the overall effect to salable mineral availability and activity should be negligible.

Land Resources

Forest Products (negligible adverse)
An array of forest products will be available from across the entire planning area; a negligible adverse effect is likely due to slightly increased likelihood of temporary lack of access to certain projects. Few salable minerals proposals are anticipated in forest or woodland communities.

Lands and Realty (minor adverse)
Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands having agricultural potential or water will be disposed of (76,223 acres, 9.7%). Lands identified for disposal will be disposed of in an order to retain those with higher resource values longest (120,722 acres, 15%). It is difficult to predict which land tenure adjustments will occur during the planning period; however, it may be more likely that the salable minerals resource will decrease somewhat. Overall, a minor adverse effect.

Renewable Energy (negligible adverse)
Not all renewable-energy projects are incompatible with salable minerals activities. Although no renewable energy projects have been received to date, it is predicted that 40,000 acres of BLM surface will be disturbed during the planning period; 0.39%, a negligible adverse effect due to decreased number of acres available for salable minerals projects.

Rights-of-Way and Corridors (negligible adverse)
Above-ground facilities such as powerlines are to be placed along major transportation routes; as no current or historic salable minerals projects utilize powerlines, this will likely have no effect; if some future project requires installing a new powerline route, this would result in increased projects costs, likely a negligible adverse effect. CCS research and projects are allowed, where consistent with other resource values. Assessing the likely level of effect on the salable minerals resource from these opportunities is difficult, as no projects have been received to date. Much of the PRB contains rock formations currently believed to be amenable to CCS; therefore, the PRB may eventually be targeted for this type of project. However, CCS projects are not necessarily incompatible with salable minerals projects; much of the surface area over CCS projects may still be available for exploitation of relatively shallow deposits, such as many salable minerals deposits. Overall, likely a negligible adverse effect.

Travel and Transportation Management (negligible adverse)
Some areas are restricted or closed to motorized travel. These areas are not completely inaccessible to salable minerals activities, but these restrictions would make exploration activities more challenging and increase costs. A negligible adverse effect is likely.

Recreation (no effect)
A total of six SRMAs are recommended for designation, totaling 30,570 acres, 3.9%, although designation of these areas would not close them to salable mineral development if those activities are consistent with other resource values. Salable mineral availability activity would not be effected.

Lands with Wilderness Characteristics (no effect)
No lands would be managed for wilderness characteristics; no effect to salable mineral availability.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (no effect)
No ACECs are recommended for designation; salable mineral availability would not be affected.

Scenic or Back Country Byways (no effect)
No roads will be evaluated during the planning period for their eligibility to be proposed as National BCBs or Scenic Byways; salable mineral availability would not be affected.

Wild and Scenic Rivers (no effect)
One WSR is under Congressional review, and is managed according to Manual 6400 - Wild and Scenic Rivers, which includes surface disturbance restrictions. If Congress does not designate the WSR, and Congress is not expected to act during the planning period, these restrictions will be lifted. This area is not a likely target for salable minerals activities, however, given its remote location and rugged terrain. No effect.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, totalling 28,931 acres, 0.86%. Congress is not expected to act during the planning period, and the BLM recommends not officially designating these areas. However, any WSAs released by Congress would be subject to considerations for lands with wilderness characteristics; therefore, the current surface disturbance restrictions will continue to apply until a plan amendment is completed.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM is to develop management strategies to recognize and point out conflicts expected to effect multiple resource use, and to incorporate to the extent possible local and regional economic development and land use plans. Effect is difficult to predict, but may result in slightly more area being restricted; negligible adverse.

4.2.5.6. Alternative D

This section describes management actions under Alternative D, the BLM preferred alternative which strikes a balance between resource use and resource conservation, and the likely resulting effects on the federal salable minerals resource during the planning period due to their implementation.

Salable Minerals (major adverse)
The three WSAs (totalling 28,931 acres, 3.7%) are restricted to salable minerals activities. Conservation measures implemented for other resources under Alternative D would result in a total of 390,162 acres (12%) being closed to or restricted from salable minerals activities. This would leave 2,957,960 acres (88%) open to salable mineral activities. Because more than 10% of the salable mineral resource would be unavailable, the effect is major adverse.

Physical Resources

Air Quality (negligible adverse)
Quantitative air quality modeling, and mitigation to ensure project emissions would approach or exceed emissions standards, are required for projects that could exceed standards.

This would increase project costs; few salable mineral projects would likely be effected, therefore the effect is negligible adverse.

Soil (negligible adverse)
Surface-disturbing activities in areas with severe erosion hazard, poor reclamation suitability, limited reclamation potential, and on slopes equal to or greater than 25% are not prohibited unless the soil resource cannot be conserved. Less than 10% of current salable minerals projects are in such areas on BLM surface, and soils are nearly always conserved. In addition, the salable minerals RFA is 1,193 acres, 0.04%. Salable mineral projects can be located to avoid sensitive soils therefore soil management actions would likely have an overall negligible adverse effect on salable mineral activities.

Water Resources (negligible adverse)
Surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams is allowed where resource objectives are met. These areas are avoided due to their related inherent problems, and with the salable minerals RFA of 1,193 acres (0.04%), salable mineral projects can avoid water resources. The effect will likely be negligible adverse.

Cave and Karst Resources (negligible adverse)
Surface-disturbing activities are prohibited within a site-specific buffer around significant cave entrances (11 acres). Salable minerals projects are not likely in these areas due to the rugged terrain and long distance to likely areas of use. Also, the salable minerals RFA is 1,193 acres (0.04%). The effect to salable minerals projects is likely to be negligible adverse.

Mineral Resources

Locatable Minerals (negligible adverse)
A total of 11,373 acres were withdrawn for three big game WHMAs, and this acreage remains withdrawn. A total of 115,614 acres are recommended for withdrawal under various management actions for other resources; the three WSAs are not recommended for withdrawal. This leaves 666,488 acres open to locatable minerals activities. The RFA for locatable minerals is 1,252 acres and 1,193 for salable minerals. Even if there are conflicts over all 1,193 acres, that is 0.04% of the salable minerals resource. Conflict is unlikely, as salable minerals are plentiful outside the areas likely to be developed for locatable minerals. Overall the effect would be negligible adverse.

Leasable Minerals - Coal (negligible adverse)
All federal coal lands would be open to coal exploration. Conflict with coal projects could potentially effect up to the entire salable minerals resource. However, the RFA for coal projects is 195,700 acres and 1,193 for salable minerals. Even if there are conflicts over all 1,193 acres, that is 0.04% of the salable minerals resource; a negligible adverse effect. Conflict in those areas is unlikely, as salable minerals are plentiful outside areas most likely to be developed for coal.

Leasable Minerals - Fluids (negligible adverse)
A total of 101,214 acres will be administratively unavailable from fluid mineral leasing, leaving 138,558 acres open to oil and gas projects. Conflict with oil and gas projects could potentially affect up to that number of acres of the salable minerals resource. However, the RFA for oil and gas projects is 422,903 acres; 1,193 for salable mineral. Even if there are conflicts over all 1,193 acres, that is 0.04% of the salable minerals resource. Conflict in those areas is unlikely, as salable minerals are plentiful outside the areas likely to be developed for oil and gas projects. The overall effect is negligible.

Fire and Fuels Resources (negligible adverse)

Fire response and treatment will vary to meet other resource objectives. Relatively few salable minerals projects might be affected through temporary restriction of access to sites. Overall a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Some silviculture and pest control treatments, techniques, and methods will be used. However, few salable mineral proposals are anticipated within forest and woodland communities, therefore any conflict between the two uses should be negligible.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Desirable non-native species allowed for short-term reclamation activities, but only with native species during final reclamation. This would Increase project costs due to the use of native seed species. Salable mineral activity would be negligibly affected.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Surface-disturbing activities are allowed within 500 feet of riparian/wetland systems and aquatic habitats where other resource objectives are met. An RFA of 1,193 acres for salable minerals (0.04%) would likely result in negligible adverse effects as salable projects typically avoid riparian and wetland areas anyway.

Invasive Species and Pest Management (negligible beneficial)
Controlling invasive species adds cost to salable mineral activities but does not affect mineral availability. Since treatments reduce the spread of invasive species overall project costs can actually be reduced; therefore the effect is negligible beneficial.

Fish and Wildlife Resources – Fish (negligible adverse)
Surface-disturbing activities are allowed within 0.25 mile of naturally occurring water bodies containing acceptable fish species where fish resource objectives can be met (51,745 acres, 1.1%). Fisheries enhancement in reservoir design is utilized consistent with other resources. Other actions will likely increase project costs. These areas are already mostly avoided due to mitigation on Wyoming DEQ Mine Permits, an overall negligible adverse effect is likely.

Fish and Wildlife Resources – Wildlife (negligible adverse)
Distance and/or timing limitations or prohibitions will adversely effect the salable minerals resource. These are within: the three WHMAs (4,583 acres, 0.58%); 0.5 mile of big game priority travel corridors (15,559 acres, 1.2%); big game crucial winter range and elk calving areas (98,411 acres, 13%); 0.25 mile year-round of occupied sharp-tailed grouse leks (940 acres, 0.10%), and seasonally within 2 miles of an occupied lek (48,127 acres, 6.2%); and within USFWS recommended biologic buffers of active raptor nests (255,129 acres, 33%). In addition, retention of 85% of existing elk security habitat is required (existing acreage 132,148 acres, 17% of BLM surface). With approximately 25% of salable minerals projects occurring in these areas, and an RFA of 1,193 acres (0.04%) salable mineral projects can be located to avoid the restricted areas so that the likely effect will be negligible adverse.

Special Status Species – Plants (negligible adverse)
Surface-disturbing activities are prohibited within SSS plant habitat (237,279 acres, 16%) when

the populations would not be conserved. Also, predisturbance flowering season surveys are required prior to project approval. These habitat areas are quite small, and given an RFA of 1,193 acres for salable minerals (0.04%), salable mineral projects can be relocated so that the likely effect is negligible adverse.

Special Status Species – Fish (negligible adverse)
Surface-disturbing activities are prohibited within 0.25 mile of any waters containing SSS fish species, unless it benefits the species (818 acres, 0.1%). Other prohibitions and requirements apply, likely increasing project costs. Overall negligible adverse effects are anticipated as salable mineral projects can easily avoid SSS fish habitat.

Special Status Species – Wildlife (negligible adverse)
Surface-disturbing, disruptive, and/or occupancy activities are prohibited or restricted to conserve SSS wildlife within the following areas: prairie dog colonies, unless suitable habitat for SSS dependent upon prairie dogs is not affected (6,156 acres, 0.8%); year-round within at least 0.5 mile of bald eagle riparian corridors (12,792 acres, 1.6%); seasonally within USFWS recommended buffer and year-round within species-specific biologic buffer of active SSS raptor nests (17,417 acres, 2.2%); and habitats of SSS amphibians, reptiles, and bats, unless populations and habitat can be conserved (176,636 acres, 23%). Greater Sage-Grouse will be managed via the WYSO policy (currently IM 2012–019).

Other requirements also apply, which will likely increase project costs. Approximately 50% of salable minerals projects occur in these areas (approximately 265 acres), however with an RFA of 1,193 acres for salable minerals projects (0.04%), salable projects can be located so that the likely effect will be negligible adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Surface disturbance is prohibited within Pumpkin Buttes, Cantonment Reno, Dull Knife Battlefield, Crazy Woman Battlefield, Contributing and unevaluated segments of the Bozeman Trail, all rock art sites, rock shelter sites, and Native American burials (15,382 acres, 0.69%). Surface disturbance is allowed within 3 miles of those areas, if the development is not visible or will result in a weak contrast rating to the setting (188,487 acres, 24%). Prohibitions and other measures will be used to mitigate adverse effects to sensitive sites such as TCPs and or sacred sites. Other requirements include establishing agreements to provide tribal access to Pumpkin Buttes, other TCPs, and sacred sites on BLM surface, and requiring Native American monitoring for surface-disturbing projects in accordance with agreements or on a project-specific basis. CRPPs will be developed for Pumpkin Buttes, sites associated with Red Cloud's War and the Great Sioux War (including Dull Knife Battle, Cantonment Reno, Crazy Woman Battle, Bozeman Trail), and the South Big Horn Mountains; it is uncertain at this time what restrictions or requirements might be included in these CRPPs. As many of such areas are already protected to a certain degree by other means, and salable minerals are plentiful elsewhere, so that with a salable minerals RFA of 1,193 acres (0.04%), salable mineral projects can be relocated so that the effect will be negligible adverse.

Paleontological Resources (negligible adverse)
Areas containing paleontological resources of high quality or importance would be designated for special management as they are identified (860 acres, 0.1%); these areas are to be avoided by

salable minerals activities. These areas are typically small, salable mineral projects can be located to avoid paleontological sites so that the effect would be negligible adverse.

Visual Resources (negligible adverse)
Areas will be managed according to their VRM classes, except certain areas; some of these other areas will be managed according to lower (more scenic) management. Visual simulation and mitigation design may be required. These actions will likely increase project costs, the effect likely to be negligible adverse.

Land Resources

Forest Products (negligible adverse)
Fencing of regeneration or treatment areas may be needed, and may temporarily limit access to certain salable minerals projects. As relatively few salable minerals projects occur in wooded areas, and with an RFA of 1,193 acres (0.04%), the likely effect would be negligible adverse.

Lands and Realty (minor beneficial)
Land tenure adjustments could increase or decrease BLM surface and/or federal mineral estate. Lands will be acquired and disposed of based on resource values, including but not limited to, agricultural potential and water (potentially 76,223 acres, 9.7%). Other management actions include: disposal of BLM surface lands identified for disposal, and other lands not identified but meeting appropriate disposal criteria (potentially 120,722 acres, 15%); acquire lands from willing sellers consistent with other resource values, and those lands adjacent to large blocks of BLM surface (before those in other areas). It is difficult to predict which land tenure adjustments will occur during the planning period; however, it may be more likely that the salable minerals resource will increase somewhat. Overall, a minor beneficial effect is likely.

Renewable Energy (negligible adverse)
Although no renewable-energy projects have been received to date, it is predicted that 75,240 acres of BLM surface will be disturbed during the planning period (9.6%). However, not all renewable-energy projects are incompatible with salable minerals activities, and with salable minerals RFA of 1,193 acres (0.04%), the effect is likely to be negligible adverse.

Rights-of-Way and Corridors (negligible adverse)
Transmission lines and above-ground facilities will be placed within existing ROW and other disturbed areas. The predicted disturbance from ROW actions is 38,762 acres of BLM surface; 4.96%. As ROW for salable minerals projects are relatively rare, these actions would likely have an overall negligible adverse effect, due to possible increased costs for a very few projects.

CCS proposals will be evaluated; assessing the likely level of effect on the salable minerals resource from these opportunities is difficult, as no projects have been received to date. Much of the PRB contains rock formations currently believed to be amenable to CCS; therefore, the PRB may eventually be targeted for this type of project. However, CCS projects are not necessarily incompatible with salable minerals projects; much of the surface area over CCS projects may still be available for exploitation of relatively shallow deposits, such as many salable minerals deposits. Overall, a negligible adverse effect to salable mineral availability.

Travel and Transportation Management (negligible adverse)
A number of area-specific restrictions to motor vehicle use may increase salable minerals project costs for certain project proponents. However, these areas might not be completely inaccessible as a number of exploration activities can be performed without motorized vehicles. These actions

may require redesigning and/or reconstructing certain roads, and restricting use of certain roads during certain time periods, increasing project costs. Projects in these areas are not likely to be common as salable minerals are plentiful elsewhere, and given an RFA of 1,193 acres for salable minerals (0.04%), a negligible adverse effect is likely.

Recreation (negligible adverse)
The planning area is to be divided into eight ERMAs (349,663 acres) and seven SRMAs (54,160 acres, 1.6%). Designation of SRMAs would close them to salable mineral development, except for administrative use only. In ERMAs additional mitigation may be applicable to projects, but would not likely prohibit development. Some of these potential SRMAs are already under some restrictions, and some are in areas not likely to be sought for salable mineral activities due to ruggedness of terrain and distance to likely places of use. In addition, the RFA for salable minerals is 1,193 acres (0.04%); therefore a negligible adverse effect.

Lands with Wilderness Characteristics (negligible adverse)
One area of land with wilderness characteristics is recommended to be managed to emphasize ecosystem health, natural values, and primitive recreational opportunities, which would include closing to salable minerals activities. Much of this area is not likely to be sought for salable minerals activities, due to rugged terrain and long distance to where these minerals would likely be used. A negligible adverse effect.

Livestock Grazing Management (negligible adverse)
Fencing off areas being explored and/or mined might be needed to protect livestock. Salable minerals project costs may increase; an overall negligible adverse effect.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
A total of three ACECs are recommended for designation, totalling 35,451 acres, 4.5%. These areas would be managed under site-specific management plans, which would likely close them to salable minerals activities. Some of these potential ACECs are already under some restrictions, and some are in areas not likely to be sought for salable mineral activities due to ruggedness of terrain and distance to likely places of use. In addition, the RFA for salable minerals is 1,193 acres (0.04%); a negligible adverse effect.

Scenic or Back Country Byways (no effect)
A number of roads will be evaluated during the planning period for their eligibility to be proposed as National BCBs or Scenic Byways. No effect is anticipated as salable mineral availability would not be affected.

Wild and Scenic Rivers (negligible adverse)
One WSR is under Congressional review, and is managed according to Manual 6400 - Wild and Scenic Rivers, which includes surface disturbance restrictions. If Congress denies its designation, these restrictions will continue to retain the areas characteristics. As Congress is not expected to act during the planning period, these restrictions result in negligible adverse effect to the salable minerals resource (2,664 acres, 0.34%). This area is not a likely target for salable minerals activities, given its remote location and rugged terrain.

Wilderness Study Areas (negligible adverse)
Currently, there are three areas in the planning area where salable minerals activities are restricted while under Congressional review: the WSAs, total 28,931 acres, 3.7%. As Congress is not

expected to act during the planning period, the BLM recommends not officially designating these areas; these areas will remain restricted from salable minerals activities. The effect on the salable minerals resource is negligible adverse.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
The BLM is to work with other entities (local, state, federal, private) to develop mitigation strategies for promoting a healthy and sustainable social and economic environment. The BLM is to work with all stakeholders to identify socioeconomic impacts of BLM actions and develop strategies to mitigate those impacts where possible to promote sustainability in a multiple resource use environment. Effect is difficult to predict, but may result in slightly more area being restricted, or more requirements that would increase project costs; negligible adverse.

4.2.5.7. Cumulative Impacts

The current total available federal salable minerals resource amounts to 3,348,121 acres. The existence of this mineral estate does not imply the presence of salable minerals of sufficient quality and/or quantity to make them economically viable to develop (see Chapter 3). Alternative A forecasts that approximately 530 acres of federal mineral estate will be disturbed during federally-authorized exploration and development activities (BLM), and approximately 4,768 acres of non-federal mineral estate during similar activities not involving federal authorization (non-BLM); see Appendix G (p. 1671). Under the other alternatives, these acres are: Alternative B – 114 acres BLM, 14,304 acres non-BLM; Alternative C – 2,090 acres BLM, 7,152 acres non-BLM; Alternative D – 1,193 acres BLM, 11,178 acres non-BLM. The actual current acres of federal salable minerals resource under exploration and development (current management, Alternative A) and the projected potential acres (alternatives B through D) are all less than one percent of the resource.

In general, BLM-authorized salable minerals activities disturb far fewer acres in the planning area than do BLM-authorized oil and gas or coal activities (see Appendix G (p. 1671)). Mineral materials use in some sectors has been decreasing, while use in other sectors has been increasing. Overall, the forecast is that mineral materials demand will rise during the planning period, though at a slower rate than experienced over the last several years. Stricter air quality standards have resulted in a continued decreasing demand for scoria for road maintenance, as this material tends to create more dust than sand/gravel; the result is increasing use of sand/gravel for road maintenance. An increasing population means roads are travelled more, which increases road maintenance demands and demand for sand/gravel. CBNG development has been decreasing in the PRB, although oil and (non-CBNG) gas, and coal development have increased (see Chapter 3). Much of these increased oil and gas activities result in less disturbance and fewer acres of road per well than CBNG: in many cases, a number of directional oil and/or gas wells can be constructed on one large pad with one road to access them, versus one pad and one road per CBNG well. Increased coal development leads to greater need for scoria on the increased length and number of coal haul roads and increased haul truck traffic. Scoria tends to be used much more frequently on coal haul roads as this material is much more plentiful in and around the coal mines than sand or gravel.

4.2.5.8. Conclusion

The alternatives listed in ascending order from least to most adverse in terms of effects on the salable minerals resource are alternatives A, C, D, and B.Table 4.36, "Summary of Impacts to Salable Mineral Development" (p. 751) summarizes anticipated effects to the salable minerals resource due to management actions for other resources under each alternative.

Alternative A is the continuation of current management. Alternative B emphasizes resource conservation, and therefore generally places the most constraints on, and is the most restrictive to, development. Alternative C emphasizes resource use, and therefore places the least constraints on, and is the least restrictive to, development. Alternative D is the BLM preferred alternative, which strikes a middle ground between resource conservation and resource use, and therefore places a more moderate amount of constraints on development.

Table 4.36. Summary of Impacts to Salable Mineral Development

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Soil	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Water Resources	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Cave and Karst Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Fluids	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Salable Minerals	Negligible adverse	Major adverse	Minor adverse	Major adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Planned Fire (Prescribed Fire)	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Biological Resources				
Vegetation – Forests and Woodlands	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Vegetation – Grassland and Shrubland Communities	Negligible beneficial	Negligible adverse	Negligible beneficial	Negligible adverse
Vegetation – Riparian/Wetland Resources	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Invasive Species and Pest Management	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Fish and Wildlife Resources – Fish	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fish and Wildlife Resources – Wildlife	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Plants	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Special Status Species – Fish	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Wildlife	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Paleontological Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Lands and Realty	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Renewable Energy	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Rights-of-Way and Corridors	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Travel and Transportation Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Recreation	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Lands with Wilderness Characteristics	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Livestock Grazing Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible adverse	No effect	Negligible adverse
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	Negligible adverse	No effect	Negligible adverse
Wilderness Study Areas	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Socioeconomic Resources				
Social and Economic Conditions	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Healthy and Safety	No effect	No effect	No effect	No effect

4.3. Fire and Fuels Management

The goals of fire and fuels management are to protect life and property; protect or enhance natural resources; maintain or restore landscape-level fire regimes; and vegetation characteristics. Fire and fuels management strategies focus on these goals and encourage the use of vegetative treatments to accomplish the goals. This chapter describes the potential effects of BLM actions on fire and fuels management, and ability to meet the goals.

4.3.1. Unplanned Fire (Wildfire)

The BFO will manage wildfires based on ecological, social, and legal consequences, and the circumstances under which wildfires occur. Firefighter and public safety is the first priority in every fire management activity. Where geographically allowed within an RMP planning

area, unplanned ignitions may be managed for both protection and resource benefit (multiple objectives). Otherwise, unplanned ignitions must be managed with the single objective of suppression.

4.3.1.1. Methods and Assumptions

Actions that affect wildfire management are those that facilitate or constrain suppression activities; alter the complexity or costs of wildfire management; or change the potential for human-caused wildfires. Actions that require inventory, analysis, or added decision levels to emergency response would increase the complexity of wildfire management.

Actions which contribute to the health of plant communities and the landscape are beneficial to unplanned fire management because they support the goals of fire and fuels management. In plant communities/systems with the highest departures from natural or historical disturbance regimes (FRCC2 and FRCC3), inaction or reduced actions could exacerbate or expand acres of undesirable conditions and increase the potential for atypical fire behavior and high-severity fire effects. In Wildland-urban Interface (WUI) areas high fuel loads would increase the complexity of suppression operations, so actions that constrain fuels treatments in these areas would consequently affect management of wildfires and would increase costs.

Wyoming BLM standardized surface use definitions specify that fire could be a surface-disturbing activity. This means both fire suppression activities and the fires themselves could be considered surface disturbances, which may in turn produce conflicting direction or guidance especially where wildfire might be used to meet multiple objectives. In most cases wildfire will not alter the vegetation beyond natural site conditions, but suppression actions generally will. Therefore for simplicity and clarity of analysis in this section, suppression actions are considered surface-disturbing activities whereas wildfire is not.

Impact analyses and conclusions are qualitatively based on the constraints versus facilitative management actions of other resources, while considering fire history, current vegetation, expected fire behavior, and previous management experience responding to unplanned ignitions in the planning area.

4.3.1.2. Impacts Common to All Alternatives

For unplanned fire, some fire suppression activities are broadly constrained in certain areas to protect sensitive resources. For example, fire retardant is restricted or prohibited in specific areas to protect water sources and rock art, and heavy equipment is constrained in cultural sites, WSAs, and other sensitive areas. There is further description in the specific resources.

Fire and Fuels Management (minor beneficial)

In general fire and fuels management actions common to all are beneficial to unplanned fire because they focus on coordinated and collaborative pre-planning, which adds safety and facilitates or simplifies emergency decisions. There are two restrictions to fire suppression tactics which have minor adverse effects to wildfire management: retardant or foam is prohibited within 300 feet of surface water sources; and fire retardant is restricted or prohibited as appropriate to protect rock art. These restrictions affect about one percent of BLM-administered lands and have a minor adverse effect on fire management. Other suppression restrictions, such as use of heavy equipment, are discussed within the alternatives.

Prescribed fire and other fuels treatments would affect wildfire management in the following ways:

- Mitigate high-intensity fire behavior and undesirable effects on resources
- Support fire suppression activities by adding safety and options to operations
- Decrease adverse effects on resources from suppression actions
- Restore or maintain appropriate fire regimes and improve FRCC classes
- Reduce costs of wildfire suppression activities.

Fuels and other vegetation projects which reduce hazardous fuels are especially helpful in conifer settings and in developed areas. Treatment acres vary across alternatives and are discussed for each alternative, but overall, fire and fuels management common to all alternatives would have a minor beneficial effect on management of unplanned fires.

Physical Resources

Air Quality (negligible adverse)
Wyoming DEQ can require ambient air quality monitoring on a case-by-case basis for unplanned fires. On fires in which the BLM has jurisdictional authority, the Air Quality Division (AQD) requires visual monitoring and reporting for fires that exceed 50 acres. Depending on air quality conditions during a wildfire, potential restrictions could constrain or prevent the use of fire for resource benefit. Air quality management common to all alternatives would have a negligible adverse effect on management of unplanned fires. This does not vary across the alternatives and is not discussed further within this section.

Soil and Water Resources (negligible adverse)
Rehabilitating all surface-disturbing activities (firelines) would ultimately benefit fire management even though the short-term workload would be increased. Costs of wildfire suppression includes rehabilitation of fire suppression damages and this should be incorporated as much as possible into the fire operations. This has negligible effects on fire management.

For unplanned ignitions that might be managed for multiple objectives, the pre-identified area would require an authorization which includes site-specific reclamation plans. The extra planning step would have a negligible adverse effect on fire management. Soils and water management common to all alternatives would have a negligible adverse effect on management of unplanned fires.

Cave and Karst Resources (negligible adverse)
Management of cave and karst resources has little effect on wildfire management. A resource advisor would be consulted during wildfire events to determine constraints, especially where fires might be managed for multiple objectives. This has negligible adverse effects on wildfire management and is not discussed further in Unplanned Fire (Wildfire).

Mineral Resources (minor adverse)

Minerals exploration and development would increase the complexity of fire management actions. The potential for human-caused fires increases during minerals exploration and development activities, as does the need to protect industrial interface areas. The proliferation of roads in remote areas could increase fire occurrence by introducing additional human-caused ignition sources, although the associated road network and new water impoundments would improve emergency vehicle access and enable an earlier response to fires. Roads could be used as control lines during suppression actions.

Although mineral resources development would vary across the alternatives, the trade-offs described above would apply to all the alternatives. In this respect, effects would not be highly variable among the alternatives, and are therefore not discussed for each alternative. The effects on fire management and emergency response depend very much on sites and circumstances, and should be considered during activity-level planning.

Overall, mineral resources management common to all alternatives would have a minor adverse effect on management of unplanned fires.

Biological Resources

Vegetation (minor beneficial)
Using an integrated approach for managing and maintaining plant communities for a diversity of native species, habitats, seral stages, and distribution; and managing forests and woodlands in desired ecological conditions would have a minor beneficial effect on wildfire management by maintaining or restoring natural fire regimes or other disturbance regimes. Specific management actions for the vegetation communities are discussed in the alternatives.

Invasive Species and Pest Management (negligible beneficial)
Cooperative IPM programs with non-BLM partners would benefit wildfire management by using landscape level-plans and actions to control annual bromes. Managing invasive plant species by utilizing best available science could increase local understanding of wildfire as a management tool, whether it is used for resource objectives where annual bromes are present, or used as an integrated process to control annual bromes. Requiring disturbed areas (firelines) to be treated for invasive species should be part of the wildfire response and has negligible effects on fire management. Overall, management of invasive species and pest management actions common to all alternatives would have a negligible beneficial effect on management of unplanned fires. There is further discussion in alternatives B, C, and D.

Fish and Wildlife Resources (negligible adverse)
Specific vegetation goals for habitat management would be considered during decisions to implement limited versus full suppression strategies for unplanned fire. Depending on circumstances, limited suppression strategies that allow more acres to be burned might be less obtrusive than aggressive actions that minimize acreage burned; however, in some cases such as protection of Greater Sage-Grouse habitat, aggressive suppression actions may be required to protect the habitat from fire.

Constraints on surface-disturbing and disruptive activities would typically increase incident complexity by adding decisions to emergency actions, although constraints might be waived as necessary to accommodate appropriate suppression tactics that would protect the habitat or site. Timing restrictions that extend to July 31 would affect management of unplanned ignitions for resource objectives, though these restrictions generally occur in sagebrush settings where protection of the habitat would be prioritized over other resource benefits. Overall, fish and wildlife resources management actions common to all alternatives would have a negligible adverse effect on management of unplanned fires. There is further discussion in each alternative.

Special Status Species (negligible adverse)
Specific goals for habitat protection or enhancement would be considered during decisions to implement limited versus full suppression strategies for unplanned fire in special status species habitats. Where policy and pre-planning is in place, incident complexity could be reduced.

Management of sensitive plant species is discussed within the alternatives.

For Greater Sage-Grouse Core Population Area and Connectivity Corridor, suppression response would follow current BLM management guidelines and fire management BMPs to protect the habitat. Suppression actions could include all tactics necessary to maximize protection of sagebrush communities and suitable habitat. This protection strategy simplifies emergency decisions but may increase costs. This does not vary across the alternatives and is not discussed further in this section. Specific surface-disturbing and timing restrictions vary across the alternatives and are discussed further in alternatives B and D, where unplanned ignitions may be managed for resource benefit.

Year-round restrictions would apply to bald eagle roosts or winter use areas, and the buffer could be extended depending on site circumstances and human activities. For nesting raptors, surface-disturbing activities would be prohibited within a buffer through spring and summer. Suppression strategies would strive to protect the habitat and nests while minimizing disruption, though the variable buffers add complexity to wildfire response especially where unplanned fire could be managed to meet other resource objectives.

Overall common management of special status species has a negligible adverse effect on fire management.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Management or protection plans for special areas or historic properties would provide preplanned direction for the Wyoming High Plains District (WHPD) Fire Management Plan and reduce the complexity of wildfire response. Overall, cultural resources management actions common to all alternatives would have a negligible beneficial effect on management of unplanned fires. See further discussion for alternatives B through D.

Paleontological Resources (negligible adverse)
Field surveys of paleontological resources would indicate where heavy equipment would be constrained. In addition, a resource advisor would be consulted during wildfire events. This would have negligible effects on wildfire management and is not discussed further in Unplanned Fire.

Visual Resources (no effect)
Management of visual resources would not affect emergency management of unplanned fires. When considering the use of wildfire to meet resource goals and objectives, visual resource management would not likely constrain this activity. This would not effect wildfire management. This does not vary across the alternatives and is not discussed further in Unplanned Fire.

Land Resources

Forest Products
See the discussion under each alternative below.

Lands and Realty (minor beneficial)
Exchanging lands to consolidate blocks of BLM-administered lands, disposing of isolated public lands, and pursuing easements to access public lands would improve wildfire management options

and safety. Alternatives A, B, and D consider or prioritize these types of actions. See Alternative C for further discussion. Lands and realty actions common to all alternatives would have a minor beneficial effect on management of unplanned fires.

Renewable Energy (negligible adverse)
As with mineral resources, renewable-energy development could increase the complexity of wildfire management actions. The potential for human-caused fires would increase, as would the need to protect industrial interface areas. The proliferation of roads in remote areas could increase wildfire occurrence by introducing additional human-caused ignition sources, although the associated road network would improve emergency vehicle access and enable an earlier response to wildfires. Roads could be used as control lines during suppression actions.

Although renewable-energy development would vary across by alternative, the trade-offs described above would apply to all alternatives. In this respect, the effects are not highly variable among the alternatives so are not discussed further in this section. The effects on wildfire management and emergency response depend very much on sites and circumstances, and would be considered during activity-level planning.

Overall, renewable-energy management actions common to all alternatives would have a negligible adverse effect on management of unplanned fires.

Rights-of-Way and Corridors (no effect)
Management of rights-of-way and corridors does not effect wildfire management and is not discussed further in Unplanned Fire.

Travel and Transportation Management (negligible adverse)
Closed areas, or limiting motorized vehicle travel to designated routes would help prevent accidental fires. However when considering the use of wildfire to meet resource goals and objectives, closed areas could increase the complexity of wildfire management decisions. With consideration of these trade-offs, travel and transportation management common to all alternatives would have a negligible adverse effect on management of unplanned fires. Restrictions and closed areas vary across the alternatives and are discussed further in each alternative.

Recreation (minor adverse)
SRMA designations and associated recreation values could constrain management of unplanned fires for resource benefit. Full protection strategies would be required where new facilities are developed. Increased human activities associated with facilities could contribute to accidental fires, although improved access to the sites could enable an earlier response to wildfire. Although SRMA designations vary across the alternatives, these trade-offs apply to all alternatives and are not further discussed in this section. Recreation management common to all alternatives would have a minor adverse effect on management of unplanned fires.

Lands with Wilderness Characteristics (no effect)
Management of wilderness characteristics is discussed in alternatives B and D, but otherwise has no effect on wildfire management.

Livestock Grazing Management (negligible beneficial)
The allocation of resource reserve allotments would benefit fire management by providing temporary grazing opportunities when rest or deferment is required after wildfires. This varies across the alternatives and is assessed within the alternatives.

Livestock grazing strategies generally would include rest periods after vegetative treatments, including treatments through unplanned fires. Under some circumstances, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain activities that benefit range, fire, and fuels management. See the alternatives for further impacts and discussion about rest periods. Vermeire et al. (2011) found that annual grasses were reduced in the Northern Great Plains following summer fire.

Special Designations

Areas of Critical Environmental Concern (no effect)
Management of ACECs and effects on wildfire management is discussed in alternatives B and D, but otherwise does not affect wildfire management.

Scenic or Back Country Byways and Wild and Scenic Rivers (no effect)
Management of these special designations does not effect wildfire management and is not discussed further in Unplanned Fire.

Wilderness Study Areas (minor adverse)
Wildfire management activities, strategies, and tactics would follow the policy and guidelines in BLM Manual 6330 – Management of Wilderness Study Areas to preserve or enhance the natural character of wilderness study areas and avoid unnecessary impairment of a WSA's suitability for preservation as wilderness. Approximately four percent of BLM-administered lands in the planning area are under wilderness review and affect wildfire management decisions. Appendix Q (p. 2101) provides more information from BLM Manual 6330 – Management of Wilderness Study Areas. Additional restrictions for motorized and mechanized equipment is discussed further in alternatives B through D.

Socioeconomic Resources

Social and Economic Conditions and Health and Safety (negligible beneficial)
Ensuring that local and regional economic development and local land use plans are considered in BLM actions, and working with local agencies to foster public awareness benefits fire and fuels management. Reducing or eliminating physical hazards through appropriate mitigations benefits fire and fuels management by adding safety to fire operations. This does not vary across the alternatives and is not discussed further in this section.

4.3.1.3. Alternative A

Fire and Fuels Management (minor beneficial)

Fuels treatments under Alternative A are allowed to treat about two percent of BLM-administered lands (approximately 14,000 acres) during the planning period. This could accomplish fuels reduction objectives in developed interface areas, which would improve wildfire suppression options and decrease costs. Treatments in other areas could achieve project-level objectives, but likely would not achieve landscape objectives. Fire and fuels management under Alternative A would have a minor beneficial effect on wildlife management. In this alternative wildfire suppression costs would be commensurate with the values to be protected. See further discussion under Impacts Common to All Alternatives.

Alternative A would continue management in accordance with the 1985 RMP as amended in 2001. Under this alternative, variable suppression strategies are balanced with resource values. There are no geographically identified areas in this alternative to manage unplanned ignitions for both protection and resource benefit (multiple objectives), so the overall objective of wildfire management is to suppress the fire.

Physical Resources

Soil and Water Resources (minor adverse)
Alternative A would restrict surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability, and within 500 feet of water sources. The authorized officer could waive the restrictions, but in whole these restrictions increase the complexity of immediate suppression decisions. Alternative A management of soils and water would have a minor adverse effect on wildfire management.

Biological Resources

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Managing vegetation to meet forest and rangeland health objectives would influence hazardous fuel loads, and would likely reduce the potential for large-scale high-severity wildfire effects. For example, forest management actions that reduce conifer encroachment in aspen communities would influence fire behavior by restoring barriers to the spread of fire. At the landscape-level, where vegetation has been managed to create mosaics of diverse structural/seral stages, the size and intensity of wildfires would likely be reduced. Alternative A management of forests and woodlands and grasslands and shrublands would have a negligible beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources (minor adverse)
See Soil and Water. The restrictions within 500 feet of water sources also apply to this resource.

Invasive Species and Pest Management (negligible beneficial)
See *Impacts Common to All Alternatives*.

Fish and Wildlife Resources (minor adverse)
In addition to effects described under *Impacts Common to All Alternatives*, Alternative A seasonal restrictions on surface disturbances near sharp-tailed grouse leks and active raptor nests would affect suppression strategies. Although the affected area for sharp-tailed grouse would be small, year-round restrictions for raptor nests apply to approximately 33% of BLM-administered lands in the planning area. Depending on raptor species, the timing restriction could apply until mid summer and would influence suppression strategies during the height of the fire season. Alternative A management of wildlife resources would have a minor adverse effect on wildfire management.

Special Status Species (negligible adverse)
See *Impacts Common to All Alternatives*.

Where fires occur in limber pine settings, fire management activities would follow current Wyoming BLM guidelines.

For Greater Sage-Grouse habitat Impacts Common to All Alternatives discusses fire management guidelines and BMPs. Because unplanned ignitions are managed in this alternative for suppression objectives only, specific surface disturbing and timing restrictions in this alternative have negligible additional affects on fire management.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
See *Impacts Common to All Alternatives*.

Land Resources

Forest Products (minor beneficial)
Under Alternative A, the commercial harvest of wood products, diseased old growth, and over-stocked forests would reduce fuel loading, improve defensible space in WUI areas, and contribute to safer and less costly suppression operations. There would be more ignition sources during management activities, but the risk would be mitigated by fire restrictions during severe fire seasons.

Timber harvest methods such as clear-cuts, which create fuel breaks and mimic fire regimes, could reduce the size of wildfires. However limiting clear-cut methods to fewer than 20 acres would not support landscape-scale fire regime objectives in lodgepole pine settings and other stand-replacement disturbance regimes.

During and after the planning period, pre-commercial thinning would provide cost-effective benefits for forest health and associated reductions in fuel loads.

Overall, Alternative A management of forest products would have a minor beneficial effect on wildfire management.

Lands and Realty (minor beneficial)
See *Impacts Common to All Alternatives*.

Travel and Transportation Management (negligible adverse)
In addition to the effects common to all alternatives, under Alternative A there would be very few BLM-administered acres closed year-round to motorized vehicles. This would simplify fire suppression activities. Approximately 16% of BLM-administered lands in the planning area would be closed during winter, which would not typically affect wildfire management. Alternative A management of travel and transportation would have a negligible adverse effect on wildfire management.

Livestock Grazing Management (negligible adverse)
Resource reserve allotments would be considered on a project specific basis, which would not likely facilitate wildfire management actions by providing temporary grazing opportunities where rest or deferment is required after wildfires. This would have a negligible adverse effect on management of unplanned fires.

In addition to effects common to all alternatives, under Alternative A, livestock rest periods after wildfire could include the first year and deferred grazing the following growing season. Under some circumstances, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain activities that benefit range, fire, and fuels management.

4.3.1.4. Alternative B

Alternative B would emphasize resource conservation and natural processes where appropriate, while protecting sensitive resources. Response to wildfires would vary from full protection where fire would be undesirable, to monitoring fire behavior in areas where fire can be used to meet multiple objectives. This alternative would use a full range of fire management actions and makes the whole planning area available to consider areas where wildfire could be managed for resource benefit (multiple objectives).

Fire and Fuels Management (negligible beneficial)

Under Alternative B, hazardous fuels reduction treatments would be allowed on 0.4% of BLM-administered land (approximately 3,500 acres) during the planning period. Treatments would focus on developed interface areas, but would not be allowed at levels necessary to meet Community Wildfire Protection Plan objectives during the planning period. Treatments outside developed interface areas would likely be rare, but unplanned ignitions could be managed to meet resource objectives in those areas and to meet desired fire regime characteristics. Alternative B fire and fuels management actions would have a negligible beneficial effect on wildfire management. By using unplanned ignitions for multiple objectives costs of fire suppression might be reduced, but constraints from other resources would likely complicate this strategy and effect costs.

Physical Resources

Soil and Water Resources (minor adverse)
Alternative B effects on wildfire management would be similar to effects under Alternative A, except that the authorized officer could not waive prohibited surface disturbances. This adds risk to wildfire management, and adds complexity in managing fires for multiple objectives. Because surface-disturbing activities are prohibited within 500 feet of water sources, Alternative B could deny the use of water for suppression operations, which does not effectively address firefighter and public safety. In terms of acres affected, Alternative B soils and water management would have a minor adverse effect on wildfire management.

Biological Resources

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Under Alternative B, managing forests and woodlands with an emphasis on natural processes would allow insect and disease, wildfire, and other natural disturbances to run their natural courses. This could be beneficial in areas where historical or desirable vegetative characteristics could be maintained by natural processes.

However, in recent decades, natural and human-caused disturbances have been prevented or eliminated in many forested areas, and other management practices have altered vegetation and fuel characteristics. These activities have created a departure from historical conditions where heavy fuel loads, ladder fuels, and high stand densities occur in contiguous areas across the forested landscape. Wildfire behavior in these areas would likely be high intensity and could produce undesirable, high-severity fire effects and large fires. Under this alternative, natural fuel breaks such as moist aspen communities could eventually be replaced by drier, more flammable

conifer vegetation, and conifer expansion into grassland communities would contribute to large fires.

Vegetation treatments under this alternative would not be allowed at levels that could compliment the use of fire for resource benefit. Using silviculture treatments only when catastrophic events threaten the public and surrounding lands would not effectively address firefighter and public safety, or the priorities of Community Wildfire Protection Plans.

Overall, Alternative B management of forests and woodlands and grassland and shrubland communities would have a negligible beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources (minor adverse)
These effects are the same as described above in Physical Resources, Soil and Water. Alternative B effects on wildfire management would be similar to effects under Alternative A, except that the authorized officer could not waive prohibited surface disturbances. This adds risk to wildfire management, and adds complexity in managing fires for multiple objectives. Because surface-disturbing activities are prohibited within 500 feet of water sources, Alternative B could deny the use of water for suppression operations, which does not effectively address firefighter and public safety. In terms of acres affected, Alternative B Riparian/Wetland Resources management would have a minor adverse effect on wildfire management.

Invasive Species and Pest Management (minor beneficial)
In addition to effects common to all alternatives, under Alternative B, developing pest management areas would generally facilitate fire management planning. This would have a minor beneficial effect on wildfire management.

Fish and Wildlife Resources – Fish and Fish and Wildlife Resources – Wildlife (major adverse)
In addition to effects common to all alternatives, the following specific restrictions under Alternative B would increase incident complexity by adding decisions to emergency actions; and would complicate managing fires for multiple objectives:

- Surface-disturbing and disruptive activities would be prohibited within 0.25 mile (1,320 feet) of naturally occurring waterbodies that contain desirable fish. Though only about 1% of BLM-administered lands are affected, this could complicate the use of water for suppression operations.
- Surface-disturbing and disruptive activities would be prohibited in elk winter range and calving areas until June 30, which affects about 10% of BLM-administered lands. Though natural ignitions would be rare it is possible they would occur in late June, a time of year when weather and fuel parameters would allow wildfires to be managed for resource benefit.
- Seasonal restrictions for sharp-tailed grouse leks would be the same as under Alternative A.
- Buffers for active raptor nests during critical times would affect about 55% of BLM-administered lands.

At a minimum, these restrictions could affect 55% of BLM-administered lands in the planning area and have a major adverse effect on wildfire management, whether the strategy is suppression or multiple objectives.

Special Status Species (major adverse)
In addition to impacts common to all alternatives, the following specific restrictions under Alternative B would increase incident complexity by adding decisions to emergency actions; and would complicate managing fires for multiple objectives:

- Surface-disturbing activities that could adversely affect special status plant habitats would be prohibited, including the use of suppression chemicals and motorized fire suppression vehicles. This management action adversely affects about 16% of BLM-administered lands and would not effectively address firefighter and public safety. In limber pine settings, fire management activities would follow the Wyoming BLM guidelines for five-needle pines.
- Buffers for active raptor nests would be extended during critical times and could affect about 14% of BLM-administered lands.
- Surface disturbance would be prohibited in special status reptile and amphibian habitats, including floodplains, wetlands, ephemeral channels, and south-facing rock outcrops. Although these areas could be mapped and incorporated into the WHPD Fire Management Plan, they are intricate and complex across the landscape, occupy approximately 23% of BLM-administered lands in the planning area, and would increase the complexity of incident management.
- Within occupied Greater Sage-Grouse habitat surface disturbance restrictions would affect about three percent of BLM-administered lands. Seasonal restrictions would affect about 60% of BLM-administered lands until mid-June, which would add complexity and cost to suppression operations. Because sagebrush preservation would be a priority, unplanned ignitions would likely not be managed for resource benefit in these areas.

At a minimum, these restrictions could affect 23% of BLM-administered lands in the planning area and have a major adverse effect on wildfire management, whether the strategy is suppression or multiple objectives.

Heritage and Visual Resources

Cultural Resources (major adverse)
In addition to effects common to all alternatives, Alternative B would prohibit surface disturbances in areas with historic properties or within 5 miles of the visual horizon of historic properties. This would have a major adverse effect on decisions and suppression strategies for wildfires.

Land Resources

Forest Products (minor adverse)
Under Alternative B, offering only sawtimber from forest treatments, limiting timer harvest areas to five acres, and not utilizing pre-commercial thinning would not efficiently meet hazardous fuels objectives. This would have a minor adverse effect on wildfire management.

Lands and Realty (minor beneficial)
See *Impacts Common to All Alternatives*.

Travel and Transportation Management (major adverse)
In addition to effects common to all alternatives, Alternative B would close motorized vehicle use year-round on approximately 40% of BLM-administered lands in the planning area. When deciding to use wildfire to meet resource goals and objectives, this would have a major adverse effect on wildfire management actions and incident decisions.

Lands with Wilderness Characteristics (negligible adverse)
Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to manage unplanned ignitions for resource benefit. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at

the landscape-level, which would improve forest health and fuel loads. This would have a minor beneficial effect on wildfire management. However in Alternative B, management actions would restrict access or constrain surface disturbances which could limit the use of wildfire for resource benefit. This would have a negligible adverse effect on wildfire management.

Livestock Grazing Management (minor adverse)
The creation and maintenance of reserve allotments would facilitate wildfire management actions by providing temporary grazing opportunities where rest or deferment is required after wildfires. This would have a negligible beneficial effect on management of unplanned fires.

A minimum of two years rest from livestock grazing would be required after managing wildfire for resource benefit. Where there are no alternative pastures, this potential hardship to lessees could eliminate the use of unplanned ignitions to meet multiple objectives. This is a concern for fire management in this alternative since fuels treatments are also limited and desired vegetation goals may be difficult to achieve. Minimum two years rest could also postpone or constrain other activities, such as adaptive grazing management to control annual bromes. This would have a minor adverse effect on managing wildfire to meet resource goals and objectives.

Special Designations

Areas of Critical Environmental Concern (moderate adverse)
Alternative B effects on wildfire management from ACEC management actions would be the same as described under Impacts Common to All Alternatives, except that Alternative B would not allow surface disturbance on approximately eight percent of BLM-administered lands in the planning area. This would have a moderate adverse effect on fire management decisions.

Wilderness Study Areas (minor adverse)
Motorized and mechanized equipment would be prohibited in WSAs in this alternative, which affects about four percent of BLM-administered lands. This has a minor adverse affect on wildfire management, whether the objectives are for resource benefit or for suppression.

4.3.1.5. Alternative C

Alternative C would emphasize resource use. Fire management under this alternative would place more emphasis on full protection strategies, with fewer constraints on the use of heavy equipment. There are no geographically identified areas in this alternative to manage unplanned ignitions for both protection and resource benefit (multiple objectives), so the overall objective of wildfire management is to suppress the fire.

Fire and Fuels Management (moderate beneficial)

The scale of fuels treatments under Alternative C would allow about five percent of BLM-administered lands (approximately 42,000 acres) to be treated during the planning period. Hazardous fuels reduction objectives could be accomplished in developed interface areas. Throughout the planning period, treatments in other areas could improve landscape-level fire regime conditions in portions of the planning area, and could compensate for the adverse effects of full suppression strategies for wildfires. Based on acres, this would have a moderate beneficial effect on wildfire management. With the emphasis on resource protection strategies and wildfire suppression objectives costs of suppression would be higher in this alternative, though the allowed levels of fuels treatments might offset this especially in areas of concern such as WUI.

Physical Resources

Soil and **Water Resources** (minor beneficial)
Alternative C soils management would not restrict surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability. Alternative C water management would allow surface-disturbing and disruptive activities within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains. Alternative C soils and water management actions would simplify fire management decisions and activities.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Under Alternative C, actively managing forests and woodlands to maximize forest health and to prevent expansion into other plant communities also would meet fuels management objectives. This would have a minor beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative C would allow surface-disturbing and disruptive activities within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains. This would simplify fire management decisions and activities and has a minor beneficial affect on fire management.

Invasive Species and Pest Management (negligible adverse)
Alternative C invasive species and pest management actions would be the same as described under Impacts Common to All Alternatives, except that management under Alternative C would be reactive. This could complicate management of unplanned ignitions for resource benefit, which would have a negligible adverse effect on wildfire management.

Fish and Wildlife Resources (negligible beneficial)
In general, Alternative C would allow surface-disturbing and disruptive activities in wildlife habitat. This would simplify fire management decisions, and could allow a full range of options to manage unplanned ignitions for multiple objectives, although this alternative would emphasize full protection strategies. This management would have a negligible beneficial effect on wildfire management.

Special Status Species (negligible beneficial)
Alternative C management would allow surface-disturbing activities in plant habitats, but not in areas with known special status plant populations. This includes the use of fire suppression vehicles and suppression chemicals. This management would simplify fire management decisions, depending on the location of special status plant populations and the status of inventories. In limber pine settings, fire management activities would follow the Wyoming BLM guidelines for five-needle pines.

For Greater Sage-Grouse habitat, Impacts Common to All Alternatives discusses fire management guidelines and BMPs. Because unplanned ignitions are managed in this alternative for suppression objectives only, specific surface disturbing and timing restrictions in this alternative have negligible additional affects on fire management.

Alternative C management would not prohibit surface disturbance in special status reptile and amphibian habitats. This would simplify fire management decisions, and could allow a full

range of options to manage unplanned ignitions for multiple objectives, although this alternative emphasizes full protection strategies.

Overall, Alternative C management of special status species would have a negligible beneficial effect on wildfire management.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Under Alternative C, management or protection plans for special areas or historic properties would not be developed, which would mean some management decisions would be made during incident response. This management would have a negligible adverse effect on wildfire management.

Land Resources

Forest Products (moderate beneficial)
Alternative C forest products management would affect wildfire management similar to Alternative A, except that Alternative C would limited the size of harvest areas by terrain and forest BMPs, rather than for predetermined acreages. This would efficiently meet wildfire and fuels management objectives for hazardous fuels reduction, and have a moderate beneficial effect on wildfire management.

Lands and Realty (negligible beneficial)
Under Alternative C, public lands could be disposed of, but exchanges and access easements would not be considered or pursued. Because there would not be opportunities to consolidate public lands, fire management strategies and complexity would not change from current conditions. This would have a negligible beneficial effect on wildfire management.

Travel and Transportation Management (negligible adverse)
Alternative C effects from travel and transportation management would be similar to effects under Alternative A, except that Alternative C would allow travel up to 300 feet off designated routes. This would increase the potential for human-caused fires and have a negligible adverse effect on wildfire management.

Livestock Grazing Management (negligible beneficial)
Alternative C effects on wildfire management from livestock grazing management would be similar to effects under Alternative A, but Alternative C would allow deferment within the first year rather than total rest. This could provide more opportunities to manage unplanned ignitions for resource benefit.

Special Designations

Wilderness Study Areas (minor adverse)
Motorized equipment would be prohibited in WSAs in this alternative, which affects about four percent of BLM-administered lands. This has a minor adverse effect on the protection strategies of wildfire management.

4.3.1.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Under this alternative, fire management would balance suppression strategies with resource values and desired conditions. Protection strategies would be used in developed areas such as WUI and industrial interface areas. In other areas wildfires might be managed for multiple objectives, to enhance other resources, such as wildlife habitat and forest health. This alternative would use a full range of fire management actions and makes the whole planning area available to consider areas where wildfire could be managed for multiple objectives.

Fire and Fuels Management (minor beneficial)

In Alternative D heavy equipment is generally limited to existing roads and trails, and is prohibited in sensitive areas unless there are safety issues or the expected fire effects would cause more resource damage than the suppression actions. These sensitive areas include the more obvious resources such as cultural, soils, and wetlands, but also include restrictions in Greater Sage-Grouse habitat and in lands with wilderness characteristics. In lands with wilderness characteristics, efficient use of heavy equipment would likely be difficult in any case. In Greater Sage-Grouse habitat where protection of sagebrush is a priority and burning out should be avoided, additional restrictions on suppression tactics would complicate fire management decisions. This would have an adverse affect to wildfire response, though the affects on fire management as a whole is based on acres of fuels treatments (next paragraph).

Similar to Alternative A, fuels treatments in this alternative would be allowed on about two percent of BLM-administered lands (approximately 14,000 acres) during the planning period. Treatments could accomplish fuels reduction objectives in developed interface areas which would improve fire suppression options, safety, and costs. Treatments in other areas could achieve project-level objectives but would likely not achieve landscape objectives. In addition to the allowed treatments, managing wildfires for multiple objectives could contribute to fuels reduction and improve FRCC. This would have a minor beneficial affect on fire management.

Physical Resources

Air Quality (negligible adverse)
The Wyoming DEQ can require ambient air quality monitoring on a case-by-case basis for unplanned fires. On fires in which the BLM has jurisdictional authority, the Air Quality Division (AQD) requires visual monitoring and reporting for fires that exceed 50 acres. Depending on air quality conditions during a wildfire, potential restrictions could constrain or prevent the use of fire for resource benefit. Air quality management common to all alternatives would have a negligible adverse effect on management of unplanned fires.

Soil and Water Resources (negligible beneficial)
Subject to evaluation, Alternative D would allow surface-disturbing activities on highly erosive soils, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability. This would provide flexibility to manage unplanned ignitions for multiple objectives or other sensitive resources, and would have a negligible beneficial effect on wildfire management.

Based on management decisions for other resource values, allowing surface disturbance within 500 feet of water sources would provide more options to safely manage unplanned ignitions or to meet objectives for other sensitive resources. Managing riparian and uplands to restore perennial flows or standing water would benefit wildfire management objectives by creating natural fire breaks.

Overall, Alternative D soils and water management would have a negligible beneficial effect on wildfire management.

Mineral Resources

See Impacts Common to All Alternatives. Minerals exploration and development would increase the complexity of wildfire management actions. The potential for human-caused fires would increase with minerals exploration and development, as would the need to protect industrial interface areas. The proliferation of roads in remote areas could increase fire occurrence by introducing additional human-caused ignition sources, although the associated road network and new water impoundments would improve emergency vehicle access and enable an earlier response to wildfire. Roads could be used as control lines during suppression actions. Alternative D management of leasable coal and fluid minerals would have a negligible adverse and a minor adverse effect on wildfire management, respectively.

Biological Resources

Vegetation – Forests and Woodlands and Grassland and Shrublands (minor beneficial)
Under Alternative D, managing forests and woodlands to maximize forest health and to emphasize multiple resource values would benefit wildfire management activities by reducing fuel loads, creating defensible space and operational options, and enhancing firefighter and public safety. This management would have a minor beneficial effect on wildfire management.

Vegetation – Riparian/Wetland Resources (negligible beneficial)
These effects are the same as those for Water Resources, above. Based on management decisions for other resource values, allowing surface disturbance within 500 feet of water sources would provide more options to safely manage unplanned ignitions or to meet objectives for other sensitive resources. Managing riparian and uplands to restore perennial flows or standing water would benefit wildfire management objectives by creating natural fire breaks. Alternative D Riparian/Wetland Resources management would have a negligible beneficial effect on wildfire management.

Overall, Alternative D soils and water management would have a negligible beneficial effect on wildfire management.

Invasive Species and Pest Management (minor beneficial)
Alternative D effects on wildfire management from invasive species and pest management would be the same as described under Impacts Common to All Alternatives. In addition, long-range pest management plans with treatment areas prioritized could benefit wildfire management planning by providing guidance for activities, as would designating and prioritizing areas for the treatment of annual bromes. This management would have a minor beneficial effect on wildfire management.

Fish and Wildlife Resources – Fish and Fish and Wildlife Resources – Wildlife (minor adverse)
In general, Alternative D would provide opportunities to evaluate surface-disturbing and

disruptive activities, and allow those activities if specific criteria could be met. This would provide opportunities to designate areas and manage unplanned ignitions for multiple objectives and for other sensitive resources. Wildlife management actions such as burying powerlines would also benefit wildfire and fuels management by enhancing safety during operations.

There would be two exceptions, as follows:

- Surface-disturbing and disruptive activities would be prohibited in elk calving areas and in crucial big-game winter range during WGFD-specified dates, which would include about 13% of BLM-administered lands during winter and spring when limited suppression strategies could be most viable. Although natural ignitions would be rare in spring, they are still possible and would affect the decision to manage unplanned ignitions for resource benefit.
- Surface-disturbing activities would be prohibited within specific buffers when those activities could disrupt nesting raptors. For most species, the seasonal restriction would be implemented from early spring until mid summer, which would include about eight percent of BLM-administered lands until July 15 and four percent of BLM-administered lands until July 31. This would affect wildfire complexity and suppression options, as well as the decision to manage unplanned ignitions for resource benefit.

These two restrictions would affect at least four percent of BLM-administered lands and would have a moderate adverse affect on fire management. Consultation with a resource advisor would be necessary to provide direction for suppression strategies in these two situations. However, weighing the allowed actions in this alternative with the constraints, the overall affect to fire management would be minor adverse.

Special Status Species (minor adverse)
Similar to management of fish and wildlife resources, Alternative D special status species management would provide opportunities to evaluate surface-disturbing and disruptive activities, and allow them if specific criteria could be met. Depending on circumstances, this would simplify wildfire incident management.

The following actions are specific to this alternative and would affect incident management decisions and complexity:

- For known populations of special status plants, Alternative D management would be similar to management under Alternative C, but Alternative D would allow the use of suppression chemicals within known populations if that use would be consistent with the biology of the plant. In limber pine settings, fire management activities would follow the Wyoming BLM guidelines for five-needle pines.
- Within occupied Greater Sage-Grouse leks and Priority Habitat Area, surface disturbance restrictions would affect about 20% of BLM-administered lands from March until late June; and in Connectivity Corridor the same seasonal restrictions would affect about six percent of BLM-administered lands. Because sagebrush protection would be a priority, these restrictions would add cost and complexity to suppression operations. Unplanned ignitions would likely not be managed for resource benefit in these Core Population Area and Connectivity Corridor. In occupied habitat outside Priority Habitat Area and Connectivity Corridor, about 46% of BLM-administered lands would be affected by these same seasonal restrictions, adding cost and complexity to suppression operations. Although natural ignitions would be rare before June 15, they are still possible in late June when weather and fuel conditions might allow unplanned ignitions to be managed for resource benefit. Restrictions outside of Core Population Area and Connectivity Corridor would reduce large portions of the landscape that

might otherwise be available to manage unplanned ignitions for resource benefit. This could have major adverse affects to wildfire management.
- Buffers for active raptor nests would follow USFWS recommendations for distance and timing restrictions, and would affect about four percent of BLM-administered lands.
- Depending on surveys and circumstances, surface disturbance would be allowed in special status reptile, amphibian, and bat habitats.

Weighing the allowed actions in this alternative with the constraints, the overall effects to fire management would be minor adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative D would prohibit surface disturbance within identified sites. Management plans described under Impacts Common to All Alternatives would provide preplanned guidance that would typically reduce decision timelines, thereby reducing complexity during wildfire incident management. Alternative D management of cultural resources would have a negligible adverse effect on wildfire management.

Land Resources

Forest Products (minor beneficial)
Under Alternative D, offering forest products throughout the planning area could enhance local markets and encourage cost-effective alternatives to slash disposal, which would benefit fuels management activities. Pre-commercial thinning and other practices that create healthy forest stands would benefit wildfire and fuels management by efficiently reducing fuel loads and ladder fuels. Rather than being restricted by predetermined acreages, treatment areas could follow topographic features and could be planned to mitigate wildfire spread and behavior. This management would have a minor beneficial effect on wildfire management.

Lands and Realty (minor beneficial)
Under Alternative D, exchanging lands to consolidate blocks of BLM-administered lands and pursuing easements to access public lands would improve wildfire management and safety on public lands. Limited suppression actions would be more feasible, which would reduce firefighter exposure and would likely decrease suppression costs. Alternative D lands and realty management would have a minor beneficial effect on wildfire management.

Travel and Transportation Management (negligible adverse)
Alternative D effects from management of travel and transportation would be similar to effects under Alternative C. Travel would be allowed up to 300 feet off designated routes. This would increase the potential for human-caused wildfires and have a negligible adverse effect on wildfire management.

Lands with Wilderness Characteristics (negligible beneficial)
Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to manage unplanned ignitions for resource benefit. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a negligible beneficial effect on wildfire management.

Livestock Grazing Management (minor beneficial)
Under Alternative D, designating future resource reserve allotments would provide options for adaptive management for temporary grazing when rest or deferment is required in other areas after managing fire for resource benefit. Livestock grazing rest or deferment could be required as necessary after fire events or other vegetative treatments, which would allow flexibility to manage for multiple resources and objectives. Alternative D livestock grazing management would have a minor beneficial effect on wildfire management.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Alternative D effects on wildfire management from ACEC management would be similar to effects under Alternative B. Alternative D would not allow surface disturbance on approximately four percent of BLM-administered lands in the planning area, which would have a minor adverse effect on wildfire management decisions.

Wilderness Study Areas (minor adverse)
Motorized and mechanized equipment would be prohibited in WSAs in this alternative, which affects about four percent of BLM-administered lands. This has a minor adverse effect on wildfire management, whether the objectives are for resource benefit and/or for suppression.

4.3.1.7. Cumulative Impacts

Cumulative impacts relevant to unplanned fire include the interaction of planned fire treatments and the allowed levels of those treatments. Management of unplanned and planned fire both contribute to human safety, suppression costs, and vegetation conditions on the landscape. The Conclusion section below and the Cumulative Impacts for Planned Fire section discuss these interactions and long-term effects on the landscape.

4.3.1.8. Conclusion

The alternatives are compared here by considering fire management strategies and costs, and the contributed benefits of the allowed levels of fuels treatments. One of the goals of fire and fuels management is to restore natural (historically characteristic) fire regimes, vegetation structures, and plant communities on the landscape during the planning period. The alternatives are weighed against this goal.

Alternative A is based on current fire management in which variable suppression strategies are balanced with resource values and protection needs. In this alternative unplanned ignitions are not managed for resource benefit (multiple objectives), but limited or conditional suppression strategies would be used to where resource values do not require full protection. Costs of suppression actions would be commensurate with the values to be protected. Through limited suppression strategies and workable resource constraints, this alternative would provide a reasonable framework for wildfire management to partially meet the goals of fire and fuels management. When combined with prescribed fire treatments, there would be an opportunity to improve landscape-level fire regime conditions in portions of the planning area.

Under Alternative B, there would be an opportunity to use a full range of fire management strategies to meet multiple objectives. This would provide options, where appropriate, to reintroduce fire into fire-dependent ecosystems and to reduce undesirable effects from suppression

actions. However, in this alternative managing unplanned ignitions for resource benefit would likely be rare because of human developments, specific resource issues, and combinations of constraints from sensitive resources. An emphasis on sagebrush protection would further reduce opportunities to use wildfire to meet other resource objectives. In theory suppression costs should be lowest in this alternative because a full range of strategies could be used, but constraints, resource conditions, reduced levels of vegetation treatments, and resource protection needs could elevate costs to the highest of the alternatives. Planned vegetative treatments (prescribed fire) under this alternative would not be of an adequate scale (0.4% of BLM-administered lands) to affect fire regime conditions at the landscape level. The goal of reintroducing fire into fire-dependent ecosystems could be pursued via unplanned ignitions, but the overall effects of wildfire might not meet desired conditions.

Alternative C emphasizes full suppression strategies to protect resources. Other than immediate protection of resources, this alternative would not pursue the goals of fire management, and suppression costs would be higher than the other alternatives. Only planned ignitions (prescribed fire) under this alternative could influence landscape conditions during the planning period and could offset the effects of full suppression strategies for wildfires.

Similar to Alternative A, fire management under Alternative D balances suppression strategies with resource values and desired conditions. Similar to Alternative B, unplanned ignitions could be managed for resource benefit. Costs would be commensurate with values protected, and with the allowed use of fire for resource benefit, suppression costs could be the lowest of all alternatives. This combination of fire management strategies, reasonable resource constraints, and allowed levels of vegetative treatments would provide a good opportunity to accomplish fire management goals.

Whether considering fire and fuels management as a whole, or unplanned ignitions alone, Alternative D would provide the best balance to meet the fire management goal in a multiple-use environment. Table 4.37, "Summary of Impacts to Management of Unplanned Fire" (p. 772) summarizes effects on wildfire and fuels management.

Table 4.37. Summary of Impacts to Management of Unplanned Fire

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Soil	Minor adverse	Minor adverse	Minor beneficial	Negligible beneficial
Water Resources	Minor adverse	Minor adverse	Minor beneficial	Negligible beneficial
Cave and Karst Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Coal	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Fluids	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Salable Minerals	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor beneficial	Negligible beneficial	Moderate beneficial	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Negligible beneficial	Minor beneficial	Minor beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Biological Resources				
Vegetation – Forests and Woodlands	Negligible beneficial	Negligible beneficial	Minor beneficial	Minor beneficial
Vegetation – Grassland and Shrubland Communities	Negligible beneficial	Negligible beneficial	Minor beneficial	Minor beneficial
Vegetation – Riparian/Wetland Resources	Minor adverse	Minor adverse	Minor beneficial	Negligible beneficial
Invasive Species and Pest Management	Negligible beneficial	Minor beneficial	Negligible adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Minor adverse	Major adverse	Negligible beneficial	Minor adverse
Fish and Wildlife Resources – Wildlife	Minor adverse	Minor adverse	Negligible beneficial	Minor adverse
Special Status Species – Plants	Negligible adverse	Major adverse	Negligible beneficial	Minor adverse
Special Status Species – Fish	Negligible adverse	Major adverse	Negligible beneficial	Major adverse
Special Status Species – Wildlife	Negligible adverse	Major adverse	Negligible beneficial	Major adverse
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major adverse	Negligible adverse	Negligible adverse
Paleontological Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	Minor beneficial	Minor adverse	Moderate beneficial	Minor beneficial
Lands and Realty	Minor beneficial	Minor beneficial	Negligible beneficial	Minor beneficial
Renewable Energy	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	Negligible adverse	Major adverse	Negligible adverse	Negligible adverse
Recreation	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	Negligible adverse	No effect	Negligible beneficial
Livestock Grazing Management	Negligible adverse	Minor adverse	Negligible beneficial	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Moderate adverse	No effect	Minor adverse
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Socioeconomic Resources				
Social and Economic Conditions	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Health and Safety	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial

4.3.2. Planned Fire (Prescribed Fire)

The goal of prescribed fire is to accomplish hazardous fuel objectives and protect or enhance natural resources by restoring natural fire regimes to the landscape.

4.3.2.1. Methods and Assumptions

Natural or historical fire frequency and severity maintains characteristic vegetation structure, health, fuel loads, and fire effects in all but the most severe weather and drought conditions. Prescribed fire and other vegetative treatments could improve or maintain healthy disturbance regimes on the landscape, improve vegetative health, and decrease hazardous fuel loadings.

Vegetative treatments in conifer settings alter fire behavior and severity by reducing ladder fuels and decreasing canopy cover, thereby inhibiting the vertical spread of fire and reducing the risk of crowning, spotting, and high-intensity fires. These treatments are especially helpful in urban interface, rural intermix, or other developed areas. Treatments affect resources and fire management in the following ways:

- Mitigate high-intensity fire behavior and undesirable effects to resources
- Support fire suppression activities by adding safety and options to operations
- Decrease adverse effects to resources from suppression actions
- Restore or maintain appropriate fire regimes and improve FRCC classes
- Reduce costs of wildfire suppression activities.

In areas with the highest departures from natural or historical disturbance regimes, inaction or reduced actions could exacerbate or expand acres of undesirable conditions.

Areas identified by Community Wildfire Protection Plans receive priority for vegetative treatments under any alternative. As possible, treatments would be implemented in other areas for resource benefit and to restore natural fire regimes. Treatment acres addressed for fire and fuels management include prescribed fire, but touch on the mechanical treatments addressed for forests and woodlands, and forest products. In some areas, mechanical treatments would be followed with prescribed fire. Some mechanical treatments, such as mowing, grinding, or hand thinning, would be used in grass or shrub communities to meet desired conditions or to protect resource values. Specific treatment sites have not been identified for parts of the planning area not covered by Community Wildfire Protection Plans, but undesirable vegetation conditions would be targeted.

Impact analyses and conclusions are qualitatively based on the constraints or facilitative actions from other resources, and how those actions could affect the implementation of vegetation treatments to meet fire regime or fuel loading conditions. Analysis is based on interdisciplinary team knowledge of resources and past treatments in the planning area, and best professional judgement of the effects of other management actions on vegetation treatment projects.

4.3.2.2. Impacts Common to All Alternatives

Resource issues under any alternative could require location and timing restrictions for vegetative treatments. However, for most activities, interdisciplinary planning would consider constraints versus beneficial effects, and would identify mitigation measures or restrictions necessary for successful implementation.

Fire and Fuels Management (minor beneficial)

Where limited suppression or resource-benefit strategies could be used on unplanned ignitions, hazardous fuels reduction objectives could be met. Depending on scale and fire effects, fire regime conditions could be improved on the landscape to achieve desired plant communities (DPCs) and seral mixes. Fire and fuels management common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool.

Physical Resources

Air Quality (negligible adverse)
Prescribed fire is managed to comply with Wyoming DEQ Air Quality Division smoke-management rules and regulations. Ambient air quality issues have rarely limited implementation of prescribed fires. Air quality management actions common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool. This does not vary across the alternatives and is not discussed further in this section.

Soil, Water Resources, and Cave and Karst Resources
These impacts are variable and discussed below under each alternative.

Mineral Resources

Management actions for mineral resources does not effect prescribed fire management and is not discussed further in this section.

Biological Resources

Vegetation (minor beneficial)
Managing plant communities for a diversity of native species, habitats, seral stages, and distribution, and managing forests and woodlands and grasslands and shrublands in desired ecological conditions would benefit fire and fuels management by maintaining or restoring natural fire regimes. Management of these vegetative communities common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool. Specific vegetation management actions vary across the alternatives and are discussed further in each alternative.

Invasive Species and Pest Management (negligible beneficial)
Cooperative IPM programs with non-BLM partners would benefit fire and fuels management by controlling weeds at the landscape level.

Managing annual bromes by utilizing best available science could increase understanding of fire as a management tool and allow continued use of prescribed fire to meet other resource objectives or even control annual bromes. Depending on scale and success of annual brome management, natural fire regimes and fire behavior and effects could be maintained or improved.

Invasive species and pest management actions common to all alternatives would have a negligible beneficial effect on prescribed fire as a management tool.

Fish and Wildlife Resources (major adverse)
Long-term benefits and short-term adverse effects for habitat enhancement projects would provide a foundation for analysis of vegetative treatments. In general, timing restrictions or prohibiting

surface disturbance from fall through spring would reduce opportunities to implement prescribed fire treatments. In some situations, especially in forested settings, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall.

For most of the alternatives, timing restrictions and prohibiting surface disturbance in elk calving areas would affect approximately four percent of BLM-administered lands in the planning area during spring. Timing restrictions also would apply to elk winter range during fall and winter, although those constraints would affect only about one percent of BLM-administered lands in the planning area. See Alternative D for further discussion.

Year-round restrictions on surface disturbance near sharp-tailed grouse leks and active raptor nests could constrain treatments on about 33% of BLM-administered lands in the planning area. Seasonal restrictions for active raptor nests could affect treatments on about 50% of BLM-administered lands in the planing area, particularly during early spring when weather and fuel parameters are often most favorable for prescribed fire. See Alternative B for further discussion.

Discussions for individual alternatives address year-round restrictions for big-game travel corridors, and seasonal restrictions and surface disturbances near sharp-tailed grouse leks, active raptor nests, and near natural waterbodies that contain desirable fish species.

Fish and wildlife resources management actions common to all alternatives would have a major adverse effect on prescribed fire as a management tool.

Special Status Species (minor adverse)
Goals and policies for special status species management would guide decisions to implement vegetative treatments in special status species habitats. Long-term benefits and short-term adverse effects would provide a foundation for analysis of treatments.

Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands. This has negligible to minor adverse affects on fuels treatments

For Greater Sage-Grouse habitats, fuels treatments would follow current BLM management guidelines and fuels management BMPs to protect or enhance the habitat. The emphasis on sagebrush preservation would reduce opportunities to implement prescribed fire or other vegetative treatments to achieve other resource objectives. However in unoccupied habitat, there could be site-specific opportunities to improve or restore fire regimes and associated fire behavior and severity. For example, reducing conifer encroachment in Greater Sage-Grouse habitat would remove uncharacteristic conditions and restore suitable habitat.

In general, year-round restrictions would apply to bald eagle roosts or winter use areas, which would affect less than two percent of BLM-administered lands in the planning area. For other nesting raptors, year-round and seasonal restrictions would affect approximately four percent of BLM-administered lands in the planning area. As further described for each alternative, these effects vary somewhat by alternative.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
Management or protection plans for special areas or historic properties would provide direction for vegetative treatments. See Alternative C for further discussion. Cultural resources management actions common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool.

Paleontological Resources (negligible adverse)
Field surveys would indicate where mitigation measures must be developed for vegetative treatments. This would have a negligible adverse effect on prescribed fire management and does not vary across the alternatives.

Visual Resources (negligible adverse)
VRM Class I and II management objectives require that visual resources be maintained, or that changes to the visual resource be unnoticeable to the casual observer. Depending on the project site, constraints could restrict the size or shape of vegetative treatment areas. About four percent of BLM-administered lands are in Class I areas in WSAs, which does not vary across the alternatives. This scale could have a minor adverse effect on prescribed fire and fuels management, but mitigation measures would likely be developed for successful design and implementation of projects. Impacts common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool. Other than WSAs, VRM is variable and is discussed further in each alternative.

Land Resources

Forest Products
Management of forest products varies across the alternatives and is discussed below under each alternative.

Lands and Realty (minor beneficial)
Exchanging lands to consolidate blocks of BLM-administered lands, disposing of isolated public lands, and pursuing easements to access public lands would facilitate fuels management actions at the project and landscape levels. Alternatives A, B, and D consider or prioritize these types of actions which has a minor beneficial effect on prescribed fire management. See Alternative C for further discussion.

Renewable Energy (no effect)
Management of renewable energy resources does not effect prescribed fire management and is not discussed further in this section.

Rights-of-Way and Corridors (no effect)
Management of ROW and corridors does not effect prescribed fire management and is not discussed further.

Travel and Transportation Management (negligible adverse)
Closing areas seasonally or year-round would reduce opportunities to implement vegetative treatments. Closures would vary across the alternatives and are further discussed by alternative. Travel and transportation management actions common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool.

Recreation (negligible adverse)
SRMA designations and associated recreation values could constrain vegetative

treatments, especially prescribed fire. However, in some cases treatments might be needed to reduce hazardous fuel loads near recreation facilities. Recreation management actions common to all alternatives would have a negligible adverse effect on prescribed fire as a management tool.

Lands with Wilderness Characteristics (negligible beneficial)
Managing lands with wilderness characteristics to emphasize ecosystem health and natural values is compatible with prescribed fire and other vegetative treatments. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a negligible beneficial effect on prescribed fire management. See Alternative B for further discussion.

Livestock Grazing Management (minor beneficial)
The creation and maintenance of reserve allotments varies across the alternatives, but where allowed, could provide temporary grazing opportunities where rest or deferment is required after vegetative treatments. Resting treatment areas as necessary prior to prescribed fire would facilitate implementation by extending burn windows. Livestock grazing management actions common to all alternatives would have a minor beneficial effect on prescribed fire as a management tool.

Livestock grazing strategies generally would include rest periods after vegetative treatments. Under some circumstances, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain grazing strategies that benefit range, fire, and fuels management. Vermeire et al. (2011) found that annual grasses were reduced in the Northern Great Plains following summer fire. See the alternatives for further discussion about rest periods. In management common to all, this negligible adverse effect is less important than the minor beneficial effects from creating reserve allotments.

Special Designations

Areas of Critical Environmental Concern
ACECs are not designated in alternatives A and C, but are discussed further in alternatives B and D.

Scenic or Back Country Byways and Wild and Scenic Rivers (no effect)
See the discussion in alternatives B and D, but these special designations otherwise have no effect on prescribed fire management.

Wilderness Study Areas (minor adverse)
Fuels management activities must follow the policy and guidelines of BLM Manual 6330 – Management of Wilderness Study Areas to preserve or enhance the natural character of WSAs and avoid unnecessary impairment of a WSA's suitability for preservation as wilderness. Appendix Q (p. 2101) provides more information from BLM Manual 6330 – Management of Wilderness Study Areas. This does not vary across the alternatives and is not discussed further in this section, however further restrictions on motorized and mechanized equipment is discussed within the alternatives.

Socioeconomic Resources

Social and Economic Conditions and Health and Safety (negligible beneficial)

Ensuring that local and regional economic development and local land use plans are considered in BLM actions, and working with local agencies to foster public awareness benefits fire and fuels management. Reducing or eliminating physical hazards through appropriate mitigations benefits fire and fuels management by adding safety to fire operations. This does not vary across the alternatives and is not discussed further in this section.

4.3.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended in 2001. Under this alternative, the BLM would treat approximately 14,000 acres with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the Forests and Woodlands section.

Fire and Fuels Management (minor beneficial)

Under Alternative A, unplanned ignitions could be managed with limited suppression strategies, which would help meet fuels and fire ecology objectives at the project level. This would have a minor beneficial effect on fuels management.

Physical Resources

Soil (minor adverse)
Under Alternative A, there would be restrictions and prohibitions on surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability. The authorized officer could waive these restrictions and prohibitions, so hazardous fuels projects could be considered in areas covered by County Wildfire Protection Plans or where high fuel loads threaten other resource values. Alternative A soils management would have a minor adverse effect on the use of prescribed fire as a management tool.

Water Resources (minor adverse)
Alternative A would prohibit surface disturbance within 500 feet of water sources, which could increase the complexity of implementing prescribed fire. However, the authorized officer could waive the prohibition as appropriate for successful implementation. Alternative A water management would have a minor adverse effect on the use of prescribed fire as a management tool.

Cave and Karst Resources (negligible beneficial)
In Alternative A there are no constraints on surface use for vegetative treatments, which would have a negligible beneficial effect on prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands and Grassland and Shrubland Communities (minor beneficial)
Under Alternative A, managing vegetation to meet forest and rangeland health standards also would meet fuels management objectives. Reducing hazardous fuel accumulations would likely improve fire regime conditions. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources (minor adverse)
Alternative A would prohibit surface disturbance within 500 feet of water sources, which could

increase the complexity of implementing prescribed fire. However, the authorized officer could waive the prohibition as appropriate for successful implementation. Alternative A riparian management would have a minor adverse effect on the use of prescribed fire as a management tool.

Invasive Species and Pest Management (negligible beneficial)
See *Impacts Common to All Alternatives*.

Fish and Wildlife Resources (minor adverse)
See *Impacts Common to All Alternatives*.

Special Status Species (minor adverse)
See *Impacts Common to All Alternatives*.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
See *Impacts Common to All Alternatives*.

Visual Resources (negligible adverse)
Under Alternative A, the approximately four percent of BLM-administered lands in the planning area are managed as VRM Class I, which could affect the sizes, shapes, or placement of vegetative treatments. This scale could have a minor adverse effect on prescribed fire and fuels management, but mitigation measures would likely be developed for successful design and implementation of projects. There would be few constraints for Class II areas. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products (minor beneficial)
Under Alternative A, the commercial harvest of wood products, diseased old growth, and overstocked forests would reduce fuel loading, improve defensible space in WUI areas, and contribute to safer and less expensive suppression operations.

Timber harvest methods (e.g., clear-cuts) that create fuel breaks could reduce the size of wildfires. However, limiting clear-cut methods to fewer than 20 acres would not support landscape-scale fire regime objectives in lodgepole pine settings.

Pre-commercial thinning would provide cost-effective benefits for forest health and associated reductions in fuel loads during and after the planning period.

Overall, Alternative A management of forest products would have a minor beneficial effect on the use of prescribed fire as a management tool.

Lands and Realty (minor beneficial)
See *Impacts Common to All Alternatives*.

Travel and Transportation Management (major adverse)
Under Alternative A, seasonally closed roads would affect approximately 16% of BLM-administered lands in the planning area, and would reduce opportunities to implement prescribed fire treatments during times when weather and fuel parameters can be most viable.

Recreation (negligible adverse)
See *Impacts Common to All Alternatives*.

Livestock Grazing Management (negligible adverse)
Also see *Impacts Common to All Alternatives*. Resource reserve allotments would not be designated in this alternative, so would not benefit fire and fuels management by providing temporary grazing opportunities where rest or deferment is required after vegetation treatments.

Livestock grazing rest periods after vegetative treatments could include the first full year and deferment the following season. In some cases, such as adaptive management of annual bromes, this could unnecessarily postpone or constrain grazing strategies that benefit range, fire, and fuels management. This would have a negligible adverse effect on the use of prescribed fire as a management tool.

Special Designations

See *Impacts Common to All Alternatives*.

4.3.2.4. Alternative B

Alternative B would emphasize resource conservation. Under this alternative, the BLM would treat approximately 3,500 acres with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section.

Fire and Fuels Management (minor beneficial)

Under Alternative B, managing wildfires for resource benefit could help meet fuels and fire ecology objectives, and compensate for constraints on allowable acres for prescribed fire treatments. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Physical Resources

Soil (major adverse)
Alternative B effects on the use of prescribed fire as a management tool would be similar to effects under Alternative A, except that under Alternative B, the authorized officer could not waive prohibitions on surface disturbances. Specifically, prescribed fire projects would be prohibited on highly erosive soils, which accounts for approximately 28% of BLM-administered lands in the planning area. Hazardous fuels projects could not be considered in areas where high fuel loads threaten structures or other resource values. Alternative B soils management would have a major adverse effect on the use of prescribed fire as a management tool.

Water Resources (minor adverse)
Alternative B effects on the use of prescribed fire as a management tool would be similar to effects under Alternative A, except that the authorized officer could not waive prohibitions on surface disturbances within 500 feet of water sources. As for soils management, hazardous fuels projects could not be considered in these areas. In addition, this restriction could deny the use of water for prescribed fire operations in nearby areas. Alternative B water management actions would have a minor adverse effect on the use of prescribed fire as a management tool.

Cave and Karst Resources (negligible adverse)
Cave and karst management in Alternative B would prohibit timber harvest activities on approximately 13% of the BLM-administered lands. This would have a major adverse effect on mechanical treatments done by machine. However, hand thinning and prescribed fire would likely be allowed with mitigation measures in place. This would have a negligible adverse effect on prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Under Alternative B, managing forests and woodlands with an emphasis on natural processes would allow insects and disease, wildfire, and other natural disturbances to run their natural courses. This could be beneficial in areas where historical or desirable vegetation characteristics are healthy and could be maintained by natural processes.

However, in recent decades, natural and man-made disturbances have been prevented or eliminated in many forested areas. This has created a departure from historical conditions, with high stand densities, ladder fuels, and heavy fuel loads in contiguous areas across the forested landscape. Wildfire behavior in these areas would likely be intense and could produce undesirable, high-severity fire effects. Under Alternative B, natural fuel breaks such as moist aspen communities would eventually be replaced by drier, more flammable conifer vegetation, and conifer expansion into grassland communities would contribute to larger fires.

Using silviculture treatments only when catastrophic events threaten the public and surrounding lands would not effectively address firefighter and public safety, or the priorities of Community Wildfire Protection Plans.

Overall, Alternative B forests and woodlands management actions would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources (minor adverse)
Alternative B effects on the use of prescribed fire as a management tool would be similar to effects under Alternative A, except that the authorized officer could not waive prohibitions on surface disturbances within 500 feet of water sources. Alternative B riparian management actions would have a minor adverse effect on the use of prescribed fire as a management tool.

Invasive Species and Pest Management (minor beneficial)
In addition to the effects described under Impacts Common to All Alternatives, under Alternative B, identifying pest management areas would generally facilitate fuels management planning. This would have a minor beneficial effect on the use of prescribed fire as a management tool.

Fish and Wildlife Resources (major adverse)
Specific to Alternative B, the following restrictions would affect implementation of fuels projects and other vegetative treatments:

- Surface-disturbing and disruptive activities would be prohibited within 0.25 mile of naturally occurring waterbodies that contain desirable fish. This would affect approximately seven percent of BLM-administered lands in the planning area.
- Prohibiting surface-disturbing and disruptive activities in crucial elk winter range, in big-game migration corridors, and in elk calving areas would reduce opportunities to implement prescribed fire treatments on approximately seven percent of BLM-administered lands in

the planning area. In some cases, especially in forested settings where much of this habitat occurs, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall. Designating elk crucial and year-round ranges for the Fortification Creek elk herd could exclude prescribed fire treatments from an additional four percent of BLM-administered lands.

- Seasonal restrictions for active raptor nests would constrain treatments as far away as 1.5 miles, which could affect approximately 55% of BLM-administered lands in the planning area. This would especially affect treatments near red-tailed hawk nests and several species of owl, whose timing restrictions cover early spring when fire prescriptions often are most feasible.

Overall, Alternative B management of fish and wildlife resources would have a major adverse effect on the use of prescribed fire as a management tool.

Special Status Species (major adverse)
Specific to Alternative B, the following restrictions would affect implementation of fuels projects and other vegetative treatments and would have major adverse effects to prescribed fire management:

- Surface-disturbing activities that could adversely affect special status plant habitats would be prohibited, including the use of suppression chemicals in motorized fire suppression vehicles. These constraints could affect the implementation of some vegetative treatments on approximately 16% of BLM-administered lands in the planning area, although project planning could provide options to accommodate the restrictions. Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands.
- Seasonal restrictions for active raptor nests would constrain treatments as far away as 1.5 miles. This would affect treatments on approximately 14% of BLM-administered lands in the planning area when prescribed fire often is most feasible.
- Prohibiting surface-disturbing and disruptive activities in special status reptile and amphibian habitats, regardless of species presence, would greatly constrain vegetative treatments in and near ephemeral channels, 100-year floodplains, and south-facing rock outcrops. These sites occupy approximately 23% of BLM-administered lands in the planning area.
- Within occupied Greater Sage-Grouse habitat, surface disturbance restrictions would affect about three percent of BLM-administered lands, and seasonal restrictions would affect about 60% of BLM-administered lands until mid-June. Because sagebrush preservation would be a priority, much of the landscape could be unavailable to meet other vegetation goals.

Heritage and Visual Resources

Cultural Resources (major adverse)
Under Alternative B, surface disturbance in areas with historic properties or within 5 miles of the visual horizon of historic properties would be prohibited. Hazardous fuels projects or other vegetative treatments could not be considered in those areas. This would have a major adverse effect on the use of prescribed fire as a management tool.

Visual Resources (major adverse)
Under Alternative B, approximately 32% of BLM-administered lands in the planning area would be managed as VRM Class I or Class II, which could affect the sizes, shapes, or placement of vegetative treatments. In addition, visual simulation and mitigation designs would be performed for all vegetative treatments in VRM Classes I to III areas. This management would have a major adverse effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products (negligible adverse)
Under Alternative B, offering only sawtimber from forest treatments, limiting harvest areas to 5 acres, and not utilizing pre-commercial thinning would not efficiently meet hazardous fuels objectives. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Lands and Realty (minor beneficial)
See *Impacts Common to All Alternatives*.

Travel and Transportation Management (major adverse)
Alternative B effects from travel and transportation management would be the same as described under *Impacts Common to All Alternatives*, except that approximately 40% of BLM-administered lands in the planning area would be closed year-round to motorized vehicles, and another 10% would be closed during winter. These restrictions would seriously limit the implementation of vegetative treatments and would have a major adverse effect on the use of prescribed fire as a management tool.

Recreation (moderate adverse)
Under Alternative B, vegetative treatments could be constrained by restrictions on surface-disturbing activities in SRMAs, which would affect approximately seven percent of BLM-administered lands in the planning area. However in some sites, treatments might be needed to reduce hazardous fuel loads around recreation facilities. Because of the restrictions on surface-disturbing activities, Alternative B recreation management would have a moderate adverse effect on the use of prescribed fire as a management tool.

Lands with Wilderness Characteristics (minor adverse)
Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to implement prescribed fire to accomplish multiple objectives. For conifer communities in particular, this would help to maintain or improve diverse structural/seral stages at the landscape-level, which would improve forest health and fuel loads. This would have a minor beneficial effect on prescribed fire management. However in Alternative B, associated management actions would restrict access or constrain surface disturbances which would limit vegetative treatments. Overall, this would have a minor adverse effect on prescribed fire.

Livestock Grazing Management (negligible adverse)
Under Alternative B, resource reserve allotments would be designated in this alternative, which would benefit fire and fuels management by providing temporary grazing opportunities where rest or deferment is required after vegetation treatments, however, a minimum of two years rest from livestock grazing would be required after prescribed fire treatments. Where there are no alternative pastures, this potential hardship to lessees could restrict or prevent prescribed fire projects. Under some circumstances, such as adaptive management of annual bromes, this could postpone or constrain other grazing strategies that would benefit range, fire, and fuels management. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Special Designations

Areas of Critical Environmental Concern (moderate adverse)
Depending on site characteristics, values, and protection measures, newly designated ACECs could either encourage or discourage the use of prescribed fire to maintain ecological conditions. Site-specific management plans would be developed for each area to provide guidance for vegetation management activities. In Alternative B, approximately eight percent of BLM-administered lands in the planning area would have restrictions on surface disturbance. This would have a moderate adverse effect on the use of prescribed fire as a management tool.

Scenic or Back Country Byways and Wild and Scenic Rivers (negligible adverse)
Such designations could influence the application of vegetative treatments, depending on values or constraints described for other resources. Constraints would have an adverse effect on prescribed fire management. Conversely, these types of designations can provide educational opportunities for interpretive displays about disturbance ecology, fire, and vegetative treatments, which would have a beneficial effect on prescribed fire management. Overall, these designations would likely have a negligible adverse effect on prescribed fire management.

Wilderness Study Areas (minor adverse)
All motorized and mechanized equipment would be prohibited in WSAs, which would preclude prescribed fire and many other vegetation treatments on about four percent of BLM-administered lands. This would have a minor adverse affect on fuels management.

4.3.2.5. Alternative C

Alternative C would emphasize resource use. During the planning period, approximately 42,000 acres would be treated with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section.

Fire and Fuels Management (negligible beneficial)

Under Alternative C, full protection strategies for wildfires would not meet fuels and fire ecology objectives, but the allowed levels of prescribed fire treatments under this alternative would compensate to meet landscape-level objectives in some areas. This management would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Physical Resources

Soil and Water Resources (negligible beneficial)
Under Alternative C, there would be no restrictions or prohibitions on surface-disturbing activities in areas of high erosion hazard, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability. Surface-disturbing and disruptive activities would be allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This would facilitate implementation of fuels treatment projects. Overall, Alternative C management of soils and water would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Cave and Karst Resources (negligible adverse)
Surface disturbance restrictions and buffers from cave and karst management would affect very few acres and would have negligible adverse effects for prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Under Alternative C, actively managing forests and woodlands to maximize forest health and to prevent expansion into other plant communities also would meet fuels management objectives. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Also see Soil and Water, above. Under Alternative C, surface-disturbing and disruptive activities would be allowed within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This would facilitate implementation of fuels treatment projects. Management riparian and wetland resources would have a negligible adverse effect on the use of prescribed fire as a management tool.

Invasive Species and Pest Management (negligible adverse)
Alternative C effects from invasive species and pest management would be the same as described under *Impacts Common to All Alternatives*, except that management would be reactive and could complicate prescribed fire management. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Fish and Wildlife Resources (negligible beneficial)
In general, Alternative C would allow surface-disturbing and disruptive activities in wildlife habitat. This would facilitate implementation of fuels treatment projects.

Special Status Species (negligible beneficial)
Except for effects described in *Impacts Common to All Alternatives*, the following actions in Alternative C would facilitate implementation of fuels treatment projects and would have a negligible beneficial effect on prescribed fire management:

- Surface-disturbing activities would be allowed in special status plant habitats but not within known populations of such plants. This includes the use of fire suppression vehicles and suppression chemicals. Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands.
- Surface disturbance would not be prohibited in special status reptile and amphibian habitats.

Restrictions for Greater Sage-Grouse habitat management would be similar to *Impacts Common to All Alternatives* with a minor adverse effect on Planned Fire, however this is not included in the assessment for this alternative.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Under Alternative C, required cultural resources surveys would be performed in vegetative treatment units to identify sites and mitigation measures before treatment. Otherwise, this alternative would allow surface-disturbing activities near cultural sites. Alternative C management would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Visual Resources (negligible beneficial)
Under Alternative C, approximately four percent of BLM-administered lands in the planning area would be managed as VRM Class I. However, all Class II areas would be managed as Class III, which would remove most restrictions on vegetative treatments. Alternative C management

of visual resources would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products (moderate beneficial)
Under Alternative C, offering an array of forest products to facilitate management of forests and woodlands would also meet fuels management objectives. In time, new local markets may be created which could lower costs for vegetation treatments. Alternative C management of forest products would have a moderate beneficial effect on the use of prescribed fire as a management tool.

Lands and Realty (negligible adverse)
Under Alternative C, there would be disposals of public lands, but exchanges and access easements would not be considered or pursued. With no opportunity to consolidate public lands, fuels management planning and vegetative treatments would remain complex in many areas. This management would have a negligible adverse effect on the use of prescribed fire as a management tool.

Travel and Transportation Management (major adverse)
In Alternative C, the effects of travel and transportation management on fuels management would be the same as described under *Impacts Common to All Alternatives*, although under this alternative, very few BLM-administered acres would be closed year-round to motorized vehicles. However, seasonally closing roads would affect approximately 16% of BLM-administered lands in the planning area and would reduce opportunities to implement prescribed fire treatments during times when weather and fuel parameters would be most viable. This management would have a major adverse effect on the use of prescribed fire as a management tool.

Recreation (negligible adverse)
See *Impacts Common to All Alternatives*.

Livestock Grazing Management (negligible beneficial)
Alternative C effects would be similar to effects under Alternative A, but Alternative C would allow deferment within the first year after treatment, rather than total rest. This could open more opportunities to implement prescribed fire treatments, and have a negligible beneficial effect on the use of prescribed fire as a management tool, especially because resource reserve allotments would not be designated in this alternative.

Special Designations

Wilderness Study Areas (minor adverse)
All motorized equipment would be prohibited in WSAs, which would preclude prescribed fire and many other vegetation treatments on about four percent of BLM-administered lands. This would have a minor adverse effect on fuels management.

4.3.2.6. Alternative D

Alternative D would generally allow resource use if the activity benefits resource values, can be done in a manner that conserves resource values, or provides adequate mitigation to reduce adverse effects on sensitive resources. During the planning period, approximately 14,000 acres

could be treated with prescribed fire and other fuels treatments. Mechanical treatments are discussed in the *Forests and Woodlands* section. Alternative D is the BLM preferred alternative.

Fire and Fuels Management (minor beneficial)

Under Alternative D, unplanned ignitions could be managed for resource benefit or with limited suppression strategies. Either strategy could meet fuels and fire ecology objectives and therefore have a minor beneficial effect on the prescribed fire management.

Physical Resources

Soil (negligible beneficial)
Subject to evaluation, Alternative D would allow surface-disturbing activities on highly erosive soils, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability. This would provide flexibility to manage prescribed fire and other vegetative treatments for multiple objectives or for other priorities such as fuels reduction in WUI areas. Alternative D soils management actions would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Water Resources (negligible beneficial)
Based on management decisions for resource values, allowing surface disturbance within 500 feet of water sources would provide flexibility to manage prescribed fire efficiently and safely and to meet other resource objectives. Managing riparian and uplands to restore perennial flows or standing water would benefit fuels management objectives by creating natural fuel breaks and restoring vegetative communities. These management actions would have a negligible beneficial effect on the use of prescribed fire as a management tool.

Cave and Karst Resources (negligible adverse)
Surface disturbance restrictions and buffers from cave and karst management would affect few acres and have negligible adverse effects for prescribed fire management.

Biological Resources

Vegetation – Forests and Woodlands and Grassland and Shrubland Communities (minor beneficial)
Under Alternative D, managing forests and woodlands to maximize forest health and to emphasize multiple resource values would benefit fire and fuels management by reducing fuel loads and restoring characteristic fire regimes and plant communities. This would have a minor beneficial effect on the use of prescribed fire as a management tool.

Vegetation – Riparian/Wetland Resources (negligible beneficial)
See *Water*, above.

Invasive Species and Pest Management (minor beneficial)
In addition to the effects described under *Impacts Common to All Alternatives*, Alternative D would include long-range pest management plans with treatment areas prioritized. This could benefit fuels management by providing guidance for activities, as would designating and prioritizing areas for the treatment of annual brome grasses. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Fish and Wildlife Resources (moderate adverse)
In general, Alternative D would provide opportunities to evaluate surface-disturbing and disruptive activities, and allow those activities if specific criteria could be met. Prescribed fire and other vegetative treatments could be implemented for multiple objectives or for other priorities, such as fuels reduction in developed interface areas. The exceptions are:

- Surface-disturbing and disruptive activities would be prohibited in crucial big-game winter range and in calving areas. Under Alternative D, approximately 12% of BLM-administered lands in the planning area would be affected, much of it in conifer settings. In some situations, especially in forested settings, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall.
- Surface-disturbing activities would be prohibited within specific buffers when those activities could disturb nesting raptors. For most species, the seasonal restriction would be in place from early spring until mid summer, and would affect approximately 7% of BLM-administered lands in the planning area. This restriction could reduce opportunities to implement vegetative treatments, although for many projects, site-specific evaluations would identify mitigation measures necessary for successful implementation.

Alternative D wildlife management actions include burying powerlines. This would enhance the safety of fire and fuels operations.

Overall, because of surface-disturbing constraints for big game and nesting raptors Alternative D fish and wildlife management actions would have a moderate adverse effect on the use of prescribed fire as a management tool.

Special Status Species (negligible beneficial)
Alternative D effects from special status species management would be similar to effects described under *Impacts Common to All Alternatives*. However, Alternative D would provide opportunities to manage special status plant habitats or implement treatments in habitats if treatments are known to enhance the species' distribution or if projects would not be within known populations of such plants. Where treatments occur in limber pine settings, current Wyoming BLM guidelines and prescriptions would be followed to enhance or maintain limber pine stands.

Alternative D, surface-disturbing and disruptive activities would be allowed where amphibian, reptile, and bat species occur if specific criteria could be met. This would provide opportunities to manage prescribed fire and other vegetative treatments for multiple objectives, other sensitive species, or for other priorities, such as fuels reduction in WUI areas.

For Greater Sage-Grouse Core Population Area and Connectivity Corridor, fuels treatments would follow current BLM management guidelines and fuels management BMPs to protect or enhance the habitat. About two percent of BLM-administered lands would have year-round surface-disturbing restrictions in Core Population Area and Connectivity Corridor, and at least 20% of BLM-administered lands would have seasonal restrictions from March through late June.

Not considering restrictions in Greater Sage-Grouse habitat, Alternative D management of special status species would have negligible beneficial effects on prescribed fire management.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative D would prohibit surface disturbance within identified sites, although the total

BLM-administered area affected would be less than one percent. This would have a negligible adverse effect on the use of prescribed fire as a management tool.

Visual Resources (minor adverse)
Under Alternative D, managing SRMAs, ACECs, and lands with wilderness characteristics as VRM Class II could restrict surface disturbance on approximately 63% of BLM-administered lands in the planning area. Depending on visual values, vegetative treatments could be constrained. However some treatments would mimic natural processes and restore characteristic plant communities, thereby contributing to the visual appeal. Because of these trade-offs, Alternative D management of visual resources would have a minor adverse effect rather than a major adverse effect on the use of prescribed fire as a management tool.

Land Resources

Forest Products (minor beneficial)
Under Alternative D, offering forest products throughout the planning area could enhance local markets and encourage cost-effective alternatives to slash disposal, which would benefit fuels management activities. Pre-commercial thinning and other practices that create healthy forest stands would benefit fire and fuels management by efficiently reducing fuel loads and ladder fuels. Rather than being restricted by predetermined acreages, treatment areas could follow topographic features and could be planned to mitigate fire spread and behavior. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Lands and Realty (minor beneficial)
Under Alternative D, exchanging lands to consolidate blocks of BLM-administered lands, disposing of isolated public lands, and pursuing easements to access public lands would facilitate fuels management actions at the project and landscape levels. This management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Travel and Transportation Management (moderate adverse)
Alternative D effects would be similar to effects under Alternative C because approximately five percent of BLM-administered lands in the planning area would be closed year-round to motorized travel. However, under Alternative D, seasonal closures would include approximately 10% of public lands in big-game crucial winter range. In some situations, especially in forested settings, prescribed fire might not be available as a treatment option because weather and fuel prescriptions could not be satisfied during summer and early fall. Alternative D management of transportation and access would have a moderate adverse effect on the use of prescribed fire as a management tool.

Recreation (minor adverse)
Alternative D effects would be similar to those described under Impacts Common to All Alternatives. In addition, vegetative treatments could be constrained under Alternative D by restrictions for surface-disturbing activities in SRMAs, although in some cases treatments might be needed to reduce hazardous fuel loads. This management would have a minor adverse effect on the use of prescribed fire as a management tool.

Lands with Wilderness Characteristics (negligible beneficial)
Managing lands with wilderness characteristics to emphasize ecosystem health and natural values could provide opportunities to implement prescribed fire to accomplish multiple objectives. For conifer communities in particular, this would help to maintain or improve diverse structural/seral

stages at the landscape-level, which would improve forest health and fuel loads. This would have a negligible beneficial effect on prescribed fire management.

Livestock Grazing Management (minor beneficial)
Under Alternative D, designating future resource reserve allotments would provide adaptive management options for temporary grazing when rest or deferment is required in other areas after prescribed fire treatments. Livestock grazing rest or deferment might be required as necessary after fires or other vegetative treatments, which would allow flexibility to manage for multiple resources and objectives. Alternative D livestock grazing management would have a minor beneficial effect on the use of prescribed fire as a management tool.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Depending on site characteristics, values, and protection measures, newly designated ACECs could either encourage or discourage the use of prescribed fire to maintain ecological conditions. Site-specific management plans would be developed for each area to provide guidance for vegetation management activities. Alternative D would restrict surface disturbance on approximately five percent of BLM-administered lands in the planning area, which would have a minor adverse effect on prescribed fire management and other vegetative treatments.

Scenic or Back Country Byways and **Wild and Scenic Rivers** (negligible adverse)
Such designations would influence the application of vegetative treatments, depending on values or constraints described for other resources. Constraints would have an adverse effect on prescribed fire management and other vegetative treatments. Conversely, these types of designations can provide educational opportunities for interpretive displays about disturbance ecology and fire, and vegetative treatments, which would have a beneficial effect on prescribed fire management. Overall, these designations would likely have a negligible adverse effect on prescribed fire management.

Wilderness Study Areas (minor adverse)
All motorized and mechanized equipment would be prohibited in WSAs, which would preclude prescribed fire and many other vegetation treatments on about four percent of BLM-administered lands. This would have a minor adverse affect on fuels management.

4.3.2.7. Cumulative Impacts

WUI areas would receive priority for vegetative treatments. Under any alternative, non-BLM partners would mechanically treat approximately 3,200 acres of WUI on other public and private lands during the planning period. Non-BLM partners also would use prescribed fire on approximately 2,000 acres near such WUI areas as subdivisions and campgrounds. When combined with BLM treatments (except under Alternative B), developed areas such as urban interface or rural intermix would likely have received hazardous fuels reduction treatments at least once during the planning period. Some areas might have been treated twice, or would be due for reentry. This would create favorable conditions for fire suppression actions, which would increase the likelihood of early success at fire containment, or would lower the risk to structures.

As possible, BLM prescribed fire treatments would be implemented in remote areas for resource benefit and to restore characteristic fire regimes. Treatments in these areas would contribute to the goal of improving fire regime conditions and vegetative structure on the landscape.

Under alternatives A and D, prescribed fire could be implemented on approximately 14,000 acres of BLM-administered lands in the planning area during the planning period, which is approximately 27,596 acres per year. Hazardous fuels objectives in WUI areas would likely be accomplished. Vegetative treatments in other areas could achieve project-level objectives, but there is little opportunity to use prescribed fire to improve landscape-level fire regime conditions. Some resource constraints or restrictions in these alternatives could be waived or mitigated, especially in Alternative D, which would help to accomplish the treatments.

In Alternative D, unplanned ignitions could be managed using a full range of strategies, including resource benefit objectives, which would contribute to fuels reduction objectives on those sites.

Alternative B would allow prescribed fire on only approximately 3,500 acres during the planning period, which is approximately 175 acres per year. Hazardous fuels objectives in developed interface areas would be partially accomplished, but might not keep pace with interface growth. Vegetative treatments in other areas would be minimal or none because of other resource constraints or restrictions. There would not be opportunities to use prescribed fire to improve fire regime conditions at any scale. Unplanned ignitions could be managed to restore fire to the landscape, but restrictions from other resources could constrain its use in most cases.

Under Alternative C, prescribed fire could be implemented on approximately 42,000 acres during the planning period, which is approximately 2,100 acres per year. Hazardous fuels objectives in developed interface areas could be fully accomplished. In addition, the scale of vegetative treatments in other areas could improve landscape-level fire regime conditions in portions of the planning area. Treatments would be necessary to maintain fire on the landscape and to offset the effects of full protection of unplanned ignitions.

4.3.2.8. Conclusion

For planned ignitions (prescribed fire), Alternative C would allow the greatest opportunity and fewest constraints to meet landscape-level fire regime and fuel objectives. This alternative would provide flexibility to plan and implement vegetative treatments as necessary to meet desired vegetation conditions in the planning area. At approximately 2,100 acres per year, there would be an excellent opportunity to implement prescribed fire projects and other treatments in developed interface and other areas.

Conversely, Alternative C would emphasize full protection strategies for unplanned ignitions, which would impede progress toward meeting desired fire regime conditions and other vegetation objectives. Because of this discrepancy, Alternative C does not best meet the overall goals and objectives of fire and fuels management, whereas Alternative D would allow a reasonable mix of planned and unplanned ignitions to meet multiple objectives.

Table 4.38, “Summary of Impacts to Planned Fire” (p. 792) summarizes effects on the use of prescribed fire as a management tool.

Table 4.38. Summary of Impacts to Planned Fire

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Soil	Minor adverse	Major adverse	Negligible beneficial	Negligible beneficial
Water Resources	Minor adverse	Minor adverse	Negligible beneficial	Negligible beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Cave and Karst Resources	Negligible beneficial	Negligible adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	No effect	No effect	No effect	No effect
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor beneficial	Minor beneficial	Negligible beneficial	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Minor beneficial	Negligible beneficial	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Vegetation – Grassland and Shrubland Communities	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Vegetation – Riparian/Wetland Resources	Minor adverse	Minor adverse	Negligible adverse	Negligible beneficial
Invasive Species and Pest Management	Negligible beneficial	Minor beneficial	Negligible adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Minor adverse	Major adverse	Negligible beneficial	Moderate adverse
Fish and Wildlife Resources – Wildlife	Minor adverse	Minor adverse	Negligible beneficial	Moderate adverse
Special Status Species – Plants	Minor adverse	Major adverse	Negligible beneficial	Negligible beneficial
Special Status Species – Fish	Minor adverse	Major adverse	Negligible beneficial	Negligible beneficial
Special Status Species – Wildlife	Minor adverse	Major adverse	Negligible beneficial	Negligible beneficial
Heritage and Visual Resources				
Cultural Resources	Minor beneficial	Major adverse	Negligible beneficial	Negligible adverse
Paleontological Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	Negligible adverse	Major adverse	Negligible beneficial	Minor adverse
Land Resources				
Forest Products	Minor beneficial	Negligible adverse	Moderate beneficial	Minor beneficial
Lands and Realty	Minor beneficial	Minor beneficial	Negligible adverse	Minor beneficial
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	Major adverse	Major adverse	Major adverse	Moderate adverse
Recreation	Negligible adverse	Moderate adverse	Negligible adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	Minor adverse	No effect	Negligible beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Livestock Grazing Management	Negligible adverse	Negligible adverse	Negligible beneficial	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Moderate adverse	No effect	Minor adverse
Scenic or Back Country Byways	No effect	Negligible adverse	No effect	Negligible adverse
Wild and Scenic Rivers	No effect	Negligible adverse	No effect	Negligible adverse
Wilderness Study Areas	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Socioeconomic Resources				
Social and Economic Conditions	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Health and Safety	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial

4.3.3. Stabilization and Rehabilitation

At present, there is no programmatic plan for the BFO to address Emergency Stabilization and Rehabilitation (ES&R) activities. Projects would be implemented on a case-by-case basis following the guidance in BLM Handbook H-1742-1, Burned Area Emergency Stabilization and Rehabilitation. Regardless of alternative, interdisciplinary planning would consider constraints and long-term effects, and would identify mitigation measures or restrictions necessary for successful implementation of ES&R projects. Appendix Q (p. 2101) provides more information about ES&R planning, funding, and implementation.

4.3.3.1. Methods and Assumptions

ES&R treatments are planned actions for emergency stabilization and repair of damages or anticipated damages from the undesirable effects of fire. Rehabilitation of fire lines and other suppression damage is an incident response action and should be performed by suppression resources shortly after the fire is contained. For example if heavy equipment is used to create fire lines, it will generally be needed to rehabilitate the lines and should be used if possible before being demobilized from the incident.

Impact analyses and conclusions are qualitatively based on expected fire effects versus the level of fire management strategies across the alternatives.

4.3.3.2. Impacts Common to All Alternatives

ES&R projects must follow management guidance from the approved RMP, and must have activity plans and decisions in place before they may be implemented.

4.3.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended in 2001 and maintained. Suppression strategies under this alternative would balance conservation of resource values with protection of developed areas. Although high-severity fire effects are

possible, appropriate response to unplanned ignitions would likely minimize the need for ES&R treatments.

4.3.3.4. Alternative B

With an emphasis on natural processes under Alternative B, conservative levels of vegetation treatments, and current fuel load conditions, large-scale high-severity fire effects would be likely in some areas, especially conifer settings. More ES&R projects would be needed than have historically been implemented in the planning area. Motorized and mechanized equipment would be prohibited in WSAs except in emergency situations, which would make Burned Area Rehabilitation (BAR) projects difficult or impossible to implement.

4.3.3.5. Alternative C

Under Alternative C, suppressing fires at smallest size could minimize total acres of wildfire, thereby reducing the need for emergency stabilization treatments. In addition, prescribed fire treatments would help offset undesirable vegetation conditions that would develop from lack of fire disturbance. However, aggressive protection actions in this alternative could create excessive damages from fireline construction and rehabilitation, and contribute to other resource concerns such as damaged soils and spread of invasive plants. Motorized equipment would be prohibited in WSAs except in emergency situations, which would make BAR projects difficult to implement.

4.3.3.6. Alternative D

Alternative D suppression strategies balance conservation or enhancement of resource values with protection of developed areas. Although high-severity fire effects would be possible, appropriate response to unplanned ignitions should minimize the need for ES&R treatments. In addition, allowing a full range of suppression actions would generally reduce surface disturbance from suppression actions and minimize the need for fire line rehabilitation. However, motorized and mechanized equipment would be prohibited in WSAs except in emergency situations, which would make BAR projects difficult or impossible to implement.

4.3.3.7. Cumulative Impacts

In any alternative, implementing ES&R projects on fire-damaged lands would create immediate and cumulative beneficial effects. This is especially applicable to important watersheds in developed areas, or to restoration of sensitive resources and wildlife habitats.

4.3.3.8. Conclusion

Stabilization and rehabilitation projects would be implemented under any alternative as necessary to repair or mitigate damage or undesirable fire effects. Alternatives A and D would provide practical management of unplanned fires so that effects from suppression actions versus fire effects could be balanced. However, undesirable fire effects would be possible under any alternative and will require ES&R activities.

4.4. Biological Resources

4.4.1. Vegetation – Forests and Woodlands

This section describes potential effects on the forest and woodland communities in the planning area from BLM management of resources and resource uses under the alternatives. The *Vegetation – Forests and Woodlands* section of Chapter 3 describes existing conditions of these vegetative communities. Healthy forests and woodlands support other resources (e.g., physical and biological resources) and resource uses (e.g., forest products and recreation). Actions that remove forest or woodland vegetation for purposes other than promoting forest health and sustainability are considered adverse (e.g., minerals development or road construction). Conversely, actions that promote healthy forest and woodland communities are considered beneficial, including those that might reduce vegetative cover over the short term (e.g., prescribed fire or pest management).

4.4.1.1. Methods and Assumptions

Indicators of forest and woodland health are the amount, diversity, and age-class structure of the forest and woodland communities. The goal is to sustain healthy forest and woodland communities in their desired ecological conditions. Forest and woodland communities should be sustainable, resilient, diverse, and able to recover from natural and human disturbances. The types of projected effects under the alternatives are similar; however, the potential amount of acres disturbed would vary by specific allowable uses and management actions associated with individual alternatives, as described below. Appendix G (p. 1671) identifies the projected amount of surface disturbance in the planning area.

Short-term effects would result during initial surface disturbance (vegetation removal) before revegetation is completed, or from decreases in forest health that do not result in a change of the vegetative community. Long-term adverse effects would be changes in vegetative community type that would restrict reestablishment of the desired vegetative community. The scale of effects would be the same as identified in the Introduction of Chapter 4.

Assumptions

Assumptions and methods used in this analysis include, but are not limited to the following:

- This impact analysis and its conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information from other agencies.
- Spatial analysis was performed using the ESRI ArcGIS 10.0 computer software.
- Effects are quantified where possible. Effects are based on the acreage of forest (51,225 acres) and woodland (26,147 acres) communities on BLM surface in the planning area.
- In the absence of quantitative data, best professional judgment was used. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate.
- Forest inventory data was collected on the larger BLM forest management area in 2005.

4.4.1.2. Impacts Common to All Alternatives

Vegetation – Forests and Woodlands (major beneficial)
The BLM goal is to sustain healthy forest and woodland communities in their desired ecological

conditions. Forest management techniques, which include silvicultural operations such as thinning, timber stand improvement, and planting, can contribute to forest health by removing dead and dying trees, reducing the number of diseased trees and the spread of insects, and reducing the likelihood of uncharacteristic wildland fires.

Physical Resources

Air Quality (minor adverse)
Restrictions on vegetative treatments to mitigate adverse effects on air quality would vary depending on air quality conditions in the immediate area at the time of proposed treatments. Potential short-term adverse effects on vegetative treatments include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. This effect would be minor.

Soil (minor adverse)
A reclamation plan is required for all surface-disturbing activities. Forest health projects could be restricted in areas with unstable soils or particularly steep terrain where reclamation is challenging. This would have a minor adverse effect on forests and woodlands management.

Water Resources (minor adverse)
In areas with high-value water resources, management practices could be limited to prevent water quality degradation. Modification of forest health projects would be necessary in these areas in accordance with the Wyoming State Forestry BMPs. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. Water management actions would have a minor adverse effect on forest and woodland communities.

Cave and Karst Resources (no effect)
Caves and karst management actions common to all alternatives are procedural and would not effect forest and woodland communities.

Mineral Resources

Locatable Minerals (negligible adverse)
Public lands not formally withdrawn from minerals entry would be available for locatable minerals development. At present, locatable minerals operations affect 0.3% of BLM-administered forest and woodlands communities (138 and 92 acres, respectively). The trend in locatable minerals development in the planning area is predicted to be similar throughout the planning period. The effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Coal (no effect)
The potential acreage available for coal leasing is extensive, but the foreseeable activity would be confined to central Campbell County and north-central Sheridan County. Coal leasing and development would not affect BLM-administered forest and woodland resources, and is not further addressed in this section.

Leasable Minerals – Fluids (minor adverse)
Federal fluid mineral estate in the planning area would be available to fluid minerals leasing unless it is identified as administratively unavailable. Based on the predicted activity from oil and gas operators surveyed as part of the reasonably foreseeable development forecast, conventional

oil and gas development (potential of low to moderate could occur on 3,468 acres (13%) of BLM-administered woodlands. CBNG development could occur on 5,737 acres (22% of BLM-administered woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid mineral activities occur, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Salable Minerals (negligible adverse)
There are 205 acres (1.2%) of sand and gravel deposits in forest management areas (Billy Creek and the Horn). With the typically small size of salable minerals development, small acreages would be removed. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed through salable minerals development. Although sand and gravel deposits are present in slightly more than one percent of the forested areas, it is not likely the entire limited amount of predicted salable minerals development would occur in forested areas. Therefore, salable minerals development would have a negligible adverse effect on forest and woodland communities. The effects would be the same scale under all alternatives. Therefore, salable minerals development is not further addressed in this section.

Fire and Fuels Management (major beneficial)

Fire management can affect forest and woodland community health. Fuels treatment projects can promote forest and woodland health by reducing the potential for catastrophic wildfire. Large wildland fires could change the seral state of the forest or woodland. Wildland fire use for resource benefit promotes forest and woodland health. Fire and fuels management common to all alternatives would have a major beneficial effect on forests and woodlands.

Biological Resources

Vegetation – Grassland and Shrubland Communities (major beneficial)
Grassland and shrubland communities overlap forest and woodland communities and play an important role in creating vegetative mosaics and diversity for both vegetation types. The overlap benefits forest and woodland health. When forest management activities are performed, the soil is scarified for the introduction of seeds and openings for the grasses and shrubs, diversity in vegetation is produced. The grasses and shrubs protect the soil and water resources and provide cover and browse. Grassland and shrubland management actions common to all alternatives would have a major beneficial effect on forests and woodlands.

Vegetation – Riparian/Wetland Resources (moderate adverse)
The Wyoming Forestry BMPs require streamside management buffers. These buffers are located with consideration of slope, aspect, stream type, and stream life. This could reduce the acres available for forest health treatments, and have a moderate adverse effect on forests and woodlands.

Invasive Species and Pest Management (moderate beneficial)
The requirements to control invasive species and revegetate disturbed areas would increase the cost of forest health projects. Requirements to flush equipment and reseed only with approved seed are examples of the restrictions that would increase operation costs. However, the ability to control invasive species and pests plays a vital role in sustaining forest and woodland health. Overall management to control invasive species and pests would have a moderate beneficial effect on forests and woodlands.

Fish and Wildlife Resources – Wildlife and Special Status Species – Plants and Wildlife (negligible adverse)
The management of fish and wildlife including sensitive, Threatened, and Endangered species and their habitats would affect forest and woodland health. Fish and wildlife management actions could preclude or seasonally restrict forest health treatments in areas with habitat for these species, such as during the nesting season near raptor nests. Vegetative manipulations such as the removal of conifers to improve sagebrush habitat for Greater Sage-Grouse would decrease the area of forests and woodlands. Management of special status plant species and communities could preclude forest management projects in places where such species are present. Many wildlife species are dependent upon healthy forest and woodland communities, habitat enhancements for these species would benefit forest and woodland communities. In all, these management actions would have a negligible adverse effect on forest and woodland communities.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible adverse)
Management of cultural and paleontological resources could indirectly affect forest and woodland health through increased costs to stabilize and protect significant sites. The likelihood of significant sites within forest and woodland health treatments is low, therefore these management actions would have a negligible adverse effect on forests and woodland communities.

Visual Resources (minor adverse)
Management of VRM Class II areas would control the size, shape and amount of acres included in a forest health project or could limit or prohibit certain types of disturbances. Management of VRM Class III and IV areas would include minor limitations.

Land Resources

Forests Products (major beneficial)
Providing for personal use forest products in an ecologically sustainable manner would have a major beneficial effect on the management of forests and woodland resources.

Lands and Realty (no effect)
Lands and realty management actions common to all alternatives would not effect forest and woodland health.

Renewable Energy (minor adverse)
Portions of the planning area including the southern Big Horn Mountains and the southern PRB have good potential for renewable-energy development, primarily wind energy. Effects on forest and woodland communities from renewable-energy development could include the removal of forest cover. These areas would be taken out of production for the life of the renewable-energy project. The areas where renewable energy potential overlaps with forests and woodlands is limited therefore the impact would be minor adverse.

Rights-of-Way and Corridors (minor beneficial)
The extension of new access roads into forest and woodland communities could allow for better access to conduct forest health treatments. Common to all management actions limit the amount of surface disturbance and vegetation removal. These management actions will have a minor effect on forest and woodland communities as they are not expected to be widespread.

Travel and Transportation Management (major beneficial)
The extension of new access roads into forest and woodland areas could allow for better access to conduct forest health treatments. Common to all management actions regulate route construction and transportation use limiting vegetation removal and resource damage which is a major benefit to the forest and woodland communities.

Recreation (minor adverse)
Management actions common to all alternatives promote dispersed recreation use of a casual nature. Dispersed casual use activities can lead to impacts such as trampling of regeneration, or carving on trees but overall the level of impact should be minor.

Lands with Wilderness Characteristics (no effect)
The likelihood of any newly acquired lands meeting size and naturalness requirements for wilderness characteristics is so low that it is considered to be no effect.

Livestock Grazing Management (negligible adverse)
Livestock are to be managed to achieve healthy rangeland standards; therefore the regeneration of aspen and other deciduous trees and shrubs in forested, wooded, and riparian areas should only be negligibly affected by livestock grazing.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
A management plan would be prepared for any designated ACECs. Management prescriptions would likely limit surface disturbing activities and vegetation loss that would benefit forest and woodland communities. The acreage to be included in ACECs would likely be small and therefore the overall benefit minor.

Scenic or Back Country Byways (no effect)
Management actions common to all alternatives have no measurable effect on the forests and woodlands resource, nor would those management actions that vary by alternative, therefore byways will not be discussed further in this section.

Wild and Scenic Rivers (no effect)
The portion of the Middle Fork Powder River that is suitable and eligible for WSR designation contains minimal forest or woodland vegetation. Management of WSRs would not affect the forests and woodlands resource and will not be discussed further in this section.

Wilderness Study Areas (negligible adverse)
WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

Socioeconomic Resources

Social and Economic Conditions and Health and Safety (no effect)

The socioeconomic management actions common to all alternatives and the management actions that vary by alternative have no measurable effect on forest and woodland communities and will not be not discussed further in this section.

4.4.1.3. Alternative A

This section describes management actions and potential effects under Alternative A, which would continue management in accordance with the 1985 RMP as amended and maintained.

Vegetation – Forests and Woodlands (moderate beneficial)
Under Alternative A designing forest management treatments, including timber harvesting, to meet overall resource management objectives to protect or improve biodiversity and water quality would have a beneficial effect on forest and woodlands and create healthy ecosystems. With the number of treatments and acreage (4,000 to 6,000 acres) anticipated to be treated including diseased old growth or overstocked forests the benefit is moderate (7.7% of forest and woodland communities).

Physical Resources

Air Quality (negligible adverse)
Under Alternative A, analysis of activities and air quality modeling may be performed on a project-specific basis. Large-scale treatments involving thousands of acres, such as planned (prescribed) fires or pest management treatments, would likely be the only activities for which air quality modeling and impacts mitigation would be necessary. Forest and woodland treatments of this scale are not common, the adverse effect on implementing forest and woodland health treatments would be negligible.

Soil (moderate beneficial)
Alternative A would prohibit or control surface-disturbing activities on sensitive soils, subject to management approval, on a project-specific basis. Forest and woodland communities commonly occur on sensitive soils. There are 30,819 acres (60%) of BLM-administered forest communities on slopes equal to or greater than of 25%, and 2,741 acres (54%) in areas with poor reclamation suitability. Woodland figures are similar; 9,213 acres (35%) of BLM-administered woodlands are on slopes equal to or greater than of 25%, and 19,282 acres (74%) in areas with poor reclamation suitability. Preventing surface-disturbing activities and vegetation removal generally benefits forest and woodland communities. However, under Alternative A, the authorized officer could waive the prohibitions resulting in loss of forest and woodland communities. The management actions could also prevent or control treatments to benefit forest and woodland health. Overall, the effect of these management actions on forest and woodland communities is moderate beneficial.

Water Resources (minor beneficial)
The only water management action under Alternative A that would directly effect forest and woodland vegetation is a 500-foot restriction on surface-disturbing activities around springs, reservoirs, water wells, and perennial streams. Like many management actions under Alternative A, the authorized officer can waive the prohibition, and there are no defined waiver criteria. This has resulted in inconsistent management. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) (243 acres) of woodlands within 500 feet of water resources. Alternative A water management actions would have only a minor beneficial effect on forest and woodland communities because management actions could be inconsistently applied.

Cave and Karst Resources (negligible adverse)
Alternative A does not include management actions for cave and karst resources, and actions in those areas would be considered on a project-specific basis. Management would likely focus on

entrances to significant caves. There are no documented significant caves in BLM-administered woodland communities, and three in forest communities. Caves are generally located in rock formations and not in the forest or woodland communities. Therefore, management of cave and karst resources would have a negligible effect on forest and woodland communities.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative A, existing withdrawals from locatable minerals entry would continue. At present, locatable minerals operations affect 0.3% of BLM-administered forest and woodlands communities (138 acres and 92 acres, respectively). The trend in locatable minerals development is predicted to be similar throughout the planning period. The effect to forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted leasable fluid minerals activity under Alternative A, conventional activity (potential of moderate or above) could occur on 1,209 acres (2.7%) of BLM-administered forest lands and 1,942 acres (7.4%) of woodlands. CBNG activity would occur on 2,148 acres (4.7%) of BLM-administered forest lands and 5,779 acres (22%) of woodlands. Physical disturbance and the loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management (major beneficial)

Under Alternative A, applying different levels of suppression efforts and restricting the use of some types of suppression equipment would have a direct beneficial effect on forest and woodland vegetation. Short-term effects from the fire itself would be direct and beneficial to some tree species, ecosystems, and natural regeneration. Prescribed fire also would have a direct beneficial effect on forests and woodlands over the short and long terms, because the burn conditions are typically less severe than for wildfires. However, short-term effects would be the destruction of any litter on the surface and the current year's growth.

Biological Resources

Vegetation – Grassland and Shrubland Communities (no effect)
There is no previous decision under this alternative.

Vegetation – Riparian/Wetland Resources (negligible beneficial)
Alternative A would prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams which protects forest and woodland communities. However, the management action would also prohibit treatments designed to promote forest and woodland health. This would affect approximately 23,831 acres, unless the authorized officer waives the prohibition. Aspen, cottonwood, ash, and willow often grow in these moist areas, prescribed management would limit surface-disturbing activities and ensure the reproduction and maintenance of these species. Overall, the management actions balance to a negligible beneficial effect on forests and woodlands.

Invasive Species and Pest Management (negligible beneficial)
Approximately 50 to 100 acres are treated annually in the Big Horn Mountains to manage invasive

species. At present, no pesticide applications are employed; however, if a pesticide is produced to control species such as the mountain pine beetle, aerial applications would be beneficial. Invasive species treatments have a negligible effect on forest and woodlands.

Fish and Wildlife Resources – Fish and **Special Status Species – Fish** (negligible beneficial)
Alternative A has few decisions to guide management of fish. At present, the practice is to cooperate with the WGFD in introducing or reintroducing native and desirable non-native fish in the planning area where there is potential habitat; to design reservoirs to enhance fisheries where there is a potential; and to maintain reservoirs and riparian areas to improve or enhance potential fisheries. Improving habitat should be a direct benefit. However, the effect would be adverse if anglers and other recreationists attracted to these areas develop foot and motorized vehicle trails and unintentionally introduce invasive species. Special status fish species are presently limited to the Tongue River drainage. Overall, Alternative A fish management would have a negligible beneficial effect on forests and woodlands.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate beneficial)
The reintroduction or augmentation of acceptable wildlife species in suitable habitats could have a long-term effect on forest and woodland management. Considering surface-disturbing activities on a project-specific basis could benefit forest and woodland management by providing management flexibility. Under Alternative A, there would prohibitions on surface-disturbing and disruptive activities in crucial elk winter range (50,586 acres) and elk calving areas (27,851 acres). Alternative A management for upland game birds would have a negligible adverse effect on forests and woodlands management as there are only woodland communities near sharp-tailed grouse leks. Alternative A would prohibit surface disturbance or occupancy within a biologic buffer around active raptor nests. Seasonally restricting surface-disturbing activities within 0.5 mile of raptor nests would affect approximately 385,148 acres. This could limit the timing for forest health operations. Waivers to allow surface-disturbing activities or occupancy could have a beneficial effect on forest and woodland management.

Under Alternative A, providing and managing habitat for Threatened and Endangered and special status wildlife species on all public lands in compliance with the Endangered Species Act, approved recovery plans, and BLM policy associated with management of habitat could have beneficial or adverse effects on forest and woodland communities. Focusing on single species often can adversely effect other species and resources. Under this alternative, prohibiting surface disturbance and occupancy within a 0.25-mile radius of the center of Greater Sage-Grouse leks, would affect approximately 3,594 acres, and seasonally prohibiting surface disturbance within an additional 1.75-mile radius would affect approximately 203,724 acres. Establishing a year-round disturbance-free buffer for eagle winter roosts would affect approximately 402 acres, and adding a 1-mile limited activity zone for roosts (November 1 to April 1) would affect approximately 3,013 acres. This would have a minor adverse effect on forest and woodland management because most of these nests occur in riparian forests, but would have a greater effect around northern goshawk nests which tend to nest in coniferous upland forests.

These management actions regulate surface-disturbing activities which promote wildlife habitat conservation and therefore forest and woodland conservation. However, the management actions could also limit treatments designed to promote forest and woodland health. Overall, Alternative A wildlife management actions would benefit forest and woodlands communities to a moderate degree.

Special Status Species – Plants (minor adverse)
Alternative A does not include management for special status plant species, which are therefore considered on a project-specific basis. Forest and woodland projects would consider special status plants. Most special status plants are typically rare and have small populations, it is not likely they would adversely effect forest and woodland management. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could have a minor adverse effect on overall forest and woodland management.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Alternative A would apply NSO stipulations to mineral leases along potentially eligible and significant segments of the Bozeman Trail and within the Crazy Woman Battle Site. Alternative A would protects these two sites, which are in shrubland communities, from surface-disturbing mineral activities. This management action would not prevent treatments designed to promote woodland health. These management actions effects on forest and woodland management would be negligible beneficial.

Paleontological Resources (no effect)
Alternative A does not include management actions for the protection of paleontological resources and it is unlikely that management of significant paleontological sites would effect forest and woodland communities.

Visual Resources (moderate beneficial)
VRM Class II management objectives require that the visual resources in these areas be maintained or that changes to visual resources not be noticeable to the casual observer. VRM management could restrict the type, size, and shape of surface-disturbing activities, including forest health activities, in these areas. Other forested areas in the planning area would be managed under VRM Class III and IV, which impose fewer restrictions on surface-disturbing actions. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented. Overall, Alternative A management of visual resources would have a moderate beneficial effect on forest and woodlands management.

Land Resources

Forests Products (major beneficial)
The ability to offer an array of products and one Million Board Feet (MMbf) for a 10-year period with regeneration would benefit the health and sustainability of forest communities. Limiting clear-cuts to 20 acres could hinder management activities in instances of treatments for insect and disease or other natural forces. However, timber stand improvement activities, such as precommercial thinning would be beneficial to forest and woodland health.

Lands and Realty (no effect)
Alternative A management of lands and realty would not effect forests and woodlands.

Renewable Energy (minor adverse)
Alternative A does not address the development of renewable energy resources. Portions of the Big Horn Mountains and southern PRB have potential for renewable-energy development,

especially wind energy. Effects on forest and woodland communities from renewable-energy development could include the removal of forest cover. Renewable energy projects within forest communities are not anticipated to be common, in part due to the necessary removal of the forest vegetation. Projects within woodland communities are more likely. Overall, renewable energy management would have a minor adverse effect on forest and woodlands communities.

Rights-of-Way and Corridors (moderate beneficial)
Under Alternative A, ROW disturbances from BLM actions are estimated to affect approximately 38,762 acres (Appendix G (p. 1671)). Surface disturbance and occupancy will not be allowed on slopes equal to or greater than 25%, which would affect approximately 215,496 acres and directly benefit all plant communities over the long term. ROW management actions do not restrict forest and woodland health management treatments. Overall, Alternative A management of ROW and corridors would have a moderate beneficial effect on forests and woodlands.

Travel and Transportation Management (moderate beneficial)
Alternative A would limit motorized vehicle use to existing roads and routes. Under this alternative, closing areas with saturated soils or steep slopes (approximately 170,590 acres) to motorized vehicles would have a direct beneficial effect on vegetation. Closing certain areas to vehicular travel (approximately 3,704 acres), limiting travel to designated routes (170,590 acres), and seasonal route closures (29,011 acres) would reduce vehicle damage to woodland vegetation and forest regeneration. These management actions combine to have a moderate beneficial effect on forest and woodland communities.

Recreation (negligible adverse)
Under Alternative A, recreation site development is anticipated to disturb approximately five acres. Most recreation use is dispersed casual use which has little long-term effect to forest and woodland communities.

Lands with Wilderness Characteristics (no effect)
Alternative A would continue to manage forest and woodland areas for multiple resource values and not manage any lands for wilderness characteristics. There would be no effect on the forests and woodlands resource.

Livestock Grazing Management (minor beneficial)
Under Alternative A, livestock grazing would not be authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of rough terrain and steep slopes and approximately 6,000 acres (1%) where grazing has been determined to be incompatible with other resource uses or values. Livestock grazing tends to be a compatible resource use with forest and woodland communities, except in areas of aspen or other deciduous regeneration. Alternative A would provide for a minimum of two years rest from livestock grazing following prescribed burns and other vegetative treatments, and allow additional rest where necessary to achieve resource goals and objectives.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are presently no ACECs within the planning area therefore there would be no anticipated impacts to forest and woodland communities.

Wilderness Study Areas (negligible adverse)
Wilderness Study Areas are managed to preserve natural conditions and processes including

forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result would be a negligible adverse effect.

4.4.1.4. Alternative B

This section describes management actions under Alternative B, which would emphasize resource conservation, and the likely resulting effects on forest and woodland communities.

Vegetation – Forests and Woodlands (major adverse)
Alternative B would minimize treatments in forests and woodlands, allowing insects, disease, an other forces to run their course. Management would not be proactive in addressing forest and woodland health. Forests and woodlands could become more susceptible to insects and disease. This management strategy would allow accumulation of fuels which sustain wildfires. The expansion of forests and woodlands into meadows would reduce species and landscape diversity.

Physical Resources

Air Quality (negligible adverse)
Alternative B would require air quality modeling and mitigation for adverse effects on air quality for proposed industrial activities with the potential to approach or exceed emission standards. Few large-acreage vegetative treatments to promote forest and woodland health are predicted. Therefore, the effect on forest and woodland resources would be negligible.

Soil (major beneficial)
Alternative B would prohibit surface-disturbing activities on sensitive soils. Forest and woodland communities commonly occur on sensitive soils. There are 30,819 acres (60%) of forest communities on BLM surface on slopes equal to or greater than 25% and 2,741 acres (54%) in areas with poor reclamation suitability. Woodland figures are similar; 9,213 acres (35%) of BLM-administered woodlands on slopes equal to or greater than 25% and 19,282 acres (74%) in areas with poor reclamation suitability. Alternative B soils protections would be absolute and would prevent disturbance in the forest and woodland communities. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be much greater than the acres of forest and woodland health treatments prevented therefore overall a major beneficial effect on forest and woodland communities is anticipated.

Water Resources (moderate beneficial)
Alternative B would prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented therefore overall a moderate beneficial effect on forest and woodland communities is anticipated.

Cave and Karst Resources (major beneficial)
Alternative B would prohibit surface-disturbing activities in cave and karst areas. There are 33,942 acres (66%) of BLM-administered forest and 4,729 acres (18%) of woodland communities on karst formations. The absolute protections could prevent treatments to promote forest or

woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented therefore overall a major beneficial effect on forest and woodland communities is anticipated.

Mineral Resources

Locatable Minerals (major beneficial)
Alternative B would recommend withdrawal from minerals entry 15,870 acres (31%) of BLM-administered forest lands and 10,777 acres (41%) of woodlands. This would have major beneficial effect on forest and woodland resources by preventing potential surface-disturbing activities.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted fluid minerals activity under Alternative B, conventional activity (potential of moderate or above) could occur on 340 acres (1.0%) of BLM-administered forest lands and 812 acres (6.9%) of woodlands. CBNG activity could occur on 900 acres (2.7%) of BLM-administered forest lands and 2,820 acres (24%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management (major beneficial)

Alternative B fire and fuels management activities would have a major beneficial effect on forest and woodland resources. Fuel treatment projects would be performed in forested areas to reduce the potential hazard of wildfire. These projects can reduce the amount of woody material on the ground and alter the structure of both the understory and overstory of trees, changing the composition and structure of the stand and allow for regeneration.

Unplanned ignitions achieving resource benefit also would benefit forest and woodland communities. In areas where this practice is allowed, wildland fire could alter stand composition and be a beneficial occurrence for regeneration, creating age-class diversity and sustainability.

Biological Resources

Vegetation – Grassland and Shrubland Communities (major beneficial)
Regenerating native plant species and performing reclamation activities would contribute to ecosystem health by conserving soils, water, and creating diversity.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Surface-disturbing activities would be prohibited within 500 feet of waterbodies. The Wyoming Forestry BMPs require streamside management zones, which benefit forest and woodland resources. These actions would have a moderate beneficial effect on forest and woodland communities.

Invasive Species and Pest Management (major beneficial)
Alternative B would allow aerial applications of insecticides. However, this has not been the preferred treatment on the forest and woodland landscapes with the types of insects encountered and the current insecticides used. Invasive species and pest management does not concentrate in forest and woodland areas, but those areas would benefit from inclusion into a plan of treatment, which would result in healthier forests and woodlands. Sanitation harvest and

biological treatments are the most common treatments in forest and woodland areas. Alternative B invasive species and pest management actions would have a major beneficial effect on forests and woodlands.

Fish and Wildlife Resources – Fish (minor beneficial) **and Special Status Species – Fish** (negligible beneficial)
Alternative B would prohibit surface-disturbing activities within 0.25 mile of fish-bearing waterbodies which could include projects designed to promote forest health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented therefore overall a minor beneficial effect on forest and woodland communities is anticipated due to the limited BLM surface near fish-bearing waters. Special status fish species are presently limited to the Tongue River drainage, limiting the benefit to forest and woodland communities to negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Under Alternative B, applying prohibitions and seasonal restrictions to surface-disturbing activities for big game and other wildlife species would benefit wildlife habitat including forest and woodland communities. However, they could also limit treatments designed for forest or woodland health. The management of Sensitive, Threatened, and Endangered species and their habitats would affect all woodland management activities on 26,000 acres. Amphibian and reptile habitat includes 36,680 acres or 47% of the forest and woodland communities. Alternative B management of general wildlife and special status wildlife species would have a major beneficial effect on forest and woodlands communities.

Special Status Species – Plants (minor adverse)
Surface–disturbing activities would be prohibited within special status plant habitat. Most special status plants are rare and have specialized habitat requirements, some of which may include forest and woodland communities. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could adversely effect overall forest and woodland management. Cumulatively special status species plant management would likely have a minor adverse effect on forest and woodland communities.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Under Alternative B, establishing and identifying historic sites and creating a 5-mile buffer around those sites could have a major beneficial effect by preventing surface-disturbing activities within forest and woodland communities. The absolute protections could prevent treatments to promote forest or woodland health. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented therefore overall a major beneficial effect on forest and woodland communities is anticipated.

Paleontological Resources (negligible beneficial)
Surface-disturbing activities, including forest health activities, would be prohibited in areas with paleontological resources of high quality or importance. However, at present, there are no high-quality paleontological areas in the forested areas, and typically the areas are small. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented. Therefore, the effect on forest and woodland communities would be negligible beneficial.

Visual Resources (moderate beneficial)
Under Alternative B, VRM Class II areas would prohibit or limit surface-disturbing activities on approximately 218,178 acres. VRM Class III and IV areas encompass 275,315 and 259,594 acres respectively, and would have minor limitations that could allow surface-disturbing activities. VRM Class II management objectives require that the visual resources in these forested areas be maintained or that changes to visual resources not be noticeable to the casual observer. VRM constraints would restrict the types, sizes, and shapes of surface-disturbing activities, including forest health treatments, in these areas. Other forested areas in the planning area would be managed as VRM Class III, which would impose few restrictions on forest management actions. The acreage of forests and woodlands protected from surface-disturbing activities would be greater than the acres of forest and woodland health treatments prevented. Overall, Alternative B management of visual resources would have a moderate beneficial effect on forest and woodlands management.

Land Resources

Forests Products (major adverse)
Limiting timber harvest options to a five acre select group harvest and preventing precommercial stand improvement operations would limit the available prescriptions to promote sustainability and forest and woodland health, a major adverse effect.

Lands and Realty (major beneficial)
Under Alternative B, land acquisitions, pursuit of easements, and retaining lands with resource value would improve overall management of public lands. Effects on vegetation would vary depending on the type of action and would be project specific. Effects would be negligible for individual projects, but could be major when considered together or if the BLM pursued and completed a large acquisition.

Renewable Energy (negligible adverse)
Portions of the Big Horn Mountains and PRB area have a potential for renewable-energy (e.g., wind) development, however, renewable energy development is excluded from most of these areas in Alternative B. If renewable-energy development were to occur in forest or woodland communities it would include the removal of forest cover. Alternative B management of renewable energy would have a negligible adverse effect on forest and woodlands management.

Rights-of-Way and Corridors (major beneficial)
Under Alternative B, designating corridors for utility ROW, constructing new ROW projects adjacent to existing projects, a development plan to concentrate communications sites, approving ROW to access private lands, and a transportation management system would reduce loss of forest and woodland communities. Concentrating sites and corridors would have a direct, major beneficial effect on vegetation over the long term.

Travel and Transportation Management (moderate beneficial)
Alternative B would limit motorized vehicle use to designated routes, close 312,561 acres to motorized travel, and seasonally limit motorized travel on another 18,464 acres. These actions would reduce vehicle damage to woodland vegetation and forest regeneration. These management actions combine to have a moderate beneficial effect on forest and woodland communities.

Recreation (negligible beneficial)
Under Alternative B, development of recreational facilities and opportunities would be limited to

designated SRMAs (55,529 acres). SRMAs would be managed to protect nautral and cultural values, including vegetation resources. Most recreation use would be dispersed casual use which has little long-term effect to forest and woodland communities. Overall, Alternative B recreation management would have a negligible beneficial effect on forest and woodland communities.

Lands with Wilderness Characteristics (moderate beneficial)
Alternative B would manage 12,237 acres for wilderness characteristics. The LWC area is predominately forest. Commercial treatments would be prohibited while forest health treatments would be allowed. Wilderness characteristics management results in a moderate beneficial impact to the forest and woodland communities.

Livestock Grazing Management (minor beneficial)
Under Alternative B, livestock grazing would not be authorized where grazing has been determined to be incompatible with other resource uses or values. Livestock grazing tends to be a compatible resource use with forest and woodland communities, except in areas of aspen or other deciduous regeneration. Alternative B would provide for a minimum of two years rest from livestock grazing following vegetative treatments and restore vegetation in areas to achieve resource objectives. Because livestock grazing tends to be compatible with forest and woodland communities, livestock predominantly graze on grass and forbs not woody plants, the overall beneficial effect of these management actions on forest and woodland communities would be minor.

Special Designations

Areas of Critical Environmental Concern (major beneficial)
Eight ACECs would be designated with Alternative B. Surface-disturbing activities would be prohibited in ACECs preventing loss of forest and woodland vegetation. Treatments for forest and woodland health could be authorized. These management actions would be a major benefit to the sustainability of forest and woodland communities.

Wilderness Study Areas (negligible adverse)
WSAs are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

4.4.1.5. Alternative C

This section describes management actions under Alternative C, which would emphasize resource utilization, and the resulting effects on forest and woodland communities. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative C.

Vegetation – Forests and Woodlands (major beneficial)
Alternative C provides for intensive management including designing treatments specific to forests and woodlands, the health of those communities would improve and the forest would be better able to resist the effects of disease, insects, and wildfire. The old growth, tree species, age-class diversity, stand density, and other characteristics that are important objectives for healthy forests would be met. Alternative C management of forests and woodlands would have a major beneficial effect on that resource.

Physical Resources

Air Quality (no effect)
Alternative C would not require air quality monitoring for industrial activities. There would be no effect on forest and woodland communities from Alternative C air quality management actions.

Soil (moderate beneficial)
Alternative C soils management actions would include allowing surface-disturbing activities on slopes equal to or greater than 25% and on soils with a severe erosion hazard, as long as those activities would be consistent with other resource values. Forest management practices would be implemented, but methods would be designed to accommodate slopes, erosion hazard, and soil moisture content consistent with the Wyoming Forestry BMPs. Allowing proposed activities on badlands, rocky outcrops, or on slopes susceptible to mass movement would make approximately 218,928 acres available for forest and woodlands management. Alternative C would also allow mineral development and other land uses on these same areas which could result in the loss for forest and woodland vegetation. Overall, Alternative C soils management actions would have a moderate beneficial effect on forest and woodlands management as although vegetation loss could increase healthy forest and woodland communities would be maintained.

Water Resources (moderate adverse)
Alternative C would allow surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. Mitigating adverse effects on forest and woodland communities would likely not prevent vegetation removal. Therefore, Alternative C water management actions would have a moderate adverse effect on forest and woodlands resources.

Cave and Karst Resources (negligible adverse)
Surface-disturbing activities, including timber harvests, would be required to maintain a buffer (likely 100 feet) around the entrances to significant caves. There are no documented significant caves in BLM-administered woodland communities, and three in forest communities. Caves are generally located in rock formations and not in the forest or woodland communities. Therefore, management of cave and karst resources would have a negligible effect on forest and woodland communities.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative C would not recommend any additional minerals withdrawals. Under Alternative C, locatable minerals are available on 26,007 acres in the forest areas of the Big Horn Mountains. There are also woodlands included in the acres available for locatable minerals development. At present, locatable minerals operations affect 0.3% of BLM-administered forest and woodlands communities, 138 and 92 acres, respectively. The locatable minerals development trend is predicted to be similar throughout the planning period, and the effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted fluid minerals activity under Alternative C, conventional activity (potential of moderate or above) could occur on 1,205 acres (2.7%) of BLM-administered forest lands and 1,936 acres (7.7%) of woodlands. CBNG activity could occur on 2,057 acres (4.7%) of

BLM-administered forest lands and 5,512 acres (22%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management (moderate adverse)

Under Alternative C, full suppression throughout the planning area without consideration of individual forest and woodland species, density, slopes, and other characteristics would have a moderate adverse effect on forests and woodlands. Full suppression would prevent most fires from growing into large fires. Wildfire could not be used for resource benefit including to promote forest health.

Biological Resources

Vegetation – Grassland and Shrubland Communities (minor beneficial)
Allowing the planting of desirable non-native species would have a beneficial effect for forest and woodlands by hastening reclamation and vegetation recovery.

Vegetation – Riparian/Wetland Resources (moderate adverse)
Alternative C management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. This management would allow for project-specific adjustments for slope, aspect, stream type, and other conditions. Wyoming Forestry BMPs and other mitigation measures would be incorporated to reduce adverse effects to water resources. Mitigating adverse effects on forest and woodland communities would likely focus on reclamation, not preventing vegetation removal. Therefore, Alternative C management actions would have a moderate adverse effect on forest and woodlands resources.

Invasive Species and Pest Management (negligible beneficial)
Alternative C would allow aerial applications of insecticides. However, this has not been the preferred treatment on the forest and woodland landscapes with the types of insects encountered and the current insecticides used. Invasive species treatment emphasis would be only on species on the Wyoming list and prioritized based on risk of spread onto private lands. Because there would likely be little invasive species and pest treatment the benefit to forest and woodland communities would be negligible.

Fish and Wildlife Resources – Fish (minor beneficial) **and Special Status Species – Fish** (negligible beneficial)
Alternative C would allow surface-disturbing activities within 0.25 mile of fish-bearing waterbodies consistent with other resource values. This management would affect 3,432 acres (19%) of the forested areas. Forest management activities could be subject to some regulation for the protection of other resources, but protective buffers would not be likely to extend more than 500 feet from fish-bearing waters. The effect on the forest and woodland communities would be beneficial. Special status fish species are presently limited to the Tongue River drainage, limiting the benefit to forest and woodland communities to negligible.

Fish and Wildlife Resources – Wildlife (major adverse)
Alternative C would not apply many restrictions on surface-disturbing and disruptive activities to protect wildlife which could result in the loss of forest and woodland communities, a major adverse effect.

Special Status Species – Plants (minor adverse)
Surface-disturbing activities would be prohibited within special status plant populations. Most special status plants are typically rare and have small populations, it is not likely they would adversely affect forest and woodland management. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could have a minor adverse effect on overall forest and woodland management.

Special Status Species – Wildlife (major adverse)
Alternative C includes restrictions for the protection of Greater Sage-Grouse and special status raptors but not protect prairie dog colonies or herptile habitat. The foreseeable loss of forest and woodland communities from Alternative C management of special status wildlife species would be a major adverse effect.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Alternative C would allow surface disturbance in areas around historic sites, which would have a long-term adverse effect on forests and woodlands. Since most cultural sites are small the overall effect on forest and woodland communities would be minor.

Paleontological Resources (negligible adverse)
No high-quality paleontological areas would be protected, such areas are typically small. Therefore, the effect on the forest products program would be negligible adverse.

Visual Resources (major adverse)
Alternative C would manage all parts of the planning area outside of WSAs as VRM Class III or IV, and would require visual simulations on a project-specific basis. This would have a major adverse effect on forest and woodland communities by providing for surface-disturbing activities within forests and woodland communities.

Land Resources

Forests Products (moderate adverse)
The ability to manage forests and woodlands to offer a diversity of products would be beneficial to forest and woodland health. However, managing to maximize economic returns without consideration of other resources and without any topographical design or harvest limits could be damaging to the resource. Regeneration would not have any protections and only minimum stocking requirements would be met. Overall the promotion of economic activity over resource protection would have a moderate adverse effect on the forest and woodland communities.

Lands and Realty (major adverse)
Under Alternative C, disposing of lands with resource value could have a long-term adverse effect on forest and woodlands communities if many forest and woodland areas are disposed of. Removing the option of acquiring the forest and woodlands adjacent to larger blocks also would have a long-term adverse effect by denying access opportunities and not acquiring lands that have natural values. These adverse effects would be major.

Renewable Energy (moderate adverse)
Under Alternative C, renewable-energy development must be consistent with all other resources values. All public lands in the planning area would be open to such development with limited

restrictions to protect other resources. Renewable energy projects would be unlikely in forested areas due to the cost of removing the forest cover. Renewable energy projects would be more likely in woodland areas. The potential for loss of forest and woodland communities from renewable energy development would be moderate.

Rights-of-Way and Corridors (minor adverse)
Alternative C provides few restrictions on the placement of ROWs which would result in the loss of forest and woodland vegetation. Based on the reasonably foreseeable ROW activity, the impact to forest and woodland communities would be minor.

Travel and Transportation Management (major adverse)
Under Alternative C, allowing motorized vehicle use on saturated soils and steep slopes would have a long-term adverse effect on forest and woodland areas and the watershed. This management would open all roads to motorized vehicle use and would allow access to management areas where regeneration could be damaged by OHV use. The adverse effect on forest and woodlands management would be major.

Recreation (negligible adverse)
Under Alternative C, 30,570 acres would be designated as SRMAs. There is little overlap between the forest and woodlands community and designated SRMAs in Alternative C. Allowing additional recreation facilities where they are supported by recreational use could affect forest and woodlands communities, depending on where future facilities are located. The overall effect of recreation management actions to the forest and woodlands resources is negligible.

Lands with Wilderness Characteristics (no effect)
Alternative C does not propose any special management related to lands with wilderness characteristics, thus there would be no effect on the forests and woodlands resource.

Livestock Grazing Management (major adverse)
Under Alternative C, allowing livestock grazing in regeneration areas and after prescribed fire would affect the sustainability and health of forests and woodlands by limiting species and age-class diversity. This would have a major adverse effect on forest and woodlands management.

Special Designations

Areas of Critical Environmental Concern (no effect)
There would be no ACECs within the planning area under Alternative C therefore there would be no anticipated impacts to forest and woodland communities.

Wilderness Study Areas (negligible adverse)
Wilderness Study Areas are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

4.4.1.6. Alternative D

This section describes management actions under Alternative D, the BLM preferred alternative, and the likely resulting effects on forest and woodland resources due to its implementation. The

effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative D.

Vegetation – Forests and Woodlands (major beneficial)
Alternative D would manage vegetative treatments considering the health of forests and woodlands and multiple resource needs. Projects would be designed and managed to meet all resource needs, forest health would improve, and forests would be better able to resist disease, insects, and wildfire. The old growth, tree species, age-class diversity, stand density, and other characteristics that are important objectives for healthy forests would be met. This management would provide forest products derived from vegetative treatments in forests and woodlands. Alternative D management of forests and woodlands and forest productions would have a major beneficial effect on forest and woodland resources.

Physical Resources

Air Quality (negligible adverse)
Alternative D would require air quality modeling and mitigation for adverse effects on air quality for proposed industrial activities with the potential to approach or exceed emission standards. Few large-acreage vegetative treatments, to which this requirement would apply, are predicted. Therefore, the effect on forest and woodland resources would be negligible adverse.

Soil (moderate beneficial)
Alternative D would allow surface-disturbing activities on sensitive soils, where adequately mitigated. Forest and woodland communities commonly occur on sensitive soils. There are 30,819 acres (60%) of forest communities on BLM surface on slopes equal to or greater than 25% and 2,741 acres (54%) in areas with poor reclamation suitability. Woodland figures are similar; 9,213 acres (35%) of BLM-administered woodlands on slopes equal to or greater than 25% and 19,282 acres (74%) in areas with poor reclamation suitability. These management actions would not prevent vegetation removal, but would promote the stabilization and reclamation of soil resources. This would benefit the long-term recovery of forest and woodland resources. Because most surface-disturbing activities would still occur, the soils protections would have a moderate beneficial effect on forest and woodland communities.

Water Resources (moderate adverse)
Alternative D would allow surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams in accordance with defined criteria. There are 3,895 acres (7.6%) of BLM-administered forest lands and 243 acres (0.9%) of woodlands within 500 feet of water resources. The mitigation for adverse effects on forests and woodlands would focus on reclamation and not prevent vegetation removal. Therefore, Alternative D water management actions would likely adversely effect forest and woodland resources to a moderate degree.

Cave and Karst Resources (negligible adverse)
Surface-disturbing activities, including forest and woodland treatments, would be required to maintain a buffer around the entrances to significant caves. There are no documented significant caves in BLM-administered woodland communities, and three in forest communities. Caves are generally located in rock formations and not in the forest or woodland communities. Therefore, management of cave and karst resources would have a negligible effect on forest and woodland communities.

Mineral Resources

Locatable Minerals (major beneficial)
Alternative D would recommend locatable minerals withdrawals on 26,007 acres in forested areas of the Big Horn Mountains, a major benefit to forest and woodland communities by preventing potential vegetation removing activities.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted fluid minerals activity under Alternative D, conventional activity (potential of moderate or above) could occur on 949 acres (2.2%) of BLM-administered forest lands and 1,576 acres (6.5%) of woodlands. CBNG activity could occur on 1,968 acres (4.6%) of BLM-administered forest lands and 5,350 acres (22%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Fire and Fuels Management (moderate beneficial)

Under Alternative D, using full suppression of wildland fire in the WUI, and recreation areas could have beneficial and adverse effects on forests and woodlands, depending on the species of trees, the fire intensity, and the suppression tactics required. Alternative D would provide flexibility in choosing fire management tactics. This would have a moderate beneficial effect on forest and woodland resources.

Biological Resources

Vegetation – Grassland and Shrubland Communities (minor beneficial)
Allowing desirable non-native plant species for short-term reclamation activities prior to seeding native species would be beneficial to the forest and woodlands by promoting restoration of native communities creating biological diversity and healthy vegetative communities. Because reclamation activities are limited to disturbed areas the benefit to forest and woodland communities would be minor.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative D management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams with appropriate mitigation. Mitigation would ensure that riparian resources are protected while allowing for surface-disturbing activities. Wyoming Forestry BMPs require a 200-foot buffer and other mitigation measures incorporated into project designs. The overall result would be a minor beneficial effect (less than 5% of forest and woodlands affected).

Invasive Species and Pest Management (minor beneficial)
Alternative D would allow aerial applications of insecticides, and BLM resource specialists would be able to determine plants and areas for treatment and prioritize areas for treatment. This would have a minor beneficial effect on the forest and woodlands resource.

Fish and Wildlife Resources – Fish (moderate beneficial) and **Special Status Species – Fish** (negligible beneficial)
Alternative D would allow surface-disturbing activities within 0.25 mile of fish-bearing waterbodies where resources could be adequately protected. This management would affect 3,432 acres (19%) of forested areas. However, since surface-disturbing activities would be subject to restrictions for the protection of fish and other resources the loss of forest and woodland

communities should be reclaimable and therefore a moderate effect. Special status fish species are presently limited to the Tongue River drainage, limiting the benefit to forest and woodland communities to negligible.

Fish and Wildlife Resources – Wildlife (moderate beneficial)
Under Alternative D, surface-disturbing activities would be required to maintain current amounts of crucial elk habitat and hiding cover. There are timing restrictions and a few prohibitions in Alternative D for the protection of wildlife species and their habitat. These management actions would ensure the sustainability of forest and woodland communities. Surface-disturbing activities would still occur within forest and woodland communities therefore the overall effect is moderate beneficial.

Special Status Species – Plants (minor adverse)
Alternative D would require that populations of special status plants be conserved. Limber pine is present on approximately 13,927 acres of the planning area. Single-species management specifically for limber pine could have a minor adverse effect on overall forest and woodland management.

Special Status Species – Wildlife (major beneficial)
Most of the forest and woodland areas include amphibian and reptile habitat. Surface-disturbing activities would have to conserve all special status species. Raptor nest sites and other special status species habitat would also limit surface-disturbing activities. The result would be a major beneficial effect to the sustainability of forest and woodland communities.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (minor beneficial)
Forest and woodland areas contain few cultural and paleontological resources where surface disturbance would be prohibited. Most sites are small which means the protections offered forest and woodland communities are also small. Alternative D management of cultural and paleontological resources would have a minor beneficial effect on forest and woodlands management.

Visual Resources (moderate beneficial)
Under Alternative D, forest and woodlands areas in the Big Horn Mountains would be managed under VRM Class II, which could restrict surface-disturbing activities. VRM constraints would restrict the types, sizes, and shapes of surface-disturbing activities. This would have a moderate beneficial effect on forest and woodlands communities, by ensuring the sustainability of forest and woodland communities, while allowing for resource uses.

Land Resources

Forests Products (major beneficial)
The ability to offer a variety of products for sale while designing and implementing treatments in an ecologically sound manner would be beneficial to forests and woodlands. Management for multiple resources would benefit forests and woodlands by conserving soils, waters, wildlife and other vegetative communities. Regeneration would be protected as needed and silvicultural treatments required to create and maintain forest and woodland health and sustainability consistent with other resource values, would be available.

Lands and Realty (minor beneficial)
Under Alternative D, acquiring and disposing of lands based on all resource values and acquiring lands adjacent to large blocks of BLM-administered lands would have a long-term beneficial effect on forest areas in the southern Big Horn Mountains and the scattered woodlands throughout the planning area. The scale of the benefits is minor due to the long and complex nature of land acquisitions.

Renewable Energy (negligible adverse)
Portions of the Big Horn Mountains and PRB area have a potential for renewable-energy (e.g., wind) development, however, renewable energy development is excluded from most of these areas in Alternative D. If renewable-energy development were to occur in forest or woodland communities it would include the removal of forest cover. Alternative D management of renewable energy would have a negligible adverse effect on forest and woodlands management.

Rights-of-Way and Corridors (minor beneficial)
Under Alternative D, allowing for the ROW transmission lines to be collocated, would reduce surface-disturbing activities resulting in a minor benefit forests and woodlands.

Travel and Transportation Management (moderate beneficial)
Under Alternative D, limiting motorized vehicle use to designated routes and managing roads consistent with forest and woodland resources would have a moderate beneficial effect on forest and woodlands management.

Recreation (negligible adverse)
Under Alternative D, 54,160 acres would be designated as SRMAs. SRMAs would be managed to balance recreational opportunites with protection of nautral and cultural values, including vegetation resources. Most recreation use would be dispersed casual use which has little long-term effect to forest and woodland communities. Allowing additional recreation facilities where they are supported by recreational use could affect forest and woodlands communities, depending on where future facilities are located. The overall effect of recreation management actions to the forest and woodlands resources is negligible.

Lands with Wilderness Characteristics (moderate beneficial)
Managing 6,864 acres for wilderness characteristics would protect forest and woodland communities. Treatments for forest health could be authorized, subject to mitigation for impacts to wilderness characteristics. Management actions for lands with wilderness characteristics would have a moderate beneficial effect on forest and woodlands resources by protecting forest and woodland communities.

Livestock Grazing Management (minor beneficial)
Alternative D would include actions and treatments to reduce potential damage to regeneration from livestock grazing to meet resource objectives, including grazing deferment after wildfires. This would have a minor beneficial effect on forest and woodlands management.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
Three ACECs would be designated with Alternative D. Surface-disturbing activities would be prohibited in ACECs preventing loss of forest and woodland vegetation. Treatments for forest and woodland health could be authorized. These management actions would be a moderate benefit to the sustainability of forest and woodland communities.

Wilderness Study Areas (negligible adverse)
Wilderness Study Areas are managed to preserve natural conditions and processes including forest and woodland communities. Intensive management to promote forest health would be restricted, however less intrusive options such as prescribed fire are available. The overall result should be a negligible adverse effect.

4.4.1.7. Cumulative Impacts

The effects on forest and woodlands health from past actions are included in the description of the affected environment (Chapter 3). Forest and woodlands comprise 1.2% of the total acres in planning area, but they play an important role in supporting many resource values, including watersheds, wildlife, and recreation.

The intermingling of private, state, and USFS lands with BLM-administered lands throughout the planning area ensures that activities outside BLM control would continue. Surface-disturbing activities within forest and woodland communities would continue on adjacent private, State of Wyoming, and USFS lands.

Silviculture treatments other resource management activities, and the construction of houses and other structures on private, State of Wyoming, and USFS lands would reduce forest and woodland acres and create more fragmentation and edge effects. Land fragmentation leads to declines in forest health and reduced biodiversity.

Decades of fire suppression and limited mechanical vegetation treatments have led to a decline in forest health, especially at the landscape scale. While some forests and woodlands appear to be thriving and healthy, on a landscape scale, forest health and the associated wildlife habitat are at risk to catastrophic loss. Because of human interference with the natural systems, these systems no longer function in the ways that have sustained them for millennia. The continued increases in the WUI or industrial development, continued fire suppression without adequate reintroduction of fire into these systems, and the inability to develop forest stands that are resilient to disturbance could lead to stand-replacing events.

Proposed management actions for forest and woodland management would affect less than one percent of the total watershed and forest and woodland acres on BLM-administered land in the planning area and the entire Big Horn ecosystem.

4.4.1.8. Conclusion

It is anticipated and logical that forest and woodland management would benefit the health of the ecosystem, benefit the health of forests and woodlands, and protect the watershed and the entire ecosystem. The primary difference between the alternatives is the number of acres anticipated for management actions and therefore the acres of forest and woodland communities affected. Alternative B, the most conservative alternative, would allow treatment on the fewest acres, and the Alternative C, the least conservative alternative, would allow for more management options on more acres of forest woodlands.

Table 4.39, “Summary of Impacts to Forests and Woodlands” (p. 820) summarizes effects to the forests and woodlands resource.

Table 4.39. Summary of Impacts to Forests and Woodlands

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Soil	Moderate beneficial	Major beneficial	Moderate beneficial	Moderate beneficial
Water Resources	Minor beneficial	Moderate beneficial	Moderate adverse	Moderate adverse
Cave and Karst Resources	Negligible adverse	Major beneficial	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Negligible adverse	Major beneficial	Negligible adverse	Major beneficial
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Major beneficial	Major beneficial	Moderate adverse	Moderate beneficial
Planned Fire (Prescribed Fire)	Major beneficial	Major beneficial	Moderate adverse	Moderate beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Moderate beneficial	Major adverse	Major beneficial	Major beneficial
Vegetation – Grassland and Shrubland Communities	No effect	Major beneficial	Minor beneficial	Minor beneficial
Vegetation – Riparian/Wetland Resources	Negligible beneficial	Moderate beneficial	Moderate adverse	Minor beneficial
Invasive Species and Pest Management	Negligible beneficial	Major beneficial	Negligible beneficial	Minor beneficial
Fish and Wildlife Resources – Fish	Negligible beneficial	Minor beneficial	Minor beneficial	Moderate beneficial
Fish and Wildlife Resources – Wildlife	Moderate beneficial	Major beneficial	Major adverse	Moderate beneficial
Special Status Species – Plants	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Special Status Species – Fish	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Special Status Species – Wildlife	Moderate beneficial	Major beneficial	Major adverse	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major beneficial	Minor adverse	Minor beneficial
Paleontological Resources	No effect	Negligible beneficial	Negligible adverse	Minor beneficial
Visual Resources	Moderate beneficial	Moderate beneficial	Major adverse	Moderate beneficial
Land Resources				
Forests Products	Major beneficial	Major adverse	Moderate adverse	Major beneficial
Lands and Realty	No effect	Major beneficial	Major adverse	Minor beneficial
Renewable Energy	Minor adverse	Negligible adverse	Moderate adverse	Negligible adverse
Rights-of-Way and Corridors	Moderate beneficial	Major beneficial	Minor adverse	Minor beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Travel and Transportation Management	Moderate beneficial	Moderate beneficial	Major adverse	Moderate beneficial
Recreation	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible adverse
Lands with Wilderness Characteristics	No effect	Moderate beneficial	No effect	Moderate beneficial
Livestock Grazing Management	Minor beneficial	Minor beneficial	Major adverse	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Major beneficial	No effect	Moderate beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.2. Vegetation – Grassland and Shrubland Communities

This section describes potential impacts to vegetation in the grassland and shrubland communities from management actions under other resource programs. Chapter 3 provides a general discussion and information about vegetative community types. FLPMA and the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) direct the BLM to manage vegetative resources toward maintenance or restoration of the physical function and biological health of vegetative ecosystems. Objectives are to maintain or improve the health and trends in plant communities that conserve soil and water, and provide forage, wildlife habitat, special status species habitat, recreation, scenic, ecological, and scientific benefits for consumptive and nonconsumptive uses.

Management actions that would contribute to the decline in abundance, distribution, or diversity would result in adverse impacts. Beneficial impacts include actions that protect, enhance, or restore these communities.

Direct impacts result from surface-disturbing and other activities that cause removal of and/or mechanical damage to plants, invertebrates, and biological soil crusts, both in terms of amount (overall biomass, density, cover) and in terms of diversity (species presence and richness). Direct impacts may also be the deposition of invasive species individuals or propagules (e.g., seeds or spores), soil compaction and/or erosion.

Indirect impacts result from activities that alter the quality and health of grassland and shrubland communities and may include soil compaction and erosion, dust deposition from nearby disturbances, loss of biological crusts, changes in hydrology, decreases in forb production due to loss of pollinators, and encroachment of invasive plant species are considered indirect impacts.

For purposes of analysis, short-term impacts result from activities that contribute to the decline in abundance or distribution within 5 years after the activities; long-term impacts are those that require more than 5 years reclaim or restore.

4.4.2.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for grasslands and shrublands communities.

Activities affect vegetative resources by altering, disturbing, or removing soil and vegetation. This impacts analysis and the conclusions are based on interdisciplinary team knowledge of resources in the planning area, review of existing literature, and information provided by other agencies. Existing literature and analyses include the Buffalo RMP (1985), the PRB EIS (BLM 2003c), USDA NRCS Ecological Site Descriptions for Major Land Resource Area (MLRA) 58B Northern Rolling High Plains, and WGFD spatial mapping and analysis. Spatial analysis was performed using the ESRI ArcGIS Desktop 10 computer software. Effects are quantified where possible. In the absence of quantitative data, impacts are expressed qualitatively based on professional judgement and interdisciplinary team knowledge.

Assumptions

To assist and simplify analysis of alternative effects on the condition of grassland and shrubland communities and the responses to different stimuli depending on the type and the level of activity. This analysis is based on the following assumptions, although there could be fluctuations based on climatic, economics, and other conditions:

- Protection of soils from disturbances and soil health, including microbes and invertebrates, are the main factors for sustaining healthy native plant communities.
- Soil and plant ecosystem management will determine the overall health of watersheds in conjunction with climate and, topography.
- Plant and plant-community health would determine the health of habitat for wildlife, habitats for special status plant species and wildlife, and the quality and quantity of forage.
- The Standards for Healthy Rangelands & Guidelines for Livestock Grazing Management for Public Lands Administered by the BLM in the State of Wyoming (BLM 1998) (referred to hereinafter as the Wyoming Standards for Healthy Rangelands) are designed to determine rangeland health, and PFC is designed to determine the health of riparian and wetland systems. Ecological site descriptions, inventory and trend monitoring, biodiversity assessments, habitat assessments, and integrated vegetation management can also contribute to overall assessments of plant community health.
- The factors with the greatest impact to vegetative and soil health include the introduction and expansion of invasive plants species, primarily cheatgrass, surface-disturbing activities, large grazing ungulates, and large-scale catastrophic events (wildfire and drought).
- Precipitation levels and soil characteristics, namely high-saline soils with minimal soil structure, are the dominant limiting factors affecting reclamation potential and should be a dominant factor in determining locations of developments.
- Based on the definition of surface-disturbing activity (see Glossary), energy development is identified as the primary source and generally increases the potential for accelerated erosion.
- Surface disturbances substantially increase the likelihood of the spread of invasive plant species.

- 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 the ability of soil to retain water, and impact rangeland health.
- Updated plant inventories are crucial to the management of public lands.

Significance Criteria

4.4.2.2. Impacts Common to All Alternatives

The importance of having baseline vegetation information to determine management goals and objectives drives the need for a complete vegetative inventory for the entire planning area.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Managing vegetative communities in accordance with Wyoming Standards for Healthy Rangelands provides minimum standards for determining rangeland health and provides the guidelines to aid communities that do not meet the standards. Using an integrated management approach (e.g., mechanical, chemical, and biological treatments; prescribed fire; and grazing management techniques) would maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives, including but not limited to, improving species richness and plant structure diversity, promoting a variety of age classes, increasing plant densities, and reducing or removing undesirable plants. Most vegetative treatments would directly benefit grasslands and shrublands, and the benefits would be long term so long as appropriate follow-up management was applied. Maintaining sustainable forage levels for livestock and wildlife habitats and managing grasslands and shrublands to protect, preserve, or enhance plant communities are continuing practices that result in direct and indirect beneficial impacts to grassland and shrubland communities over the long term.

Managing the siting of facilities and related infrastructure (e.g., utility corridors and roads) and planning and developing travel routes, recreational facilities, mineral exploration and development sites, and ROW would reduce impacts. Reclamation has been difficult due to, among other things, lack of soil structure, limited precipitation, soil textures, inversion of spoil piles, unavailability of seed of preferred species, herbicide application to reclaimed sites, re-disturbance of reclaimed sites, drought, and improperly applied techniques. Vegetation, if not timely established, would facilitate soil erosion, introduction of invasive species, and changes in site biodiversity due to the introduction or departure of native species or the use of non-native species. Grasses and forbs would dominate reclaimed sites initially and forbs and shrubs would return over a longer period. Developing a contingency plan to address catastrophic natural events such as drought, wildfires, and large-scale pest infestations by incorporating strategies that best protect vegetative resources would result in direct, short-term, beneficial effects to vegetation during the event and to the long-term overall health of plant communities. Working with landowners to reestablish disturbed sites to healthy plant communities on split estate lands would directly benefit plant communities by reestablishing native vegetative species and densities, therefore improving the health of those plant communities and decreasing the opportunity for invasive species to establish and spread in the short and long term.

Physical Resources

Air Quality (major beneficial)
Adherence to rules and regulations and enhancing cooperative processes are administrative processes that would have no direct effect on grassland and shrubland communities. Dust that covers vegetation reduces the photosynthesis process by blocking light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with either gravel or scoria, if untreated, would force large amounts of dust into the air; this dust could settle on vegetation. Reducing dust emissions and overall air quality management throughout the planning area would have a major beneficial effect on grassland and shrubland resources.

Soil (major beneficial)
Management actions include evaluating impacts to soil resources from proposed surface-disturbing activities using NRCS soil survey data and onsite investigation; and authorizing surface-disturbing activities that include plans for reclamation. These management actions help maintain and improve soil conditions and minimize soil erosion. Protecting soils and minimizing or mitigating impacts would result in direct, long-term, beneficial impacts to grasslands and shrublands.

Water Resources (moderate beneficial)
Water management actions include managing surface-disturbing activities to prevent degradation of water quality for all waters; managing water resources to meet the Wyoming Standards for Healthy Rangelands to achieve PFC; meeting Wyoming water quality standards; and taking appropriate actions to improve the biological, chemical, and geomorphic conditions of streams. Protecting and enhancing water quality and water functions would result in indirect, long-term, beneficial impacts to grasslands and shrublands.

Cave and Karst Resources (no effect)
Conducting cave inventories and significance determinations would not impact grasslands and shrublands.

Mineral Resources

Leasable Minerals – Coal (minor adverse), **Locatable Minerals, Leasable Minerals – Fluids, and Salable Minerals** (major adverse)
Management actions Common to All Alternatives include any lands not withdrawn [closed] to mineral entry, closed to leasing or closed to mineral material disposal are available for exploration or development for locatable, leasable, and salable minerals; areas open to oil and gas leasing would be open to geothermal development. Coal development occurs primarily in areas with high development potential, north-central Sheridan County and south central Campbell County (Map 11), and consideration could be given to areas outside this designation. All oil and gas mineral estate are open to leasing (Map 12) unless specifically identified as administratively unavailable during the planning period.

Impacts to grasslands and shrublands from the listed management actions would be direct and include long- and short-term impacts ranging from small and localized removal of vegetation to large-scale disturbances covering several hundred acres. The severity of effects would vary, depending on the amount of activity, the size of the disturbance, and the success of reclamation efforts (e.g., impacts from uranium mining would be negligible; impacts from CBNG and coal development would be minor). Surface disturbance and infrastructure from mineral development can fragment vegetative communities and alter plant community structure, diversity, and landscapes. Impacts can be short term until revegetation is successful. There would be long-term

adverse impacts associated with surface disturbance, site developments, infrastructure, roads and utility corridors, and unsuccessful or partially successful reclamation. Effects on grassland and shrubland resources from mineral resource development would be direct, long term, and adverse.

Leasable – coal mineral exploration and development could be permitted in one to five percent of all grassland and shrubland communities in the planning area; therefore management actions common to all alternatives for coal would have minor adverse effects on grassland and shrubland communities. Locatable mineral, leasable fluid mineral, and salable mineral exploration and development could each be permitted in greater than ten percent of all grassland and shrubland communities; therefore management actions common to all alternatives would all have major adverse effects on grassland and shrubland communities.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Most wildfires in the planning area are ignited by lightening in fine fuels (cured grasses), especially cheatgrass. Management actions include rehabilitating fire lines constructed by heavy equipment or on steep slopes to prevent or control erosion. Rehabilitation would include, but not be limited to, water barring and reseeding. Surface disturbance and soil compaction resulting from fire line construction, use of heavy equipment, and other fire-suppression activities would result in direct adverse effects by flattening or removing vegetation, potentially removing root systems of plants, particularly trees and shrubs, and increasing erosion, especially on steep slopes. The response to fire depends on the size, location, intensity, season, timing, and amount of post-fire precipitation, and preexisting plant community condition and the abundance of invasive plant species in the area. Large fires (100 acres or more) occur every five to seven years. Management actions also include cooperating and pursuing agreements with other agencies and landowners to perform landscape treatments to enhance fuels management and restore fire-adapted ecosystems. Prescribed fire, hazardous-fuels reduction, and WUI projects that include fire would result in direct beneficial impacts. These activities are planned on a project-specific basis, are generally applied in the cooler seasons (spring, fall, and winter), and often involve adjacent land owners. Protection from wildfire or enhancement of vegetation by applying planned ignitions would have a direct, beneficial effect on grassland and shrubland communities over the long term.

In shrubland communities, the impacts from fire usually are long term and depend on the scale and severity of the disturbance. Prescribed fires and wildland fires typically result in the complete mortality of Wyoming big sagebrush. Wyoming big sagebrush recovers very slowly from both types of burns at all sites, even those with relatively moist conditions. Full recovery to pre-burn sagebrush canopy cover would take well over 100 years (Montana Natural Heritage Program 2007).

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no management actions for forests and woodlands in the Common to All Alternatives section.

Vegetation – Riparian/Wetland Resources (major beneficial)
Management actions include managing riparian and wetland systems to enhance ecosite vegetation conditions and improve water quality; preventing degradation, loss, or destruction of

riparian and wetland habitat; and managing all riparian systems with sensitive species concerns to a succession stage appropriate for that system, including vertical and horizontal vegetative structure and composition. As riparian/wetland systems occur in or near greater than ten percent of the grassland and shrubland communities in the planning area, implementation of actions to protect, enhance, and prevent degradation, loss, and destruction of these systems would result in indirect, long-term, major, beneficial effects on adjacent upland plant communities.

Invasive Species and Pest Management (minor beneficial)
Historically, chemical or biological treatments are the most common treatment methods; in the future, IPM practices will be actively applied to manage designated pests on public surface lands. IPM uses a variety of tools to accomplish control, including, but not limited to, herbicide application, mechanical treatments (mowing), biological treatments (insects, fungi), cultural treatments (prescribed burns), and any combination thereof. Use of certified weed seed-free vegetation products ensures invasive species would not be unintentionally introduced. Encouraging minimum disturbance accomplishes two purposes it reduces reclamation efforts and costs, and reduces the size of area for invasive species to establish.

Removing native vegetation and disturbing soils make sites vulnerable to invasive species; these sites must be managed to reduce opportunities for invasive species to establish and spread. Areas of primary concern are surface disturbance sites, including roads, trails, utility corridors, recreation sites, mineral development sites, gravel pits, mines, and surface water. Herbicide treatment can directly benefit native species by reducing competition for water and soil nutrients. Herbicide treatments, if broad spectrum, can result in direct, long-term, adverse effects on non-target forbs and shrubs. Invasive species management would result in direct beneficial impacts over the long term.

Requiring all disturbance areas be treated would ensure the responsible party, whether the BLM or another entity, manages for invasive species. Animal and Plant Health Inspection Service-Plant Pest Quarantine (APHIS-PPQ) responds to many new introductions of plant pests to eradicate, suppress, or contain them through various programs in cooperation with state departments of agriculture and other government agencies. These can be emergency or longer-term domestic programs that target specific pests. APHIS is the lead agency for monitoring pest species and coordinating with the county weed and pest control districts and the BLM to administer control treatments on public lands.

Controlling invasive species by chemical and mechanical methods could have a direct adverse effect on other plant species. As an example, if an herbicide is nonselective for all broadleaf plants, the chemical could adversely affect forb species. If mechanical methods are used, any plant in the direct path of the application would be affected. Biological treatments are generally species specific and effects would be adverse, direct, and long-term to the pest species; removing pest species would have an indirect beneficial effect on other plants by improving the health of the vegetative community. Control measures for leafy spurge include grazing, biological agents, and herbicide. Biological agents have spread to concentrations of leafy spurge not accessible by motorized vehicle and difficult to access by foot. Management of this species would have a direct, beneficial effect over the long term.

Control treatments have not been pursued for cheatgrass because this species is currently not listed on the Wyoming Weed and Pest Control Act Designated List and a lack of funding. Cheatgrass results in direct, long-term, adverse impacts to grasslands and shrublands.

Fish and Wildlife Resources – Fish and **Special Status Species – Fish** (no effect)
Management actions common to all alternatives for fish and special status species fish are either administrative or do not overlap grasslands and shrublands and would have no effect on grassland and shrubland communities.

Fish and Wildlife Resources – Wildlife (major beneficial)
Maintaining, enhancing, and protecting important wildlife habitats to ensure suitable habitat components and minimize disturbance in these areas would indirectly promote the long-term health of vegetative communities. Wildlife browsing or grazing has less effect on grassland and shrubland communities, because wildlife frequently move and tend to not re-graze forage unless they are confined. Wildlife trails, bedding areas, and other congregation areas result in direct, long-term, adverse effects on grasslands and shrublands, but the scope of these effects would be negligible.

Upland game birds, raptors, and migratory birds can depend on grassland and shrubland communities for cover (upland game birds), food sources, and protection. Actions that protect or enhance habitats for these species would result in indirect, long-term, major beneficial effects.

Special Status Species – Plants (minor beneficial) **and Special Status Species – Wildlife** (major beneficial)
Special status species are given priority consideration in planning and implementing on-the-ground activities and projects. Some species require early seral ecological conditions, such as black-tailed prairie dogs and mountain plover. Actions that maintain or enhance these habitats result in direct adverse effects on the long-term health of vegetation by promoting water and wind erosion of soil. Management action for special status plant species common to all alternatives promotes health of the habitats which would also promote improving health of the grassland and shrubland communities in which they could occur. Special status plant habitats occur in one to five percent of grassland and shrubland communities in the planning area; therefore, the beneficial effects would be minor. Management actions common to all alternatives for special status wildlife species encourage managing vegetation composition, diversity and structure in Greater Sage-Grouse habitats; thereby improving the health of grassland and shrubland communities. Habitats for special status wildlife species are within greater than ten percent of all grassland and shrubland communities in the planning area; therefore, the beneficial effects would be major.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Management actions under all alternatives would generally focus on avoiding, stabilizing, and protecting cultural sites. These actions would decrease surface-disturbing activities on or near such sites. This could result in the adjustment of a project location or design. Areas important to Native American tribes would be managed to minimize disturbances; this would benefit shrublands and grasslands. Data recovery excavations would include surface disturbance and vegetation removal, but these areas are generally small (less than one acre), and data recovery excavations would have short-term, direct, adverse effects on grassland and shrubland resources. Overall, management actions that avoid or protect cultural resources by prohibiting or limiting soil disturbance would have a negligible beneficial effect on grasslands and shrublands.

Paleontological Resources (no effect)
No effects are anticipated from paleontological management actions.

Visual Resources (minor beneficial)
Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities. Management of VRM Class III and IV areas would include minor limitations on surface disturbance; this would have an indirect minor beneficial effect on grasslands and shrublands, depending on the locations, types, and durations of approved projects.

Land Resources

Forest Products (no effect)
Management actions common to all alternatives for forest products do not affect grassland and shrubland communities.

Lands and Realty (minor adverse)
Land acquisitions, pursuit of easements, and tenure adjustments would improve management of the public lands overall. Effects on grasslands and shrublands would vary, depending on the type and extent of the action. Actions that would remove public land management from small scattered parcels and promote larger seamless tracts of public land would benefit management of grasslands and shrublands.

Vegetation on land proposed for exchange or acquisition could be indirectly affected by such action due to a change in ownership and management. Management actions that promote vegetative resources, such as habitat enhancement, would benefit grasslands and shrublands and actions that promote surface disturbance and vegetation removal would have an adverse effect; these effects would be long term.

Overall, lands and realty management actions could occur in one to five percent of grassland and shrubland communities; therefore, management actions Common to All Alternatives would have minor adverse effects on grasslands and shrublands.

Renewable Energy (no effect)
Cooperating with stakeholders to coordinate renewable-energy opportunities would have no effect on grasslands and shrublands as this action is administrative.

Rights-of-Way and Corridors (major adverse)
Actions to minimize surface disturbance and adverse effects on other resources, and to locate new ROWs adjacent to or in existing disturbed areas would lessen adverse effects from ROWs. New ROWs and corridors could be located in greater than ten percent of all grassland and shrubland communities in the planning area; therefore, management actions common to all alternatives for ROWs and corridors would have direct, long-term, major, adverse effects on grasslands and shrublands.

Travel and Transportation Management (minor adverse)
Roads and trails have a direct adverse effect on vegetation, but are necessary to conduct management and development on public lands. Management actions include provisions to inventory and evaluate upgrade, maintain, or close and reclaim, reduce surface water runoff and erosion and restrict motorized vehicles to designated roads and trails and temporary and permanent road and trail closures. All these management actions would reduce erosion, protect and stabilize soils and vegetation, and reduce opportunities for invasive species and weeds to establish. Overall, transportation and access would be permitted in one to five percent of all grassland and shrubland communities in the planning area; therefore the management actions common to all alternatives would have minor adverse effects on them.

Recreation (minor adverse)
Development of recreational opportunities, trails, maintenance of established sites, facility construction, and designating trails to caves all would have the potential to directly affect native grassland and shrubland communities. Trails, roads, campgrounds, and facilities remove vegetation for the life of the development. Adjacent vegetation would be indirectly affected by trampling, dust, and erosion from vegetatively denuded sites. Erosion and decreased vegetative cover would occur from soil compaction and the channelization of surface water runoff in ruts and road ditches. Recreation management actions that involve disturbance of the soil and vegetation removal would have minor adverse effects on grasslands and shrublands by promoting soil erosion, removing plant, and providing an opportunity for invasive species to establish.

Lands with Wilderness Characteristics (no effect)
Management actions common to all alternatives for wilderness characteristics include evaluation of lands only and would have no effect on grassland and shrubland communities.

Livestock Grazing Management (major beneficial)
Livestock grazing strategies, including implementation of the Wyoming Standards for Healthy Rangelands, Allotment Management Plan (AMP) and grazing agreement implementation, proper livestock management, and installation of range improvement projects, are designed to assist in achieving appropriate levels of forage consumption by livestock and wildlife. AMPs and grazing agreements include defined rotations, deferments, periods of rest from grazing, manipulation of season of use, and grazing intensity. Over time, these actions can alter the amounts and types of vegetation present on the landscape; therefore, they can be used as tools to directly and indirectly manipulate and improve plant community composition, plant structure, plant cover, and vigor of vegetation. Construction and location of range improvements helps disperse livestock and can be used as management tools. Strategies will be developed and implemented to minimize adverse effects on vegetation during periods of drought. Prescribed-burn areas will be managed before the treatment to ensure needed fuels are available. Grazing (livestock and wildlife) has adverse and beneficial effects on grasslands and shrublands, depending on grazing intensity (utilization), timing (allowances for re-growth during active growing season), season of grazing, rangeland health, and precipitation.

Historic and current trailing of livestock on the established stock driveways can contribute to disturbed soil, trampled vegetation, deposited manure, loss of plant cover, and localized areas dominated by annuals and invasive and other weed species. The major stock driveways (The Slip, Trabing Road, and Hazelton Road) are designated county roads; therefore, effects from trailing constitute only a small portion of adverse effects. Trailing is also short term, occurring only two to three weeks in spring and fall. Trailing livestock would have a negligible adverse effect on vegetation.

Livestock grazing allotments contain greater than ten percent of all grassland and shrubland communities in the planning area; therefore, proper livestock grazing management would have a major beneficial effects on them.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas (negligible beneficial)
Management actions associated with special designations would be to maintain or enhance their natural characteristics and emphasize primitive, nonmotorized activities to maintain current

natural values. Special designations could increase popularity with recreationists and increase use in these areas, resulting in increased potential for vegetation disturbance and removal and invasive plant and weed species establishment. Overall, management actions that prohibit disturbance of the soil or removal of native vegetation would have a negligible beneficial effect on grasslands and shrublands plant communities.

Socioeconomic Resources

Social and Economic Conditions (moderate adverse)
Multiple entities depend on public lands for their livelihoods or a portion of their livelihoods. Public land natural resources also can add to the quality of life, and benefits from these can be directly and indirectly derived from activities such as hunting, outfitting, fishing, and guided hunts and tours. Managing in a way that considers these sources of employment and income can be beneficial and adverse to vegetation and would be similar to those described for recreation.

Health and Safety (negligible beneficial)
Management actions designed to prevent accidental spills of hazardous materials would benefit grassland and shrubland communities by protecting riparian and upland areas. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. There would be no adverse effects on vegetation unless there was an accident or spill. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or upland area to its original condition over the short term; therefore, there would long-term adverse effects. Reclamation of abandoned mines would have a direct beneficial effect by reducing erosion, protecting and stabilizing soils and vegetation, and reducing opportunities for invasive species and weeds to establish on grassland and shrubland communities at the affected sites over the long term.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above.

4.4.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to grassland and shrubland communities from management of other resources under Alternative A.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Alternative A would continue management in accordance with the 1985 RMP as amended and maintained, which did not include specific decisions for management of grasslands and shrublands. With no specific management decisions, reclamation would be guided by BLM policy, which allows use of non-native species. Use of non-native species could directly benefit grasslands and shrublands by quickly establishing vegetation on sites reducing the opportunity for erosion and invasive plant establishment. This could indirectly benefit vegetative communities by reducing erosion potential. Achieving successful reclamation would directly benefit the surrounding plant community and could help discourage invasive species.

Physical Resources

Air Quality (negligible beneficial)
The types of effects to grassland and shrubland communities from Alternative A would be the

same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (vegetation conservation). In Alternative A, though, these impacts would be analyzed on a project-specific basis. Without monitoring or oversight on a programmatic level, lack of consistency would cause the beneficial effects to likely only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial effects on grassland and shrubland communities.

Soil (moderate beneficial)
Soils management under Alternative A would prohibit surface-disturbing activities from March 1 through June 15, and on slopes equal to or greater than 25% unless the authorized officer waives the prohibition. These protective measures have a beneficial effect by not allowing soil disturbance and vegetation removal. However, waivers allow for inconsistent application of management and could allow activities when and where soils would be highly susceptible to erosion. Restricting surface-disturbing activities on soils with poor reclamation suitability on a project-specific basis does protect the soil resource in these specific areas. Soils management under Alternative A would allow for surface-disturbing activities on 22% of BLM-administered public land, on slopes equal to or greater than 25%, 58% of BLM-administered public land with poor reclamation suitability. Current management decisions do not address limitations and restrictions on badlands, rock outcrops, and slopes susceptible to mass movement and all current decisions can be waived. Current management decisions have soil protective measures that have a beneficial effect on the vegetation but do not adequately address and protect all soils capable of eroding and this lack of decisions has a direct adverse long-term effect. Protective measures for soils would conserve vegetation in greater than ten percent of all grassland and shrubland communities in the planning area. Without oversight on a programmatic level or allowing waivers without specified criteria, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate.

Water Resources (minor beneficial)
Alternative A prohibits surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams unless the authorized officer waives the prohibition. This management would affect approximately 19,861 acres of BLM-administered public land. This allows inconsistent management application and could allow activities at distances that could adversely affect water quality and quantity; remove or crush vegetation, thus reducing its ability to hold the soils and filter sediment; reduce or degrade habitat for numerous plant and animal species that inhabit these water systems; and reduce or degrade potential habitat for special status species. The prohibition decision is beneficial but the ability to implement waivers without identified criteria reduces that to minor. Impacts could have direct and indirect effects that could be short term (days to months) or long term (months to years).

Cave and Karst Resources (no effect)
There are no current management actions for this resource.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative A, withdrawing the Amsden Creek, Middle Fork Canyon, and Kerns Game Ranges (4,583 acres) from mineral location, and restricting locatable minerals activities in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) would have a direct, long-term, beneficial effect on vegetative communities at these sites because surface-disturbing activities would not be allowed or would be restricted. Under the

locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately 554 acres over the next 20 years (less than 1% of available acres). This would have a negligible adverse effect on grassland and shrubland communities.

Leasable Minerals – Coal (major adverse)
Opening all federal coal lands (federal mineral estate for coal retained by the federal government) to study and exploration subject to license stipulations necessary to protect other resource values, would allow surface-disturbing activities in greater than ten percent of all grassland and shrubland communities in the planning area and would have a direct major adverse effects. These effects would be long term for the life of the project and would require successful reclamation to ensure the vegetative component was reestablished to predisturbance vegetative states and to reduce the potential introduction and establishment of invasive plant species. Although significant acreage is open to study and exploration, only a portion would be developed. Under current management, approximately 195,700 acres (4%) would be disturbed; 120,700 would be reclaimed, 45,500 acres are actively mined, leaving approximately 75,000 acres disturbed over the long term (Appendix G (p. 1671)).

Leasable Minerals – Fluids (major adverse)
Alternative A would continue to lease and allow development of federal oil and gas and would make the WSAs (28,931 acres) administratively unavailable. Site development, roads, and utility corridors associated with oil and gas activities would be surface-disturbing activities that would require successful reclamation. Under the leasable CBNG program for the planning area, development could be permitted in greater than ten percent of grassland and shrubland communities; therefore management actions for leasable fluid minerals under Alternative A would have a major adverse effect on them. Overall, it is estimated that BLM CBNG actions would disturb approximately 2,258 acres over the next 20 years (less than 1% of the total available acres). Reclamation will occur on 903 acres. Under the leasable oil and gas conventional program for the planning area, overall it is estimated that BLM actions would disturb approximately 8,317 acres over the next 20 years. Reclamation will occur on 5,575 acres (Appendix G (p. 1671)). This management action would promote surface-disturbing activities that would have a direct adverse effect on those grassland and shrubland plant communities. There is no anticipated disturbance from geothermal-related activities.

Salable Minerals (minor adverse)
Salable minerals activities would be prohibited in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres). Prohibiting soil-disturbing mineral activity would have a direct beneficial effect for the long term on those protected plant communities. The estimated areas of surface disturbance from salable minerals activities over the next 20 years would be small (530 acres disturbed) (Appendix G (p. 1671)). Long-term disturbance of vegetative communities would have a direct adverse effect on grassland and shrubland communities. Salable minerals, under Alternative A could be permitted in greater than ten percent of all grassland and shrubland communities in the planning area; therefore, the effects would be minor.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible adverse) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Both wildland fire and prescribed fire have adverse and beneficial effects on grassland and shrubland communities. In the short term, wildland fires and prescribed-fire projects would

reduce canopy and ground cover through the direct loss of vegetation, litter, and duff, thereby exposing soils to potential wind and water erosion and increasing the potential for runoff. Fires also can promote the spread of invasive species by leaving soil bare and transporting invasive plants and seeds by human activity, on tools, and on vehicles. In the long term, because of the role fire historically played in these communities, fire can increase vegetative species and seral-stage diversity across the landscape, rejuvenate decadent plants, and improve the overall health of these communities (Thonicke et al. 2001).

Current management uses prescribed fire to achieve desired vegetative and wildlife habitat management objectives. Prescribed fire is an important vegetation management tool and fires are planned on a landscape basis, usually with multiple land owners involved. Management objectives using prescribed fire can include increasing the age and species diversity of plant communities, increasing plant vigor, and enhancing nutrient cycling. Prescribed fires reduce fuels loading and minimize the risk of catastrophic wildland fires; therefore, short-term effects associated with prescribed fire generate long-term benefits by reducing the risk of highly damaging catastrophic wildland fires. Prescribed fire can adversely affect non-targeted species in the same vegetative community. Prescribed fires usually burn at lower temperatures, enabling more rapid recovery of the surviving plant species. The change in ground-surface temperature could damage vegetation root structure, but usually would not destroy the root crown of perennial grasses, thereby enabling them to flourish after fires have removed the undesirable or competing vegetation. Prescribed fires can be controlled to times of year when fire would be less likely to damage soils through excessive heating. Prescribed fires generally are not possible in areas with oil and gas development and in WUI areas.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Designing vegetative treatments, including sagebrush spraying or burning, to meet overall resource management objectives to protect or improve biodiversity and water quality would affect vegetation. Plant recipients of the treatments would be directly and adversely affected, but overall, vegetative communities would indirectly benefit through improved health over the long term (10 or more years, depending on the treatment). Forest and woodland management would impact less than one percent of grassland and shrubland communities in the planning area; therefore, management action for forests and woodlands would have negligible beneficial effects on grassland and shrubland communities.

Vegetation – Riparian/Wetlands Communities (moderate beneficial)
Current management prohibits surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. This prohibition of surface disturbance and associated vegetation removal would have direct, beneficial effects over the long term. The authorized officer may waive the prohibition which could allow surface-disturbing activities. Removing vegetation by exceptions to the prohibition would have a direct adverse effect and would increase the potential for soil erosion. This would contribute to movement of sediments into the water systems, which would affect water quality. Riparian/wetland resource health indirectly affects grassland and shrubland communities by proximity. Riparian/wetland systems occur in or near great than ten percent of all grassland and shrubland communities in the planning area; therefore, the prohibitions would have major beneficial effects on grassland and shrubland communities. Without oversight on a programmatic level or allowing waivers without specified criteria, though,

it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate.

Invasive Species and Pest Management (minor beneficial)
The goal for managing invasive and pest species is to maintain weed seed-free, native communities to sustain their natural values. Under Alternative A, areas with established invasive plant patches would be treated to control unwanted species, which would protect native plant communities from initial invasion or expansion of invasive species. Control of invasive and pest species on public lands (approximately 8,000 acres annually) in cooperation with county weed and pest control districts would have direct and indirect, short- and long-term, and beneficial and adverse effects on grasslands and shrublands. Most of the control effort would include the use of chemical, mechanical, and biological methods. Long-term disturbances over the next 20 years are estimated to affect approximately 1,000 acres from BLM actions, with 7,000 acres of reclamation.

Pest (e.g., grasshoppers) control would primarily be by chemical (insecticide) application; effects on grasslands and shrublands would be indirect, beneficial and short term.

Fish and Wildlife Resources – Fish (moderate beneficial)
Alternative A would apply constraints on surface-disturbing and disruptive activities on a project-specific basis. These constraints should affect greater than ten percent of all grassland and shrubland communities over the long term; thereby having major beneficial effects. Without oversight on a programmatic level or allowing waivers without specified criteria, though, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate by not providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate beneficial)
Current management actions include surface disturbance and occupancy prohibitions or restrictions in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek Game Ranges in crucial elk winter range between November 15 and April 30; in elk calving areas; within 750 feet of sharp-tailed grouse leks any time, within an additional 0.64-mile radius of sharp-tailed grouse leks from April 1 through May 30; within a 0.25-mile radius of the center of Greater Sage-Grouse leks, and within an additional 1.75-mile radius from March 1 to June 15 unless the authorized officer waives the prohibition. Prohibitions of surface disturbance is a direct, major benefit by denying plant removal and soil disturbance. Without oversight on a programmatic level or allowing waivers without specified criteria, though, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only moderate.

Special Status Species – Plants (negligible beneficial)
Limiting surface disturbing activities in habitats with known populations of special status plants species would have a direct, beneficial effect on grasslands and shrublands over the long term. Special status plants occur in less than one percent of all grassland and shrubland communities in the planning area; therefore, management actions for special status plant species, under Alternative A, would have negligible beneficial effects on them.

Special Status Species – Fish (negligible beneficial)
Restricting surface-disturbing and disruptive activities near any water that contains special status fish species would affect approximately 818 acres (less than one percent of the grassland and shrubland communities in the planning area), which would have a direct, negligible, beneficial impact to grasslands and shrublands over the long term.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
Current management decisions protect cultural sites near the Bozeman Trail. Prohibiting surface-disturbing activities for cultural resources, under Alternative A, would conserve vegetation in one to five percent of the grassland and shrubland communities in the planning area. This would have direct minor beneficial effects on grassland and shrubland communities over the long term.

Paleontological Resources (no effect)
No effects are anticipated from paleontological management actions.

Visual Resources (minor beneficial)
Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities. Management of VRM Class III and IV areas would include minor limitations on surface disturbance within one to five percent of the grassland and shrubland communities in the planning area. This would have an indirect minor beneficial effect on grasslands and shrublands, depending on the locations, types, and durations of approved projects.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (minor adverse)
The types of effects from Alternative A would be the same minor adverse effects as described in the *Impacts Common to All Alternatives* section for lands and realty (vegetation loss and degradation).

Renewable Energy (moderate adverse)
Alternative A does not establish guidelines for the development of renewable-energy resources. Under the renewable-energy program for the planning area, overall it is estimated that approximately 20,000 acres would be disturbed over the next 20 years. This would have a direct, moderate, adverse effect as renewable energy actions could be permitted in, and cause removal of vegetation in five to ten percent of the grassland and shrubland communities in the planning area.

Rights-of-Way and Corridors (moderate adverse)
Current management actions under Alternative A include locating transmission lines and transportation facilities within identified corridor areas to the extent feasible. This action concentrates the surface disturbance to designated areas, thereby reducing the amount of disturbed acres overall. Also, surface disturbance and occupancy will not be allowed on slopes of 25% or more. ROWs and corridors could be permitted in five to ten percent of the grassland and shrubland communities in the planning area. ROW disturbances are estimated to affect approximately 38,762 acres (Appendix G (p. 1671)). This would have a direct, moderate, and adverse effect over the long term.

Travel and Transportation Management (minor beneficial)
Motorized travel removes plants and decreases plant production and species composition; this contributes to accelerated soil erosion. Limiting motorized vehicle use to existing roads and vehicle routes would concentrate adverse effects. Current decisions under Alternative A include

closing areas with saturated soils and with slopes equal to or greater than 25% (approximately 170,590 acres) to motorized vehicles; this would have a direct beneficial effect on vegetation, soils, and water quality over the long term. In addition, closing certain areas to vehicular travel (approximately 3,704 acres), limiting vehicular travel to designated roads and trails (150,070 acres) in other areas, and seasonally closing areas from November 15 to April 30 (approximately 29,011 acres) would directly benefit grassland and shrubland communities over the long term by protecting vegetation and soils overall and at times when erosion could occur. For a list of areas closed to motorized travel, see the *Travel and Transportation Management* section of this chapter.

Recreation (negligible adverse)
Under Alternative A, recreation-site development is anticipated to disturb approximately five acres, with successful reclamation on all five acres. Unless waived by the authorized officer, Alternative A prohibits surface disturbance or occupancy in the Red Wall/Hole-in-the-Wall area, in Middle Fork Canyon and with 0.5 mile of the canyon rims, and in the Dry Creek Petrified Tree Environmental Education Area. Prohibiting surface disturbance has a direct beneficial effect on the vegetation. Waivers allowing surface-disturbing activities would likely be limited in number but would have a direct adverse effect on plant communities and would be in effect for the duration of the project or permit over the long term (usually 10 or more years) Recreational site development will remove the majority of the vegetation due to impacts from motorized vehicles and human acclivity, these sites would have a direct, negligible, adverse effects for the long term.

Lands with Wilderness Characteristics (no effect)
Presently no areas outside the three WSAs are managed for the preservation of their wilderness characteristics.

Livestock Grazing Management (major beneficial)
Under Alternative A, livestock grazing is not authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing is allowed on all public lands in the resource area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values. Most of these areas are have fragile soil surfaces, shallow soils, and steep slopes, and produce little vegetation.

Native grasslands evolved with grazers, and many grass species respond positively to leaf removal by propagating, which increases vegetative cover (Anderson 2006) Current decisions include allocating temporary increases in available forage first to wildlife to meet the population objectives of the WGFD. Any of the increased forage not needed for wildlife would be available for livestock use. Any permanent increases in the amount of forage produced would be considered for watershed protection and wildlife habitat before authorizing additional livestock use. Management actions that protect watersheds and enhance habitats would have a direct beneficial effect on grasslands and shrublands communities.

Under Alternative A, a minimum of two years rest from livestock grazing would be provided following prescribed fire and other vegetative treatments. Additional rest might be allowed where necessary to achieve resource goals and objectives. Impacts from vegetative treatments, including prescribed fire, would include deferring planned areas from grazing to leave grasses (fine fuels) to help carry the ignition. Prescribed fire and other treatments would cause short-term losses of vegetation and changes in plant community structure. In the long term, treatments would be designed to improve the health and vigor of vegetation, increase vegetative diversity, modify

vegetation types (e.g., a change from shrubs to herbaceous vegetation), and modify age class and structure. Treatments would have a beneficial effect on grasslands and shrublands.

Current management allows development of range improvements. These result in localized short-term disturbances to grassland and shrubland communities, including the flattening or loss of vegetative cover due to construction activities. Placement of water, salt, or other supplements results in trampling of vegetation and small bare areas of livestock and wildlife concentration. Where salt and mineral supplements are not in containers, changes in soil chemistry could delay long-term recovery of vegetation. Long-term loss of vegetation would occur near pits and reservoirs and along fence lines where there are roads or animal trails. However, improved management due to additional water sources, fences, and other improvements potentially improve plant composition and vigor. Estimates for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 70 acres (80 miles), with successful reclamation on approximately 50 acres (57 miles) and approximately 20 acres disturbed over the long term. Wells are estimated to disturb 1 acre.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, and Wild and Scenic Rivers (negligible adverse)
Alternative A does not include special designations. Areas have been identified and are being managed under interim management criteria that protects the resource. Current management may not have adequate management actions to protect the vegetative resources which has a direct, negligible adverse effect on grasslands and shrublands.

Wilderness Study Areas (negligible adverse)
If Congress decides not to designate the WSAs as wilderness, Alternative A would allow leasing for minerals. The WSAs currently encompass less than one percent of the grassland and shrubland communities in the planning area. This would have a direct adverse effect on grassland and shrubland communities due to the surface-disturbing activities of development and needed infrastructure. Adverse effects would continue for the life of the permit or lease. At present, there are no decisions addressing motorized travel in these areas. Limiting motorized travel would benefit vegetation unless it restricts the application of herbicides to control invasive species in the plant communities.

Socioeconomic Resources

Social and Economic Conditions (no effect)
No effects are anticipated from social and economic management actions.

Health and Safety (no effect)
No effects are anticipated from health and safety management actions.

4.4.2.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely resulting effects on grassland and shrubland resources from those management actions.

Vegetation – Grassland and Shrubland Communities (moderate adverse)
The management action includes authorizing only native plant species for all reclamation activities, eliminating the concern of cross pollination of non-native species with native species and competition for water and soil nutrients, overall, creating a more naturally healthy plant community. However, native plants can be more difficult to establish than some non-native species that have specific plant characteristics that assist in achieving reclamation objectives.

Physical Resources

Air Quality (major beneficial)
Under Alternative B, air quality modeling would be performed on a project-specific basis. In addition, projects expected to approach or exceed emissions standards would be evaluated for potential mitigation strategies. This would protect the health of all of the plant communities and would have a major beneficial effect on grassland and shrubland communities.

Soil (major beneficial)
Soils management actions under Alternative B would include prohibiting surface-disturbing activities on slopes equal to or greater than 25% (approximately 170,590 acres or 22% of public land acres), on soils with a severe erosion hazard (approximately 215,496 public land acres or 28%), and on soils with poor reclamation potential (approximately 455,090 public land acres or 58%). Management actions would also prohibit certain proposed activities on badlands, rock outcrops, or slopes susceptible to mass movement, which would affect approximately 218,928 public land acres or 28%. All these actions would serve to protect the soil resource which would have direct beneficial effects on grassland and shrubland communities over the long term. In general, protecting soils directly correlates to protecting vegetation by reducing erosion potential and providing a healthy medium in which plants can grow. This would occur in greater than ten percent of the grassland and shrubland communities in the planning area; therefore the management actions for soil under Alternative B would have major beneficial effects on grassland and shrubland communities.

Water Resources (minor beneficial)
Watershed management actions to prohibit surface disturbance within 500 feet of any natural or man-made water feature (approximately 19,861 public land acres or 2.5%) would have a direct beneficial effect on vegetation and water quality in these sensitive sites. This action would prohibit removal of vegetation and disturbance of soil which would reduce potential for soil runoff into nearby water systems that could contribute to the impairment of water quality. Other management actions include prohibiting activities that would result in surface discharge of water and prohibiting construction of on-channel reservoirs that could adversely affect natural flow regimes. These actions would directly benefit grassland and shrubland communities by preventing the natural transition of plant species from dry land species to more wetland-tolerant species in grasslands and shrublands, and minimizing the opportunity for invasive plant species to establish on these sites. Managing riparian and upland areas to restore perennial flow or standing water in historically perennial systems would return these systems to their natural state and would provide habitat for numerous flora and fauna species. The removal and reclamation of

unneeded CBNG reservoirs would directly benefit vegetative communities over the long term by returning these systems to their natural state and reducing the opportunity for invasion and spread of undesirable plant species. All of these actions would have a minor beneficial effect on grasslands and shrublands plant communities.

Cave and Karst Resources (major beneficial)
Caves and karsts are generally present in rock formations. Alternative B management actions to prohibit surface-disturbing activities in cave and karst areas and implementation of cave-specific management plans would directly benefit grassland and shrubland communities by limiting soil and vegetation disturbance from minerals development or other human activities. Approximately 101,455 public land acres or 13% would be protected from disturbance. Trails leading to popular cave and karst areas could trample and remove vegetation, which would have a direct adverse effect on those plants over the long term. Management actions to protect cave and karst resources would have a major beneficial effect on grasslands and shrublands.

Mineral Resources

Locatable Minerals (major adverse)
In addition to areas currently withdrawn or restricted from locatable minerals development, Alternative B includes new areas to protect and preserve cultural, paleontological, recreation, lands with wilderness characteristics, and other special designation resource values (ACECs, Scenic or BCBs, WSRs, and WSAs). This would result in 2,727,957 acres (13%) available. Locatable minerals development has a direct adverse effect on vegetation over the long term, and protecting these areas would benefit grassland and shrubland plant communities. Under the locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately 277 acres over the next 20 years. Reclamation would occur on 72 acres. The long-term disturbance would have a adverse effect on those plant communities directly affected. Locatable minerals could be permitted in greater than ten percent of the grassland and shrubland communities in the planning area; therefore, management actions for locatable minerals under Alternative B would have major adverse effects on them.

Leasable Minerals – Coal (major adverse)
Under Alternative B, closing all federal coal lands (federal mineral estate for coal retained by the federal government) outside the high development potential areas would have a direct beneficial effect on vegetation in these areas. However, where development does occur, vegetation would be directly and adversely affected over the long term for the life of the project and would require successful reclamation to ensure the native vegetative component was reestablished to predisturbance conditions and to reduce the potential establishment and spread of invasive plant species. Under this alternative, approximately 186,600 acres would be disturbed, with reclamation occurring on approximately 120,600 acres, 36,500 acres being actively mined, and approximately 66,000 acres disturbed over the long term. This long-term disturbance has a direct and adverse effect on those vegetative communities. Alternative B management of leasable coal resources would have a major adverse effect on grasslands and shrublands.

Leasable Minerals – Fluids (minor adverse)
Under Alternative B, management to conserve other resources would make 2,612,920 acres of public land closed to fluid minerals leasing (41% of total public land acres). This large amount of protected acreage would directly benefit vegetation; however, in areas of development, the effect would be direct, adverse, and long term. The fluid mineral program is estimated to disturb approximately 286 acres over the next 20 years. Long-term disturbances have a direct and

adverse effect on those vegetative communities (Appendix G (p. 1671)). Leasable fluid mineral exploration and development could occur in one to five percent of the grassland and shrubland communities in the planning area; therefore management actions for fluid minerals would have a minor adverse effect on grasslands and shrublands.

Salable Minerals (negligible adverse)
Alternative B would close leasing in accordance with management identified to conserve other resources. This would result in 1,663,422 acres of federal mineral estate (88%) closed to salable minerals development. Alternative B would result in reducing adverse effects to grassland and shrubland communities because additional acreage would not be developed over the long term and only a small portion of public land would be developed. Estimated acres of disturbance for salable minerals over the next 20 years would be negligible (114 acres) (Appendix G (p. 1671)).

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor beneficial) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Alternative B management actions apply full suppression in areas where fire is undesirable affecting approximately 42,232 acres. Monitoring fire behavior only in areas where fire can be used as a management tool based on resource goals and objectives would directly benefit grassland and shrubland communities by enhancing/restoring the natural fire regime of these communities. Limiting suppression vehicles to existing roads and trails unless they are in identified full suppression areas would affect approximately 739,910 acres, and rehabilitating all fire-related damage would directly benefit vegetative communities over the short and long terms by reducing the potential for vegetation compaction or removal and soil erosion. Alternative B protected acres would be the same as under Alternative A. Long-term, the application of prescribed fire to improve grassland and shrubland communities (plant species diversity, production and vigor) and wildlife habitat objectives is estimated to affect approximately 3,500 acres from BLM actions. All acres would be successfully reclaimed (Appendix G (p. 1671)). This management would have minor beneficial effects.

Rehabilitating all fire-related damage would directly benefit vegetative communities over the short and long terms by reducing the potential soil erosion and limiting opportunities of invasive species establishment. Using wildland fire and other vegetative treatments to restore fire-adapted ecosystems and to reduce hazardous fuels would benefit native vegetation by returning a historic fire regime to the ecosystem; reducing hazardous fuels reduces the opportunity for wildfire and severe impacts from wildfires. Long-term, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 3,500 acres from BLM actions. All acres are expected to be successfully reclaimed (Appendix G (p. 1671)).

Under Alternative B, prescribed fire and other vegetation treatments would be used to restore fire-adapted ecosystems and reduce hazardous fuels. Wyoming big sagebrush requires 50–120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Prescribed fire would have minor beneficial effects on grasslands and major adverse effects on shrublands. Unplanned fire would have negligible to major effects, depending on the fire size, soil type, type of vegetative community, and burn conditions.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No effects are anticipated from forests and woodlands management actions.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative B, prohibiting surface-disturbing activities for mineral leasing within 500 feet of riparian and wetlands systems, aquatic habitats, and floodplains (approximately 23,831 acres) would directly benefit adjacent grassland and shrubland communities. Restoring vegetation on all CBNG-supported wetland and riparian systems would return those hydric systems in the upper watershed back to upland vegetation and reclaim the large numbers of systems constructed to receive CBNG produced water. These systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle, and reclamation would establish competitive native species. Reclamation also would include eradication of invasive species. These management actions would occur in one to five percent of the grassland/shrubland communities in the planning area and would have a minor beneficial effect on the health of them.

Invasive Species and Pest Management (major beneficial)
Alternative B would control invasive plant species in cooperation with county weed and pest districts. Treating plants on the Wyoming Weed and Pest Control Act Designated List, the appropriate county lists, and other species of concern as determined by BLM resource specialists would treat all species that adversely affect native plant communities. Annual bromes (cheatgrass) are present throughout the planning area; therefore, a treatment management plan addressing cheatgrass should incorporate the entire planning area. Treatment of annuals would improve the ecological condition of the vegetative communities and reduce the potential for wind and water to erode soil. Non-selective herbicides could affect other broadleaf plants (forbs, special status plant species, and shrubs) along with the target species. Aerial application of pesticides would allow for treatment of large acreages for widespread species such as cheatgrass and leafy spurge, and lower rates of herbicide so other non-target, yet susceptible, species would be less affected. All these actions would have direct beneficial effects on grasslands and shrublands over the long term. Long-term disturbances over the next 20 years are estimated to affect approximately 15,000 acres from BLM actions, with 13,000 acres of reclamation (Appendix G (p. 1671)).

Fish and Wildlife Resources – Fish (major beneficial)
Alternative B management actions would consider fish and fish habitat in reservoir, riparian and wetland systems, and perennial water management. Alternative B would apply constraints on surface-disturbing and disruptive activities providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities adjacent to or within greater than ten percent of the grassland and shrubland communities in the planning area. Management actions for fish under Alternative B would have major beneficial effects on grassland and shrubland communities.

Fish and Wildlife Resources – Wildlife (moderate beneficial)
Alternative B management actions include distance and timing limitations or prohibitions on surface disturbance and occupancy in or near big-game and elk crucial winter ranges or big-game transition ranges, elk calving areas, within 750 feet of upland game bird leks at any time and an additional 0.64-mile radius from April 1 through May 30, and within a biological buffer zone around nests of conservation concern raptor species Limitations and prohibitions protecting the soil surface for wildlife would conserve vegetation in five to ten percent of the grassland and shrubland communities in the planning area. Management actions under Alternative B for wildlife would have direct, moderate, beneficial effects on grasslands and shrublands over the long term.

Special Status Species – Plants (negligible beneficial)
Alternative B management actions that prohibit surface-disturbing or disruptive activities in designated areas would affect approximately 126,811 acres (less than 1%) of grassland and shrubland communities. Limiting these activities in habitats with known populations of special status plants species would have a direct, negligible, beneficial effect on grasslands and shrublands over the long term.

Special Status Species – Fish (negligible beneficial)
Alternative B management actions that prohibit surface-disturbing and disruptive activities with 0.25 mile of any water that contains special status fish species and prohibit impoundments where they could adversely affect such fish would affect approximately 818 acres (less than 1%), which would have a direct, negligible, beneficial impact to grasslands and shrublands over the long term.

Special Status Species – Wildlife (major beneficial)
Maintenance or enhancement of special status wildlife species habitat will usually directly benefit the surrounding plant community unless the special status species requires a habitat contrary to "typical" habitats, such as the prairie dog and the mountain plover, which are associated with short-grass prairie dominated by blue grama (*Bouteloua gracilis*). These species require a degraded ecological state of health to thrive. Providing these habitat requirements would have a direct adverse effect on the plant community over the long term. Prohibiting surface-disturbing and disruptive activities in all prairie dog colonies to provide suitable habitat for special status species that depend on prairie dog colonies would affect 6,156 acres.

Alternative B management actions would prohibit renewable-energy projects in Greater Sage-Grouse nesting, brood-rearing, and winter concentration areas. Actions would prohibit or avoid surface-disturbing activities within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks year-round, would prohibit surface-disturbing activities within 4 miles of occupied leks from March 1 to June 30, and prohibit surface-disturbing activities within wintering habitat from November 15 to March 14, which in total would affect approximately 467,897 acres. Other areas include identified nesting and early brood-rearing habitat outside the 4-mile lek buffer, which would affect approximately 135,194 acres, and Greater Sage-Grouse winter habitat, including winter concentration areas, which would affect approximately 226,595 acres. The larger the area protected from surface disturbances the greater the benefit to vegetative communities. Alternative B management actions that prohibit or avoid surface-disturbing activities would have a direct, beneficial effect on associated grassland and shrubland communities over the long term.

Alternative B management would avoid surface-disturbing and disruptive activities and occupancy in Greater Sage-Grouse winter habitat, including winter concentration areas, from November 15 to March 14 and allow no more than three percent removal of sagebrush habitats per 640-acre section. The action to allow no more than three percent removal of sagebrush habitats per 640-acre section might or might not benefit grassland and shrubland communities, depending on the ecological condition of the communities and other resource objectives. Alternative B management actions would also restore, where appropriate, all disturbed grassland and shrublands to Greater Sage-Grouse habitats. This would increase the health of these systems.

Alternative B management actions that prohibit surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats would affect approximately 176,636 acres. This would have a direct, beneficial effect on grasslands and shrublands by protecting vegetation and soils from disturbance.

Overall, the prohibitions/restrictions for special status wildlife habitats would encompass and conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area; therefore the management actions for special status wildlife resources under Alternative B would have major beneficial effects on these communities.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Prohibiting surface disturbance in areas with historic properties, or within 5 miles or the visual horizon (whichever is closer) would affect approximately 330,592 public land acres of historic properties that retain their integrity of setting. These prohibitions would conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area; therefore they would have a direct, major, beneficial effect on grassland and shrubland communities by keeping soils and vegetation intact.

Paleontological Resources (major beneficial)
Requiring paleontological field surveys to determine types and locations of classes, monitoring, and then initiating protective measures, including limiting or prohibiting surface-disturbing activities, would protect vegetation from possible large-scale surface disturbance. This could affect up to 754,668 acres of public land (greater than ten percent of the grassland and shrubland communities). Protecting lands with paleontological resources could promote paleontological excavation and research activities. These small (under one acre) short-term activities would have a direct adverse effect on grasslands and shrublands by disturbing soils and removing vegetation for the life of the project through successful reclamation. It is estimated that approximately 200 acres would be disturbed, with successful reclamation anticipated on all acres (Appendix G (p. 1671)). Overall there would be a major beneficial effect.

Visual Resources (moderate beneficial)
Under Alternative B, the BLM could prohibit or limit some surface-disturbing activities in VRM Class II areas on about 218,178 acres and thereby protect grassland and shrubland communities. VRM Class III and IV areas encompass approximately 275,315 and 259,594 acres respectively, on which the BLM would allow surface-disturbing activities with some limitations. Prohibiting or limiting surface-disturbing activities for management of visual resources would occur in five to ten percent of the grassland and shrubland communities and would, therefore, have a moderate beneficial effect.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (moderate beneficial)
Alternative B management actions would pursue land disposals, acquisitions, easements, or land tenure adjustments for lands holding custodial grazing allotments, and sales independent of other resource values. As they pertain to the overall management of public lands if pursed and completed, these actions would improve public land management capabilities overall and would occur in five to ten percent of the grassland and shrubland communities, having an indirect, moderate, beneficial effect on grassland and shrubland communities over the long term.

Renewable Energy (minor adverse)
Alternative B management actions would affect development in the public lands by excluding specific areas on about 710,376 acres and avoid areas from mineral leasing on about 67,319 acres. These restrictions would lessen the adverse effects to grassland and shrubland communities if the energy developments involved surface-disturbing activities. Under the renewable-energy program for the planning area, overall for the next 20 years it is estimated that BLM actions would disturb approximately 5,000 acres. Reclamation would occur on 4,500 acres (Appendix G (p. 1671)). These management actions would allow renewable-energy development within one to five percent of the grassland and shrubland communities in the planning area, therefore, having a minor adverse effect on grasslands and shrublands.

Rights-of-Way and Corridors (major adverse)
Management actions include prohibiting ROW on slopes equal to or greater than 25% and on highly erodible soils to minimize impacts to soil resources. Requiring co-location of new communication sites within designated areas, authorizing transmission lines in identified corridors, and avoid constructing facilities along major transportation routes. All these actions would reduce surface disturbance directly reducing adverse effects to vegetation over the long term by limiting removal or mechanical damage to vegetation and reduce the potential for water and wind to erode soil. ROW development on public land would be excluded on 370,088 acres and avoided on 395,444 acres of public land. ROW disturbances are estimated to affect approximately 5,750 acres for pipelines and 28 acres for communications sites during the planning period; all pipeline acres are expected to be successfully reclaimed. Roads are estimated to affect 9,275 acres, with successful reclamation on approximately 2,690 acres 6,585 acres of long-term disturbances on the public lands. Powerlines are estimated to affect approximately 2,458 acres, with successful reclamation on approximately 245 acres and 2,213 acres of long-term disturbance (Appendix G (p. 1671)). These Alternative B management actions would allow ROWs and corridors to be permitted in greater than ten percent of grassland and shrubland communities; therefore, having a major adverse effect on grasslands and shrublands.

Travel and Transportation Management (minor adverse)
Alternative B management actions would allow motorized vehicles off designated routes with a special use permit. Management actions would close areas with saturated soils or on slopes of 25% or greater, in habitat for special status species, special designation areas, and big game ranges during specific timeframes; also limit travel to designated roads and trails on 451,077 acres. These actions would protect the grassland and shrubland resources during conditions when soil and plants are highly susceptible to erosion. Prohibiting vehicular travel on saturated soils and requiring closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available would directly benefit vegetative resources. Transportation and access would be permitted in one to five percent of the grassland and shrubland communities in the planning area; therefore management actions under Alternative B for transportation and access would have a minor adverse effect on grasslands and shrublands.

Recreation (minor adverse)
Alternative B management actions to designate eight areas as SRMAs, for 55,529 acres, with possible consideration of additional lands for SRMA designation, and prohibit surface disturbance in designated SRMAs unless the disturbance is for administrative purposes would generally help protect, maintain, and enhance vegetative resources. However, the BLM promotes visitor use and access in SRMAs, which would increase the areas' popularity and visitation. This would increase vegetation disturbance from trampling and increase the potential for invasive plant species introduction and spread. SRMAs under Alternative B encompass one to five percent of

the grassland and shrubland communities in the planning area. Alternative B management actions would have a minor adverse effect on grasslands and shrublands over the long term.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative B includes management actions for lands with wilderness characteristics, which would directly benefit vegetative communities by limiting surface-disturbing activities in those areas on approximately 12,237 acres, less than one percent of the grassland and shrubland communities. This management would have a negligible beneficial effect on grasslands and shrublands.

Livestock Grazing Management (moderate beneficial)
Alternative B livestock grazing management actions include: (1) prohibiting increases in livestock stocking rates as a result of vegetative treatments; (2) providing a minimum of 2 years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments, with additional rest where necessary; (3) limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values; (4) locating livestock salt or mineral supplements a minimum of 0.5 mile from water sources, riparian areas, and aspen stands; (5) designating and managing future resource reserve allotments as needed; and (6) authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and to livestock grazing as the second priority. All these management actions benefit vegetative communities. Prohibiting increases in livestock stocking rates would ensure benefits to vegetation gained through treatment would not be lost to increased grazing pressure. Locating salt and mineral supplements away from water sources and other sensitive areas would discourage livestock from congregating and would alleviate long-term impacts from animals and hoof action. Reserve allotments would enable other pastures and allotments to be rested if needed. Treatment and project-related deferment or rest allows vegetation to complete two life-cycles, or more if determined needed, before resuming livestock grazing. Increases in forage would be allocated to watershed protection and wildlife habitat to meet health standards before making it available to livestock. Construction of range improvements would have a direct adverse effect on vegetation for the life of the project. All other livestock-related actions would have an indirect beneficial effect over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb 1 acre, with successful reclamation (Appendix G (p. 1671)).

Alternative B livestock grazing management would have a moderate beneficial effect on grasslands and shrublands.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Alternative B management actions include designating seven areas as ACECs, which would affect approximately 536,304 acres. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities, including minerals development, vehicular travel, ROW, and any other activity not compatible

with retaining or enhancing the area's values. All these restrictions would have direct, minor, beneficial effects on grasslands and shrublands over the long term.

Scenic or Back Country Byways (negligible beneficial)
Evaluating the road system for potential designation could indirectly benefit vegetation because some activities (minerals and energy development) might be discouraged based on scenic values. This management would have a negligible beneficial effect on grasslands and shrublands.

Wild and Scenic Rivers (negligible beneficial)
The portion of the Middle Fork Powder River portion that is suitable and eligible for WSR designation is awaiting Congressional action. Until Congress acts, or if Congress releases the corridor from WSR consideration, management would continue in accordance with the Middle Fork Interim Management Plan to retain its free-flowing characteristics and outstanding resource values. Under the designation or continuation of interim management, upland vegetation would indirectly benefit from special management actions. This management would have a negligible beneficial effect on grasslands and shrublands.

Wilderness Study Areas (negligible beneficial)
There are three WSAs in the planning area totaling 28,931 acres. There are restrictions to preserve wilderness conditions in these areas until Congress acts on their Wilderness status. Designation of these areas and interim management is based on conservation of the natural resources, which would directly benefit vegetative communities and limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on grasslands and shrublands.

Socioeconomic Resources (no effect)

No effects are anticipated from socioeconomic resources management actions

4.4.2.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting impacts to grassland and shrubland resources.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
The management action allowing non-native plant species (mostly sterile, small-grain cereal crops such as oats, triticale, and barley) for initial (one to two years) reclamation practices would provide another tool for achieving reclamation goals, but also would provide the opportunity for non-native species to be introduced. Non-native species could cross pollinate with native species, outcompete native species for water and soil nutrients, and move out of their original niche and become an invasive species. Use of non-native species could directly benefit grasslands and shrublands by quickly establishing vegetation on sites reducing the opportunity for erosion and invasive plant establishment. This could indirectly benefit vegetative communities by reducing erosion potential. Achieving successful reclamation would directly benefit the surrounding plant community and could help discourage invasive species.

Physical Resources

Air Quality (major adverse)
There would be no air quality modeling under Alternative C. Industrial projects

would be expected to approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse impacts to grassland and shrubland communities. Vegetation is possibly more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, which can reduce photosynthesis by as much as fifty percent. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems. Plants also become more vulnerable to attacks by pests, disease, and environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. Adverse impacts to vegetation would be major.

Soil (major adverse)
There would be no constraints for surface-disturbing activities under Alternative C. Allowing surface-disturbing activities would directly remove and mechanically damage vegetation, remove soils and soil microbes, decrease forage availability, remove habitat and increase opportunities for invasive species where development occurs throughout the planning area. This action would have a direct, major, adverse effect on grasslands and shrublands communities.

Water Resources (moderate adverse)
There would be no constraints surface-disturbing activities under Alternative C. Management actions include allowing on-channel reservoirs, which locates these in the most productive vegetative sites. Surface discharge would be authorized when permitted by the State of Wyoming, which would promote upland vegetation transition to hydric species including invasive species such as tamarix and Canada thistle. All these actions would have a direct moderate adverse effect on grasslands and shrublands over the long term.

Cave and Karst Resources (negligible beneficial)
Alternative C management actions include establishing project-specific buffers (100 feet, for a total of 11 acres of protection) from significant cave entrances to protect caves from surface-disturbing activities. This would have a direct, negligible, beneficial effect on grasslands and shrublands.

Mineral Resources

Locatable Minerals (major adverse)
Alternative C does not include recommendations for new withdrawals or restrictions on locatable minerals development. Lands open to mineral entry (open is about 3,319,535 acres – including greater than ten percent of the grassland and shrubland communities in the planning area and withdrawn are about 11,373 acres) are consistent with other resource values. Grassland and shrubland communities would be directly and adversely affected by not protecting more areas from locatable minerals activities. Under the locatable minerals program for the planning area, overall it is estimated that BLM actions would disturb approximately 1,455 acres over the next 20 years. Reclamation would occur on 378 acres. Alternative C management of locatable minerals would have a major adverse effect on grassland and shrubland communities.

Leasable Minerals – Coal (minor adverse)
Alternative C would open all federal coal lands (federal mineral estate for coal retained by the federal government) to availability for exploration and leasing (in one to five percent of the grassland and shrubland communities in the planning area), subject to license stipulations necessary to protect other resource values. Though there are no constraints, development is only

likely to occur in those area previously identified. Where development does occur there is a direct and adverse impact to the vegetation through removal and mechanical damage. Effects are long term until successful reclamation is achieved. Allowing these surface-disturbing activities would have a direct, minor, adverse effect on vegetation in these areas.

Leasable Minerals – Fluids (major adverse)
Alternative C makes all lands administratively available for development (within greater than ten percent of the grassland and shrubland communities in the planning area). Development would include surface-disturbing activities at the production sites as well as all the necessary infrastructure. Surface-disturbing activities would have a direct and adverse effect on vegetation for the long term until required successful reclamation is achieved. Native grasses and forbs would dominate reclaimed sites initially, and forbs and shrubs would return over a longer period. Mechanical removal and injury to the vegetation would occur. Soil removal and compaction wold occur and channelization of surface runoff in ruts and road ditches is likely. Alternative C management of leasable fluid minerals would have a major adverse effect on grasslands and shrublands. Under the CBNG program for the planning area, overall it is estimated that BLM actions would disturb 13,200 acres over the next 20 years. Reclamation will occur on 5,280 acres. Under the leasable conventional oil and gas program for the planning area, overall it is estimated that BLM actions would disturb approximately 9,055 acres over the next 20 years. Reclamation will occur on 6,070 acres. There is no anticipated disturbance from geothermal activities.

Salable Minerals (major adverse)
Alternative C does not recommend new closures or restrictions. The existing closures and restrictions were imposed to protect and preserve other resource values. Not adding areas to be protected from these minerals activities would have a direct, adverse effect on grassland and shrubland communities. For salable minerals over the next 20 years, the estimated areas of surface disturbance would be occur in greater than ten percent of grassland and shrubland communities in the planning area; 2,090 acres disturbed, 392 acres reclaimed, and 1,698 acres long-term disturbance (Appendix G (p. 1671)).

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse) **and Planned Fire (Prescribed Fire)** (minor beneficial)
Under Alternative C, management actions that involve full suppression regardless of other resource objectives would have a direct adverse effect on grassland and shrubland communities. The use of heavy equipment with few constraints would have a direct adverse effect on vegetative communities over the short and long terms by increasing the opportunities for water and soil erosion, soil compaction, and invasive plant species establishment. Long-term estimates for the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 42,000 acres from BLM actions. All acres are expected to be successfully reclaimed.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No effects are anticipated from forests and woodlands management actions.

Vegetation – Riparian/Wetland Resources (major adverse)
Alternative C management actions would allow surface-disturbing and disruptive activities and

apply standard lease terms for mineral leasing within 500 feet of riparian and wetlands systems, aquatic habitats, and floodplains. This would have a direct adverse effect on the adjacent grassland and shrubland communities by promoting activities that would lead to soil erosion. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would benefit only a very small number of the systems overall. All systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle. This would have an adverse effect on the health of greater than ten percent of the adjacent grassland and shrubland communities.

Invasive Species and Pest Management (moderate adverse)
Under Alternative C, restricting aerial application to only insecticides would limit herbicide applications to motorized vehicle and hand application. This would restrict where application could occur and the size of treatments, therefore allowing vast acreages (in the case of leafy spurge, which inhabits thousands of acres across multiple landscapes, plant communities, remote locations, and a variety of terrain) to go untreated. This would have a direct adverse effect on upland and hydric plant communities over the long term. Long-term disturbances over the next 20 years are estimated to affect approximately 10,000 acres from BLM actions; reclamation would occur on 8,500 acres (Appendix G (p. 1671)).

Annually treating only designated areas for cheatgrass would be ineffective because there would be only small, scattered treatments and most of the cheatgrass would be unaffected. This would have an adverse effect on grassland and shrubland communities.

Fish and Wildlife Resources – Fish (major adverse)
Alternative C management actions would consider other resources a higher priority than fish and fish habitat in reservoir, riparian and wetland systems, and perennial water management. Alternative C would not apply constraints on surface-disturbing and disruptive activities, and would apply only the standard lease terms for minerals leasing in naturally occurring waterbodies. This lack of constraints would indirectly and adversely affect these systems over the long term by not providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities. Prioritizing other resources considerations above fish and fish habitat could also adversely or beneficially effect greater than ten percent of the vegetation depending on the management action.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative C wildlife management actions, including management for big-game species, upland game birds, migratory birds, special status plants, special status fish, and special status amphibians and reptiles, would not be implemented on a project-specific basis. Alternative C would manage special areas consistent with other resource values, rather than for wildlife species, except raptors, and would not apply constraints on locations and timing of surface disturbances. These management actions would still conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area. Management actions for wildlife under Alternative C would have indirect and direct, major beneficial effects on vegetative communities over the long term.

Special Status Species – Plants (negligible beneficial)
Alternative C management actions would allow aerial application of herbicide treatments in areas with habitat for special status plant species. The alternative would restrict treatments in areas of known special status plant populations. This would conserve vegetation in less than one percent of the grassland and shrubland communities in the planning area and would have a

direct, negligible, beneficial long-term effect. Other invasive management methods would be applied in habitats of known species.

Special Status Species – Fish (negligible adverse)
Alternative C management actions would prohibit surface-disturbing and disruptive activities in less than one percent of grassland and shrubland communities, if impacts could not be mitigated. Other actions include designing impoundments and instream structures to minimize impacts on or near existing or potential sites and habitats. These actions would reduce, but not prevent, direct adverse effects such as surface-disturbing activities that could affect upland vegetation; however, the primary effect would be to the riparian habitat adjacent to the stream. All effects would be long term.

Special Status Species – Wildlife (major beneficial)
Maintenance or enhancement of special status species habitat usually benefits the plant communities. However, vegetation in the prairie dog towns is already in lower ecological state, with a large component of cheatgrass. Alternative C management actions that would allow surface-disturbing activities in prairie dog habitat would adversely affect vegetation by direct mechanical removal or damage to plants, removal of soil medium, and increase the opportunity for resident cheatgrass to spread. Impacts to grasslands and shrublands would be direct, adverse, and long term.

Alternative C management actions would allow renewable-energy projects in Greater Sage-Grouse nesting, brood-rearing, and winter concentration areas. Management would prohibit or avoid surface-disturbing activities within a specified distance from designated leks, identified nesting and early brood-rearing habitat, and Greater Sage-Grouse winter habitat during specific periods, some areas would prohibit surface-disturbing activities yearlong. Only those areas protected from surface disturbance year-round would benefit the vegetation. Those areas, under Alternative C still conserve greater than ten percent of the grassland and shrubland communities in the planning area. All other management actions would be adverse since surface disturbance could occur. There would be no limit on the amount of sagebrush removal, so decision would be based on multiple resources rather than only on Greater Sage-Grouse habitat. Allowing surface disturbance has a adverse effect on grassland and shrubland communities.

Alternative C management actions would allow surface-disturbing and disruptive activities in known areas of special status amphibian and reptile species and their habitats. This would have a direct, adverse effect on those habitat types over the long term.

Overall, management action for special status wildlife species under Alternative C would have major beneficial effects on grassland and shrubland communities.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Alternative C management would allow surface disturbance in areas with historic properties which would have a direct adverse effect on vegetation over the long term by mechanical removal or damage to the vegetation, removal of the soil medium, increasing the opportunities for soil erosion and invasive species establishment. The areas open to disturbance encompass one to five percent of the grassland and shrubland communities in the planning area; therefore, management actions for cultural resources under Alternative C would have minor adverse effects on grassland and shrubland communities.

Paleontological Resources (minor adverse)
Alternative C management actions that would limit the requirement for paleontological field surveys to all PFYC Class 4 and 5 formations potentially affected by proposed activities would affect 28,177 acres. Lack of protective measures, including limiting or prohibiting surface-disturbing activities, would subject vegetation to possible direct, moderate, adverse effects by removal or damage to vegetation. Under Alternative C, this could occur in one to five percent of otherwise protected grassland and shrubland communities, therefore, management action for paleontological resources would have minor adverse effects on grassland and shrubland communities.

Visual Resources (moderate adverse)
Under Alternative C, WSAs and WSRs are managed as VRM Class I (30,101 acres), manage VRI Class II as VRM Class III (167,334 acres), and manage all VRI Class III and IV areas (584,500 acres) as VRM Class IV. Management would be applied at a lower level of VRM class, therefor more surface disturbing activities would be allowed within five to ten percent of grassland and shrubland communities. This would have a direct, moderate, adverse effect on vegetation over the long term.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (major adverse)
Alternative C management actions would not pursue land disposals, acquisitions, easements, or land tenure adjustments for lands holding custodial grazing allotments, and sales independent of other resource values. Lands otherwise available for these actions contain greater than ten percent of the grassland and shrubland communities in the planning area, therefore, effects to grasslands and shrublands would be indirect, major, adverse, and long term.

Renewable Energy (major adverse)
Alternative C would allow sites and areas for energy development, which would likely involve surface-disturbing activities within greater than ten percent of the grassland and shrubland communities in the planning area. This would have a major adverse effect on grassland and shrubland communities. Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 40,000 acres over the next 20 years. Reclamation will occur on 22,500 acres (Appendix G (p. 1671)).

Rights-of-Way and Corridors (moderate adverse)
Alternative C would not apply constraints on ROW and corridor placement or development. Not limiting surface disturbance and not avoiding activities on slopes equal to or greater than 25% would have a direct adverse effect (removal) on vegetation over the long term. ROW disturbances are estimated to affect approximately 20,000 acres for pipelines and 84 acres for communications sites during the planning period; successful (100%) reclamation is estimated to occur on all effected acres. Roads are estimated to affect 27,825 acres, with successful reclamation on approximately 12,800 acres; the remaining 15,025 acres would experience long-term disturbances on public lands. Powerlines are estimated to affect approximately 7,374 acres, with successful reclamation on approximately 737 acres and 6,637 acres of long-term disturbance (Appendix G (p. 1671)). ROWs and corridors, under Alternative C would be permitted in one to five percent

of the grassland and shrubland communities in the planning area; therefore, the adverse effects would be moderate.

Travel and Transportation Management (moderate adverse)
Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25%, and in special species habitat. These actions would have a direct, long-term, moderate adverse effect by not protecting the protecting the soil or vegetation resources within five to ten percent of the grassland and shrubland communities in the planning area.

Recreation (negligible adverse)
Alternative C management actions include designation six areas as SRMAs with no consideration to additional lands for SRMA designation, leasing minerals in accordance with management for areas surrounding SRMAs, and allowing surface disturbance and salable minerals development in the six designated SRMAs. Mineral leasing and surface disturbance would be allowed, this would have a direct adverse effect on vegetation over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation, increase vegetation disturbance from trampling, and increase the potential for invasive plant species introduction and spread. This would also have a direct and adverse effect over the long term. SRMAs encompass less than ten percent of the grassland and shrubland communities in the planning area; therefore, the management actions for recreation under Alternative C would have negligible adverse effects on them.

Lands with Wilderness Characteristics (minor adverse)
Alternative C management actions include managing the LWC areas the same as the surrounding areas. There are no significant protective measures for the surrounding areas therefor the management actions. Effects on grasslands and shrublands from these actions would be indirect, minor, adverse, and long term as vegetation removal could occur in one to five percent of grassland and shrubland communities in the planning area that are present in LWCs.

Livestock Grazing Management (major adverse)
Alternative C management actions include allowing increases in livestock stocking rates as a result of vegetative treatments and providing a maximum of two years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments. This would compromise the health of vegetative communities. Livestock are often attracted to new vegetation following vegetative treatments and fires. If not monitored, these sites can be over utilized, and increasing stocking rates could compound the issue. Two years of rest might not be sufficient to achieve preferred ecological state and vegetation management goals. Grazing of young seedling plants would reduce their ability to compete with more aggressive plants, which often are invasive or less palatable and less nutritious species.

Estimates of surface disturbances in the planning area over the next 20 years for range improvement projects include spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres as long-term disturbance. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Overall, Alternative C livestock grazing management allotment occur in greater than ten percent of the grassland and shrubland communities in the planning area, therefore, the management actions under this alternative would have a major adverse effect on them.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
Alternative C would not designate ACECs. Lack of designation would allow these areas that contain less than ten percent of the grassland and shrubland communities in the planning area to be eligible for surface-disturbing activities, among other actions, which would have a direct, negligible, adverse effect on vegetative communities.

Scenic or Back Country Byways (no effect)
No evaluation of the road system for potential designation would occur. Activities would not be discouraged based on scenic values. This management would have no effect on grasslands and shrublands.

Wild and Scenic Rivers (negligible adverse)
Alternative C management would be the same as management in the surrounding areas until Congress acts. Rather than developing a specific management plan for this area, these management actions would be generic. The Middle Fork Powder River area contains less than one percent of the grassland and shrubland communities in the planning area. Grassland and riparian communities would indirectly benefit over the long term from this management action, but likely not to the same degree as the more protective measures under a specific management plan.

Wilderness Study Areas (negligible adverse)
There are three WSAs in the planning area totaling 28,931 acres and encompass less than one percent of the grassland and shrubland communities in the planning area. Alternative C management would be the same as management in surrounding areas, which would be generic and might not address all resource issues. This would have an indirect, negligible, adverse effect on grassland and shrubland communities over the long term.

Socioeconomic Resources (no effect)

No effects are anticipated from socioeconomic resources management actions.

4.4.2.6. Alternative D

This section describes management actions under Alternative D, which presents the preferred actions, a compromise between resource conservation and resource use, and the potential impacts to grasslands and shrublands from those management actions.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Under Alternative D, allowing non-native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. These species would only be used on those sites where native species have proven not to establish or the timing of native plant seedling establishment is not conducive (months of low precipitation with higher climatic temperatures). Plant establishment is critical to prevent erosion of soil and reduce the opportunities for invasive species establishment. It is the anticipated that non-native species would be used on in the short term (1 to 3 years). As stated in Chapter 2 of the Integrated Vegetation Management Handbook

(H-1740-2) (BLM 2008e); it is the policy of the BLM to manage for biologically diverse, resilient and productive native plant communities to sustain the health and productivity of the public lands. This policy recognizes that, for a variety of reasons, not every acre of public land will contain native plants and that, in certain circumstances to prevent further site degradation and improve functionality, non-native plants may be used as part of post fire stabilization and rehabilitation activities as well as in restoration to achieve short-term site stabilization objectives. However, where practical, uses and activities will be conducted to favor the health and persistence of native plant communities where they currently exist and rehabilitation or restoration actions will be undertaken to improve their diversity, resiliency and productivity. The policy in BLM Manual 1745 requires that native species shall be used except under limited circumstances. Use of non-native species could have the direct benefit of quickly establishing vegetation on sites, stabilizing soils, and reducing the opportunity for erosion and invasive species establishment. This would directly benefit vegetative communities over the short and long terms. Non-native species could outcompete native plants for water and soil nutrients and move out of their original niche and become an invasive. These outcomes would have a direct adverse effect on grasslands and shrublands. There also would be a small potential risk of non-native species cross pollinating with native species.

Physical Resources

Air Quality (major beneficial)
Effects to grassland and shrubland associated with air quality management actions in Alternative D would be the same as those described in Alternative B.

Soil (major adverse)
Surface-disturbing activities would be allowed under Alternative D when soil resource objectives can be met. Development on and disturbance of sensitive soils would have approved site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives. Alternative D would avoid surface disturbances on badlands, rock outcrops, and slopes susceptible to mass movement unless site-specific construction, stabilization, and reclamation plans to conserve the soil resource and meet reclamation and resource objectives are submitted and approved.

Alternative D would allow development on a total of 3,285,316 acres (within greater than ten percent of the grassland and shrubland communities in the planning area). Alternative D would have a direct, long-term, effect on grassland and shrubland communities. Under Alternative D, restrictions for construction on sensitive soils will likely be permitted and would have major adverse effects on grassland and shrublands in the planning area.

Water Resources (minor beneficial)
Alternative D would allow surface disturbances within 500 feet of springs, water wells, perennial streams, CBNG reservoirs, and non-CBNG reservoirs (within one to five percent of the grassland and shrubland communities in the planning area) in accordance with identified criteria and based on management decisions considering other resource values. This management would have a direct, long-term, beneficial effect on grasslands and shrublands. Disturbance in these areas would have a direct adverse effect on vegetation and water quality in these sensitive sites; however, meeting the stipulations and criteria would reduce the areas where development could occur and would minimize adverse effects. Allowances for on-channel reservoirs could have a direct adverse effect on vegetation.

Cave and Karst Resources (negligible beneficial)
Alternative D management actions include establishing project-specific buffers (100 feet, for a total of 11 acres of protection – less than one percent of the grassland and shrubland communities in the planning area) from significant cave entrances to protect caves from timber sales and surface-disturbing activities. This would have a negligible, beneficial effect on grasslands and shrublands over the long term.

Mineral Resources

Locatable Minerals (major adverse)
In addition to areas currently withdrawn or restricted, Alternative D includes a number of new areas to conserve other resource values; this would leave 3,232,508 acres open to mineral entry, with 115,614 acres recommended for withdrawal from mineral entry in addition to the 11,373 acres of existing withdrawals. Grassland and shrubland communities would directly benefit over the long term from the additional withdrawn acreage. However, in the greater than ten percent of the grassland and shrubland communities in the planning area where development did occur, any related actions that disturbed the surface would have a direct and adverse effect until successful reclamation is achieved. Under the locatable minerals program for the planning area, overall it is estimated that BLM actions would disturb approximately 1,252 acres over the next 20 years. Reclamation would occur on 329 acres (Appendix G (p. 1671)). This long term disturbance would have a direct major adverse effect on the vegetative communities.

Leasable Minerals – Coal (major adverse)
Alternative D would open all federal coal lands (federal mineral estate for coal retained by the federal government) to study and exploration, subject to license stipulations necessary to protect other resource values (4,775,136 acres), which includes greater than ten percent of the grassland and shrubland communities in the planning area. Leasing is subject to unsuitability screening and is discretionary based on NEPA analysis. Implement existing coal leasing authority when federal coal lands are requested for in situ gasification. Federal coal minerals are not likely to be developed due to the ratio of development costs and cost returns. However, in areas where coal development does occur, or where gasification facilities are constructed, grasslands and shrublands would be directly and adversely affected for the life of the project until reclamation goals and objectives are achieved.

Leasable Minerals – Fluids (major adverse)
Alternative D would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources within greater than ten percent of the grassland and shrubland communities in the planning area. This management would make a total of 101,081 acres of federal land administratively unavailable for minerals leasing.

Salable Minerals (major adverse)
Alternative D would open 2,957,960 acres of federal minerals to salable minerals exploration and development and would close 390,162 acres. Salable are not predicted to impact large acreage but where salable minerals are leased and developed (within greater than ten percent of the grassland and shrubland communities in the planning area), vegetation would be directly and adversely impacted by the mechanical removal or damage to the vegetation; soils also would be directly and adversely impacted until reclamation goals and objectives are met. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would be 1,193 acres disturbed, 224 acres reclaimed, and 969 acres of long-term disturbance (Appendix G (p. 1671)).

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible beneficial) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Under Alternative D, response to wildland fires would vary from full suppression in areas where fire is undesirable, to monitoring fire behavior in areas where fire can be used as a management tool based on resource goals and objectives. Alternative D prohibits heavy equipment use within specifically identified areas totaling approximately 503,612 acres of public land except when human safety is at risk or if the effects of fire would cause more resource damage than the use of heavy equipment. Prohibiting heavy equipment would directly benefit vegetation over the short and long terms. Full protection strategies and tactics would be used in designated areas on approximately 38,760 acres. All protective measures have a direct, long-term, negligible, beneficial effect on vegetation. All fires would be evaluated for rehabilitation and severity of impacts. Alternative D would use prescribed fire, wildland fire, and other vegetative treatments to meet management objectives. Effects from management actions would be direct, beneficial and long term.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No effects are anticipated from forests and woodlands management actions.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative D would allow surface-disturbing activities when riparian/wetland and other resource objectives can be met on 23,831 acres (one to five percent of the grassland and shrubland communities in the planning area). Reclaiming vegetation on all CBNG riparian and wetland systems in accordance with ecological site protection measures would achieve returning all water-affected systems to their pre-CBNG natural state. These actions would have an indirect, minor, beneficial effect on vegetation.

Invasive Species and Pest Management (moderate beneficial)
Alternative D would allow aerial application in areas where topography, extent of infestation, target species, and timing limit other application methods. Areas with annual bromes would be designated and prioritized for treatment. These actions would have a direct, moderate, beneficial effect on vegetative communities over the long term.

Fish and Wildlife Resources – Fish (major beneficial)
Alternative D management actions would consider fish and fish habitat in reservoir, riparian/wetland systems, and perennial water management. Alternative D would apply constraints on surface-disturbing and disruptive activities providing protection of vegetation, soils, and soil microbial activity from surface disturbing activities within greater than ten percent of the grassland and shrubland communities in the planning area; therefore, the management actions for fish under Alternative D would have major beneficial effects on grassland and shrubland resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative D would prohibit surface disturbance and occupancy in established big-game winter ranges, unless in doing so, the resource objectives are achieved. Any limitations, restrictions, or prohibitions on surface-disturbing activities and motorized travel would directly benefit greater than ten percent of the grasslands and shrublands communities over the long term. Activities that

enhance habitat for wildlife would likely have a direct, major, beneficial effect on grassland and shrubland communities over the long term.

Special Status Species – Plants (moderate beneficial)
Alternative D management actions would allow surface-disturbing activities, ROW, and motorized travel in habitats of special status plant species (126,811 acres, or 17%, of public land – five to ten percent of grassland and shrubland communities), but not in the area of known populations. This would have a moderate beneficial effect long term.

Special Status Species – Fish (minor beneficial)
Alternative D management actions would prohibit surface-disturbing and disruptive activities within 0.25 mile of any water that contains special status fish species (818 acres). This area of restriction also encompasses one to five percent of the grassland and shrubland communities in the planning area. This action would have a direct, minor, beneficial effect on grasslands and shrublands over the long term.

Special Status Species – Wildlife (major beneficial)
Alternative D would allow surface-disturbing and disruptive activities in active prairie dog colonies, within defined criteria, that do not adversely affect special status wildlife species that depend on the habitat provided by the colonies. Allowing these activities in prairie dog habitat would further impact vegetation that is already in a lower ecological state and increase the opportunity for resident cheatgrass to spread. Adverse effects to grasslands and shrublands would be direct and long-term.

Alternative D management actions would prohibit renewable-energy projects in Greater Sage-Grouse Priority Habitat Area. Actions also would prohibit or avoid surface-disturbing activities during specific periods within a specified distance from designated leks, identified nesting and early brood-rearing habitat, and Greater Sage-Grouse winter habitat. There would be no more than 5% removal of sagebrush habitat in Priority Habitat Area; outside these areas have no limitation on the amount of sagebrush removal. Decisions would also be based on management of occupied Greater Sage-Grouse habitats and Priority Habitat Area of Greater Sage-Grouse. In addition, lands that meet identified criteria would be prioritized for restoration to Greater Sage-Grouse habitat. These would have beneficial effects on vegetative communities.

Alternative D management actions would allow surface-disturbing and disruptive activities in accordance with defined criteria in known areas of special status amphibian and reptile species and their habitats. Known populations would be protected with an additional 1,640 feet (500 meter) buffer. This would affect approximately 176,636 acres, and would have a direct, beneficial effect over the long term.

Overall, protective measures for special status wildlife species would also conserve vegetation within greater than ten percent of the grassland and shrubland communities in the planning area; therefore, management actions for special status wildlife resources under Alternative D would have major beneficial effects on these vegetative communities.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Alternative D would prohibit surface disturbance in areas with historic properties, or within three miles or the visual horizon (whichever is closer) of historic properties that retain their integrity of setting (approximately 188,487 acres, less than ten percent of the grassland and shrubland

communities in the planning area). This would have a direct, negligible, beneficial effect on grasslands and shrublands over the long term.

Paleontological Resources (minor beneficial)
Requiring paleontological field surveys and initiating protective measures would protect vegetation from possible large-scale surface disturbance within one to five percent of the grassland and shrubland communities in the planning area. This could affect up to 754,668 acres of public land acres. This would result in a minor beneficial impact on grasslands and shrublands.

Visual Resources (major beneficial)
Under Alternative D, VRI Class II areas and special emphasis areas (SRMAs, ACECs, etc.) would be managed as VRM Class II. All VRI Class III areas, plus the Powder River Breaks and Fortification Creek, would be managed as VRM Class III. VRM Class I and II areas could prohibit or limit some surface-disturbing activities. VRM Class III and IV areas would have some limitations that could allow surface-disturbing activities. Overall, these management actions would occur in greater than ten percent of the grassland and shrubland communities in the planning area and, therefore, have a direct, major, beneficial effect on them over the long term.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (major beneficial)
Alternative D management actions would pursue land disposals, acquisitions, easements, or land tenure adjustments for lands holding custodial grazing allotments, and sales in accordance with other resource values within greater than ten percent of the grassland and shrubland communities in the planning area. As they pertain to the overall management of public lands if pursed and completed, these actions would improve public land management overall and would have an indirect, long-term, major, beneficial effect on grassland and shrubland communities.

Renewable Energy (minor adverse)
Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatables, salables, ROW exclosures areas, and other areas where surface disturbance is prohibited for a total exclusion acreage of 396,995 public land acres. Renewable energy development would also be avoided on 340,912 public land acres, leaving less than 6% of public land available for development. (See Map 49 for specific locations.) Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 75,240 acres over the next 20 years. Reclamation would occur on 50,240 acres (Appendix G (p. 1671)). This management would have a minor adverse, and long term effect on the vegetation.

Rights-of-Way and Corridors (minor adverse)
Alternative D management actions would exclude 101,081 acres from ROW development and avoid an additional 290,336 acres. Newly proposed transmission lines and ground facilities would be allowed within existing ROW and other disturbance areas. ROW activities would be avoided on slopes equal to or greater than 25% and on highly erodible soils. All these actions would have a direct, beneficial effect on grasslands and shrublands over the long term (Appendix G (p. 1671)). ROW disturbances are estimated to affect approximately 14,000 acres for pipelines and 56 acres for communications sites during the planning period; successful reclamation is

estimated to occur on all affected acres. Powerlines are estimated to affect approximately 4,916 acres (1,900 miles), with successful reclamation on approximately 491 acres, leaving 4,425 acres of long-term disturbance (Appendix G (p. 1671)). These disturbances are allowed to occur within one to five percent of the grassland and shrubland communities in the planning area; therefore they would have minor adverse effects on those resources.

Travel and Transportation Management (negligible adverse)
Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in special status species habitat and on saturated soils or on slopes 25% or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. Alternative D management actions would allow disturbance in less than one percent of the grassland and shrubland communities in the planning area and would have a direct, negligible adverse effect on grassland and shrubland communities over the long term.

Recreation (minor adverse)
Alternative D management actions to designate seven specified areas as SRMAs, 54,160 acres, with possible consideration of additional lands for SRMA designation, and prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance vegetative resources. Alternative D allows additional recreation facilities consistent with other resource values, these would have a direct adverse effect on vegetation in and around the facilities over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation and increase vegetation disturbance from trampling and increase the potential for introduction and spread of invasive plant species. SRMAs under Alternative D encompass one to five percent of the grassland and shrubland communities in the planning area. Alternative D management actions would have a minor adverse effect on grasslands and shrublands over the long term.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative D actions would include managing lands with wilderness characteristics to emphasize vegetative health, natural values, and primitive recreational opportunities on about 6,864 acres along the face of the Big Horn Mountains. These areas would conserve vegetation within less than one percent of the grassland and shrubland communities in the planning area. Managing these lands to those standards would have an indirect, negligible, beneficial effect over the long term.

Livestock Grazing Management (moderate beneficial)
Alternative D management actions include management of Category M allotments would be to achieve multiple resource health and objectives, rather than maintaining a certain number of Category M allotments and Animal Unit Months (AUMs). Range improvements would be developed in accordance with resource needs and livestock management objectives, rather than developing range improvements and then monitoring to detect undesirable changes. AMPs would continue to be developed, but increases in vegetative production would be allocated for watershed protection first, then forage and habitat, rather than allocated for wildlife first, then livestock use. Livestock grazing would be allowed on all public lands except for areas described under Alternative A, with the addition of evaluated areas determined to be incompatible with other resource uses or values such as entrances of caves, campgrounds, and culturally significant sites. Permanent increases in forage allocations would be considered for watershed protection, livestock grazing, wildlife habitat, and other resource values. Rest and deferment following wildfires, prescribed fires, and vegetative treatments would continue until resource objectives were met,

rather than based on a specific timeframe. Other management actions that do not address previous decisions include locating livestock salt and mineral supplements, designating future resource reserve allotments, and allowing increases in livestock stocking rates as a result of vegetative treatments when resource objectives for the project are met. Construction of range improvements would have a direct adverse effect on vegetation for the life of the project but they are a tool for improving grazing management and this would benefit the vegetative communities. All other livestock-related actions would have an indirect, beneficial effect over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 38 acres (200 miles), with successful reclamation on approximately 35 acres (140 miles) approximately 3 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Alternative D livestock grazing management would have a moderate beneficial effect on grasslands and shrublands.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Alternative D management actions include evaluating three proposed areas as ACECs, which would affect approximately 35,451 acres, including less than one percent of the grassland and shrubland communities in the planning area. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities. This would have a direct, negligible, beneficial effects over the long term.

Scenic or Back Country Byways (negligible beneficial)
The effects to grassland and shrubland communities from scenic or BCBs under Alternative D would be the same negligible beneficial effects as described in Alternative B.

Wild and Scenic Rivers (negligible beneficial)
The effects to grassland and shrubland communities from Wild and Scenic Rivers under Alternative D would be the same negligible beneficial effects as described in Alternative B.

Wilderness Study Areas (negligible beneficial)
There are three WSAs in the planning area totaling 28,931 acres, including less than one percent of the grassland and shrubland communities in the planning area. There are restrictions to preserve wilderness conditions in these areas until Congress acts on these WSAs. Designation of these areas and interim management is based on conservation of the natural resources, which would limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on grasslands and shrublands.

Socioeconomic Resources (no effect)

No effects are anticipated from socioeconomic resources management actions.

4.4.2.7. Cumulative Impacts

Chapter 4 describes effects to grassland and shrubland plant communities from past and present actions, federal and non-federal as part of the affected environment. Non-federal actions will affect vegetation similar to federal actions but mitigation for effects to vegetation resources would differ between federal and non-federal actions. The primary non-BLM authorized activities in the planning on and adjacent to public land have the potential to affect plant communities by changing species diversification within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. The extent of non-federal activity is several times greater than BLM activities because BLM administers approximately 11% of the surface acreage in the planning area. These actions could improve or impair wildlife habitat, soil and water resources, and riparian and wetland habitats, and those improvements or impairments could extend to other adjacent ownerships. The impacts from adjacent land owners would involve livestock grazing, habitat manipulation, and invasive species. Because of the intermingled ownership pattern, grazing management and the acres of livestock grazing on BLM surface versus non-federal surface does not change appreciably, and acre for acre, similar effects on vegetation would be anticipated.

4.4.2.8. Conclusion

Table 4.40, "Summary of Impacts to Grassland and Shrublands" (p. 861) summarizes impacts to grassland and shrublands by alternative.

Table 4.40. Summary of Impacts to Grassland and Shrublands

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air quality	Negligible beneficial	Major beneficial	Major adverse	Major beneficial
Soil	Moderate beneficial	Major beneficial	Major adverse	Major adverse
Water Resources	Minor beneficial	Minor beneficial	Moderate adverse	Minor beneficial
Cave and Karst Resources	No effect	Major beneficial	Negligible beneficial	Negligible beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Major adverse	Major adverse	Major adverse
Leasable Minerals – Coal	Major adverse	Major adverse	Minor adverse	Major adverse
Leasable Minerals – Fluids	Major adverse	Minor adverse	Major adverse	Major adverse
Salable Minerals	Minor adverse	Negligible adverse	Major adverse	Major adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible adverse	Minor beneficial	Minor adverse	Negligible beneficial
Planned Fire (Prescribed Fire)	Negligible beneficial	Negligible beneficial	Minor beneficial	Negligible beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Negligible beneficial	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	Minor beneficial	Minor adverse	Minor beneficial	Minor beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Riparian/Wetland Resources	Moderate beneficial	Minor beneficial	Major adverse	Minor beneficial
Invasive Species and Pest Management	Minor beneficial	Major beneficial	Moderate adverse	Moderate beneficial
Fish and Wildlife Resources – Fish	Moderate beneficial	Major beneficial	Major adverse	Major beneficial
Fish and Wildlife Resources – Wildlife	Moderate beneficial	Moderate beneficial	Major beneficial	Major beneficial
Special Status Species – Plants	Negligible beneficial	Negligible beneficial	Negligible beneficial	Moderate beneficial
Special Status Species – Fish	Negligible beneficial	Negligible beneficial	Negligible adverse	Minor beneficial
Special Status Species – Wildlife	Moderate beneficial	Major beneficial	Major beneficial	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Minor beneficial	Major beneficial	Minor adverse	Negligible beneficial
Paleontological Resources	No effect	Major beneficial	Minor adverse	Minor beneficial
Visual Resources	Minor beneficial	Moderate beneficial	Moderate adverse	Major beneficial
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	Minor adverse	Moderate beneficial	Major adverse	Major beneficial
Renewable Energy	Moderate adverse	Minor adverse	Major adverse	Minor adverse
Rights-of-Way and Corridors	Moderate adverse	Major adverse	Moderate adverse	Minor adverse
Travel and Transportation Management	Minor beneficial	Minor adverse	Moderate adverse	Negligible adverse
Recreation	Negligible adverse	Minor adverse	Negligible adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	Negligible beneficial	Minor adverse	Negligible beneficial
Livestock Grazing Management	Major beneficial	Moderate beneficial	Major adverse	Moderate beneficial
Special Designations				
Areas of Critical Environmental Concern	Negligible adverse	Minor beneficial	Negligible adverse	Negligible beneficial
Scenic or Back Country Byways	Negligible adverse	Negligible beneficial	No effect	Negligible beneficial
Wild and Scenic Rivers	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Wilderness Study Areas	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.3. Vegetation – Riparian/Wetland Resources

This section describes potential impacts to the vegetation in riparian/wetland systems from management actions under other resource programs. Chapter 3 provides a general discussion and information about riparian and wetland community types.

Most riparian lotic (flowing) systems in the planning area originate in the southern Big Horn Mountain watersheds and flow northeasterly to the plains. Other systems, but not all, are found along the major river and stream corridors, such as the Powder River, Crazy Woman Creek, Clear Creek, and Little Powder River. FLPMA and the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) direct the BLM to manage vegetative resources toward the maintenance or restoration of the physical function and biological health of vegetative ecosystems. Objectives are to maintain and improve the health and trend in plant communities that conserve soil and water, and provide forage, wildlife habitat, special status species habitat, recreation, scenic, ecological, and scientific benefits for consumptive and nonconsumptive uses.

Implementing any of the alternatives could cause direct or indirect impacts. Because riparian/wetland systems are limited and are often the most productive lands, humans, livestock, and wildlife disproportionately affect these areas compared to the same types or extent of actions in upland systems. All alternatives usually would avoid or minimize direct effects on riparian and wetland systems whenever possible. An impact to riparian and wetland systems affects the physical, chemical, or biological components of the ecosystem. Actions that contribute to the decline in abundance, distribution, or functionality of riparian and wetland systems would result in adverse effects; beneficial effects would result from activities that protect or restore these habitat types. Direct impacts to riparian and wetland systems result from surface-disturbing activities that remove or mechanically damage vegetation or the ground surface in these systems. Indirect impacts to riparian and wetland systems 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 invasive plant species. For purposes of this analysis, short-term effects include actions that contribute to the decline in abundance or distribution of these systems, but can be reclaimed or restored within five years after the action; long-term effects require more than five years to repair or reclaim.

4.4.3.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for riparian/wetland systems.

Activities affect vegetative resources by altering, disturbing, or removing soil and vegetation. This impacts analysis and conclusions are based on interdisciplinary team knowledge of resources in the planning area, review of existing literature, and information provided by other agencies. Existing literature and analyses include the Buffalo RMP (1985), the PRB EIS (BLM 2003c), and WGFD Spatial Mapping and Analysis. Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. Effects are quantified where possible. In the absence of quantitative data, best professional judgement or interdisciplinary team knowledge was used. Potential impacts are sometimes described using ranges, or in qualitative terms if appropriate. Many impacts are described qualitatively because suitable data are not unavailable.

Assumptions

- Baseline inventory is needed to determine current riparian/wetland health and to develop management plans. The most recent assessment is more than 20 years old.
- Riparian and wetland systems comprise only a small portion of public lands, but offer more species and diversity than any other land type.
- Some riparian systems are evaluated during assessments for the Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)). Where assessments for healthy rangeland standards have been performed, riparian plant systems are functioning properly or are in the process of achieving PFC.
- Livestock and wildlife use typically is disproportionately higher in riparian and wetland systems than in upland systems. Improper grazing can adversely affect these systems throughout the year, but generally results in greater adverse effects in spring and early summer, when soils are wet (and therefore more vulnerable to compaction) and stream banks are more vulnerable to sloughing.
- It is assumed that the more 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.
- Stream channels and land health can degrade quite rapidly. Recovery is often a much slower process. It is generally more efficient to prevent degradation than to recover a degraded system.
- Partnering with adjacent surface owners would allow achievement of PFC or DFC on longer reaches of qualifying streams and systems.
- Wetted systems are known to attract special status plant species, but also invasive plant species.

Significance Criteria

An adverse effect on water resources as a result of project actions would be considered potentially significant if it violates objectives associated with water quality, watershed, and soils management and its magnitude is such that special mitigation is warranted or it persists indefinitely.

Impacts on water quality, watersheds, and soils would be considered significant if any of the following were to occur:

- Unmitigated loss of wetlands or wetland function (EOs 11990 and 11988) or activities that would degrade riparian and wetland systems such that, as a minimum physical state, PFC and Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) are not being maintained.
- Streamflow characteristics of perennial streams are altered such that established fisheries, wildlife, livestock, recreation, domestic, municipal, and industrial uses are affected.
- The alteration of stream hydraulic geometry by accelerated runoff and erosion (i.e., undue erosion, sedimentation, or mass wasting) beyond that expected through natural processes.
- The natural flow to or level of groundwater in existing springs, seeps, artesian wells, or permitted water supply wells is reduced to the point where beneficial uses cannot be maintained.
- Water quality is degraded to the level livestock and/or humans avoid it or is not fit for consumption.

4.4.3.2. Impacts Common to All Alternatives

Vegetation – Riparian/Wetland Resources (major beneficial)
Riparian systems are some of the most productive ecosystems in the western United States, with a great diversity of plant and wildlife species. Healthy riparian systems purify water by removing

sediment as it moves through vegetation. Stream bank erosion is prevented as riparian vegetation absorbs and dissipates the energy of flood waters. They also provide crucial habitat for wildlife, fish, and some special status species.

A baseline riparian inventory and information is needed to establish management goals and objectives and set priorities for these systems. Chapter 3 states the basis for this need – development and implementation of activity plans to manage riparian systems to be at or above, or continue to be improving toward, PFC while achieving Wyoming Standards for Healthy Rangelands. Management plans must be developed and implemented with continued monitoring to maintain, restore, and enhance the health and diversity of plant systems to achieve resource or multi-resource objectives, including but not limited to, improving species richness and plant structure diversity (vertical and horizontal vegetative structure and composition), promoting a variety of age classes, increasing plant densities, reducing or removing undesirable plants, addressing sensitive species concerns, and improving water quality. Riparian and wetland systems are able to recharge and rebound faster than other vegetative systems in the planning area.

For these systems to function properly, partnerships must be developed to enhance and expand these resource systems and to prevent degradation, loss, or destruction of riparian/wetland systems and habitats, regardless of land ownership.

Physical Resources

Air Quality (major beneficial)
Adherence to rules and regulations and enhancing cooperative processes are administrative processes that would have no direct effect on riparian/wetland resources. Dust that covers vegetation reduces the photosynthesis process by blocking light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with either gravel or scoria, if untreated, would force large amounts of dust into the air; this dust could settle on vegetation. Reducing dust emissions and overall air quality management throughout the planning area would have a major beneficial effect on riparian/wetland resources.

Soil and Water Resources (major beneficial)
Management actions aimed at maintaining or improving soil conditions and minimizing soil erosion also would maintain or improve the health of vegetation. Management actions, including managing surface-disturbing activities; managing water resources; managing to achieve PFC, and meeting Wyoming water quality standards would benefit the associated riparian/wetland systems. All these actions would have a direct, long-term, beneficial effect on riparian and wetland systems. Also beneficial would be appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely effected by BLM-authorized actions and permitted activities. Management actions common to all alternatives for soil occur within greater than ten percent of riparian/wetland vegetation; therefore they would have major beneficial effects on riparian/wetland resources.

Water quality, watershed, and soils management actions that allow for surface discharge of produced waters into stream channels from oil and gas activities would alter riparian vegetation to accommodate higher quantity and persistence of flow regimes. Alteration of hydrologic conditions can affect the physical and chemical properties, such as pH, soil salinity, sediment properties, oxygen content, and nutrient availability, in wetlands (BLM 2003c). In ephemeral channels, existing vegetation would be lost through erosional processes. In more stable locations where vegetation could reestablish, composition would be dominated by salt-tolerant species.

Perennial drainages would widen and have more defined channels. Where regulated flows mimic natural patterns, site stability would be maintained and vegetative cover and structure would be improved, while composition would shift to more salt-tolerant species. Management actions common to all alternatives for water occur within greater than ten percent of riparian/wetland vegetation; therefore they would have major beneficial effects on riparian/wetland resources.

Cave and Karst Resources (major beneficial)

Cave inventories could benefit riparian/wetland resources. Riparian/wetland vegetation communities would be monitored through these inventories. Inventories would occur within greater than ten percent of riparian/wetland communities; therefore, management actions common to all alternatives would have major beneficial effects on riparian/wetland resources.

Mineral Resources

Leasable Minerals – Coal (negligible adverse), **Locatable Minerals, Leasable – Minerals – Fluids, and Salable Minerals** (major adverse)
Coal development occurs primarily in areas with high development potential, north-central Sheridan County and central Campbell County, and consideration could be given to areas outside this designation. The multiple use coal screen requires the BLM to emphasize the protection of wetlands and riparian areas under 43 CFR 3420.1–4(e0(3). The Tongue River runs through areas with high potential for coal development in northern Sheridan County. Coal resources occur within less than one percent of riparian/wetland communities; therefore, management actions common to all alternatives for coal would have a negligible effect on riparian/wetland resources.

Any lands not withdrawn (closed) to mineral entry, closed to leasing or closed to mineral material disposal are available for exploration or development for locatable, leasable, and salable minerals. Most fluid mineral development occurs in east-central Johnson County, southern Campbell County, and northern and eastern Sheridan County. Most of the headwaters and riparian/wetland systems are a part of the southern Big Horn Mountain watersheds in southwestern Johnson County. For these major riparian and wetland systems, there is minimal conflict with fluid minerals development. For wet systems collocated in CBNG development areas, additional water and modifications (sediments, nutrients, and mineral loading or loss) could modify existing riparian and wetland systems. The largest proportion, approximately 80%, of the habitat disturbance would be caused by construction of linear facilities such as pipelines, roads, and powerlines. Straight-line construction of these facilities is the most cost-effective method; therefore, riparian and wetland areas would be in the path of construction. Roads and powerline and pipeline corridors are likely to cross riparian areas in particular. Well pads, compressor station pads, and many water-handling facilities would not cause loss of riparian and wetland systems because they would be located in upland sites. Some of the disturbance would be short term, such as construction of buried pipelines and overhead powerlines, while other disturbances would be long term or essentially permanent, such as construction of roads. The road system, pipelines, and utility corridors associated with minerals activities would affect soil erosion by generating excess overland flow from road surfaces and cut slopes and directing water into channels. The direct discharge of produced water that could reach local riparian and wetland areas also would affect these systems. Increases in surface water flow would have a direct adverse effect on existing riparian and wetland areas due to the large increase in water volume. These processes can impair stream banks, alter hydrologic functions, and alter the composition and physical structure of riparian and wetland systems.

Habitat loss in riparian and wetland systems would occur directly through construction of roads, pipelines, powerlines, and some water-handling facilities. Habitat loss in riparian and wetland systems can substantially affect plant and animal species that depend on these ecosystems. Many plants grow only in seasonally flooded or saturated soils associated with riparian and wetland systems. These indirect adverse effects would degrade riparian and wetland systems. Roads, well pads, or powerlines adjacent to riparian and wetland systems cause various wetlands species to disappear from physical impacts. Decreases in the species richness can occur due to soil erosion, changes to hydrological patterns, and invasive plant species (BLM 2003c).

Locatable, fluid, and salable minerals are all available within greater than ten percent of riparian/wetland communities; therefore, management actions common to all alternatives for locatable minerals, leasable fluid minerals, and salable minerals would each have major adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (major beneficial)
The following management actions would directly benefit riparian/wetland systems: (1) prohibiting the use of retardant or foam within 300 feet of surface water sources, (2) rehabilitating fire lines constructed using heavy equipment, or on steep slopes, to prevent or control erosion, and (3) rehabilitation, including water barring and reseeding. Actions that would prevent water quality impairment and minimize erosion potential would be beneficial. These actions would reduce opportunities for soil and water erosion, thus preventing movement of sediments that could impair water quality and modify streamflow. Minimizing erosion potential would have an indirect, long-term, beneficial effect on riparian and wetland systems. Prohibitions for use of retardants or foam would occur within greater than ten percent of riparian/wetland vegetation communities; therefore, management actions common to all alternatives for unplanned and planned fire would have major beneficial effects on riparian/wetland resources.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for forest and woodland resources; therefore, there would be no effects to riparian/wetland resources.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Management actions to: (1) manage vegetative communities in accordance with Wyoming Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management; (2) use an integrated management approach to maintain, restore, and enhance the health and diversity of plant communities; (3) manage grasslands and shrublands; (4) manage planning and development of travel routes, recreational uses, mineral exploration, and development sites; and (5) the siting of facilities and related infrastructure (e.g., utility corridors and roads) and ROW to reduce impacts to vegetative resources all would benefit nearby riparian and wetland systems. Management actions that improve the health of the surrounding upland vegetative community would indirectly benefit riparian and wetland systems. Limiting surface-disturbing activities nearby would directly benefit riparian and wetland systems by reducing opportunities for soil erosion, water erosion and water quality impairment, and limiting the opportunity for invasive plant species to establish and expand. Grassland and shrubland management actions would have major beneficial effects on riparian and wetland systems.

Invasive Species and Pest Management (moderate beneficial)
Management actions include implementing and maintaining cooperative IPM programs on public lands adjoining deeded and state lands, and limiting surface disturbance to the minimum needed for safe project completion to limit the spread of invasive plant species. These actions would benefit riparian and wetland systems by controlling invasive species regardless of land status. Riparian and wetland systems commonly traverse private, state, and federal lands. Minimizing the area of surface disturbance would benefit riparian and wetland systems by reducing the area of potential invasive species establishment. Management actions also include the use of vegetation products certified to be free of weed seed on all BLM-administered projects and lands. Application of herbicides can be beneficial and adverse, depending on the species being controlled and the herbicide itself. Non-selective herbicides could affect other broadleaf plants (forbs, special status plant species, and shrubs) along with the target species. Certain herbicides are safe for water application and others require a certain buffer, depending on application method (10 feet for hand, 25 feet for boom, and 100 feet for aerial - all BLM standard buffer zones - unless the herbicide label states or recommends a wider buffer). Stricter requirements would be no aerial application within 0.25 to 0.5 mile of wetlands, riparian systems, and aquatic habitats, and no vehicle or hand application within 0.25 mile of these same habitats. The greater the buffer area around sensitive resources where chemicals are applied or mixed, the less potential for impacts to habitats within the buffer area associated with vegetation removal, soil disturbances, or chemical spills. Other implications for establishing buffers in wetlands, riparian systems, and aquatic habitats is the difficulty of treating invasive species in wetland systems. There is the possibility of invasive species spread, which could allow invasive species to out-compete native species and potentially destroy the natural, native riparian/wetland communities.

Salt cedar is a shrub and a concern in some riparian and wetland systems because it transpires large amounts of water, resulting in salinization of soil around the plant (BLM 2007m). This species is a phreatophyte, which is a deep-rooted plant that obtains water from the water table. As a result, salt cedar could outcompete native riparian shrubs and herbaceous plants, thereby radically altering and affecting system functions. Salt cedar does not depend on surface disturbances outside the riparian zone to increase its ability to invade riparian and wetland systems.

Fish and Wildlife Resources – Fish (moderate beneficial)
Providing public access would have a direct adverse effect on riparian and wetland systems over the long term because this activity would promote foot or primitive vehicular trails, which would trample native species and could introduce invasive species to these systems. Providing public access to fish-bearing waters would have an adverse long-term impact. Managing harmful non-native riparian vegetation in river and stream systems important to fish species would promote increased health of riparian systems. Five to ten percent of all riparian/wetland communities within the planning area are located along fish-bearing water systems; therefore, management actions common to all alternatives for Fish and Wildlife Resources – Fish would have moderate beneficial effect on riparian/wetland resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
Elk, deer, and pronghorn are attracted to and often congregate in riparian and wetland systems. Extensive browsing of desirable shrubs in riparian habitats could affect the density, height, and vigor of such species as willows, aspen, water birch, cottonwood, dogwood, and currant. In localized areas, elk have substantially affected riparian habitats through trampling, wallowing, and grazing. Beaver can dramatically change the nature of a stream and the riparian and wetland systems with which it is associated. In most cases, changes to riparian and wetland systems created by beaver activity are beneficial. Management actions maintain or improve important

wildlife habitats through vegetative manipulations, habitat improvement projects, and livestock grazing strategies; all these would indirectly improve any associated riparian/wetland systems. Improved habitat would correlate directly to improved health for the riparian zone. If wildlife populations grazed or inhabited riparian/wetland systems to the point of overgrazing and habitat degradation, adverse effects would result. Management actions common to all alternatives for wildlife resources would have a major beneficial effect on riparian/wetland systems.

Special Status Species – Fish (negligible beneficial) **and Special Status Species – Plants and Wildlife** (major beneficial)
All measures in all special status species common to all alternatives that protect and enhance special status species habitat in riparian and wetland systems would directly benefit those systems over the long term. These include such actions as assisting authorized agencies in the restoration or reestablishment of special status species habitats; supporting the WGFD in obtaining water rights for the benefit of special status fish habitat; implementing actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate best management practices and reasonable and prudent measures in biological opinions for Threatened and Endangered species. It is possible that special status plant species could take precedence over other native species; protection measures such as limiting or prohibiting treatments of invasive plants and pests, could contribute to the demise of other native specie. This would have an indirect, adverse effect for the long term. Special status fish habitats occur within less than one percent of all riparian/wetland vegetation communities within the planning area; therefore, management actions for special status fish species would have negligible beneficial effects on riparian/wetland resources.

Management of special status species generally involves restricting activities in the vicinity of special status plants or occupied wildlife habitat either year-round or during specific times of the year. As a result, riparian and wetland systems in the vicinity of buffer zones of special status species can benefit from less public use. Under all alternatives, no water development or salt, mineral, or forage supplements are allowed in areas inhabited by special status plant species. This restriction will prevent trampling of plants and changes to the soils that support special status plant species.

Habitats important to special status wildlife species occurs within greater than ten percent of all riparian/wetland vegetation communities within the planning area; therefore, management actions common to all alternatives for special status plant and special status wildlife species would have major beneficial effects on riparian/wetland resources.

Heritage and Visual Resources

Cultural Resources (major beneficial) **and Paleontological Resources** (moderate beneficial)
Management actions include inventories for these resources. Lack of inventories means the locations of significant sites are not known. It is difficult to determine the extent of impacts to riparian/wetland systems from management of these resources. Cultural sites are often found close to streams, natural springs and seeps, and larger waterbodies. Therefore, protecting these cultural sites would directly benefit riparian and wetland systems. However, data recovery excavations would include direct and long-term soil surface disturbance and vegetation removal, but these areas are generally small (less than one acre). Vegetation disturbance would usually be direct and adverse but short term.

Cultural resources occur within greater than ten percent of all riparian/wetland vegetation communities and areas of high paleontological resources occur within five to ten percent of

all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for cultural resources would have major beneficial effects and for paleontological resources moderate beneficial effects to riparian/wetland resources.

Visual Resources (major beneficial)

Management of visual resources in VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect riparian and wetland systems. VRM Class III and IV areas would have minor limitations. Management actions of visual resources that limit or prohibit surface-disturbing activities would have a direct and beneficial effect on riparian and wetland systems. Visual resources would be managed within greater than ten percent of all riparian/wetland vegetation communities within the planning area; therefore, management actions common to all alternatives would have major beneficial effects on riparian/wetland resources.

Land Resources

Forest Products (negligible beneficial)
Prohibiting timber harvest within 200 feet of surface waters would directly benefit riparian and wetland systems over the long term; the fewer disturbances, the fewer impacts to the resource, including reducing the opportunity for invasive species to establish. Building roads and trails for timber removal would also need to be included in this management action to minimize potential soil erosion and water quality impairment. Forest products occur within less than one percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for forest products would have negligible beneficial effects on riparian/wetland resources.

Lands and Realty (minor beneficial)
Considering land use authorizations (e.g., permits and leases) on a project-specific basis consistent with other resource objectives, and withdrawals from surface disturbances and minerals development on a project-specific basis would benefit riparian/wetland resources if those actions are consistent with riparian and wetland resource objectives. Withdrawals would have a direct, beneficial impact by limiting or denying the opportunity for surface disturbance and its associated impacts.

Vegetation on land proposed for exchange or acquisition would be indirectly affected due to a change in ownership and management. Land withdrawals, or available for exchanges and/or acquisitions occur in one to five percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for lands and realty would have minor adverse or beneficial effects on riparian/wetland resources.

Renewable Energy (minor adverse)
Effects are difficult to predict because renewable energy is considered future development, but most impacts are likely to occur from the removal of vegetation to construct these facilities. Most of the planning areas has low potential for wind-energy development; however, one area with high potential is the southern Big Horn Mountains (DOE 2010). Wind-energy development in that area could affect numerous riparian and wetland systems. Wind energy is likely to occur within one to five percent of riparian/wetland communities; therefore management action common to all alternatives for renewable energy will have minor adverse effects on riparian/wetland resources.

Rights-of-Way and Corridors (major adverse)
Most ROWs are associated with mineral development, which is primarily in south Campbell

County, east-central Johnson County, and northern and eastern Sheridan County. For systems that might be affected, the effects from surface disturbance would be direct, adverse and long term. Corridors would limit locations and reduce acreages disturbed and would have a direct and long-term effect. ROWs and corridors will likely occur within greater than ten percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives for ROWs and corridors will have major adverse effects on riparian/wetland resources.

Travel and Transportation Management (moderate beneficial)
Management actions to design, construct, and maintain roads and trails in consideration of other resources and to minimize surface disturbance, changes to surface water runoff, and erosion would have a beneficial effect on riparian and wetland systems over the long term. Transportation and access would occur within five to ten percent of all riparian/wetland communities in the planning area; therefore management actions common to all alternatives for transportation and access would have moderate effects on riparian/wetland resources.

Recreation (negligible adverse)
Management includes avoiding riparian and wetland habitat or developing and managing recreation sites, recreation facilities, and recreation access in a manner that minimizes impacts to riparian and wetland habitats, and prohibiting dispersed camping and commercial camps within 200 feet of surface water. Avoiding riparian and wetland habitat would be a management priority and would directly benefit these systems. However, it might be difficult to control recreation activities in these areas. If not controlled, recreation activities would likely have a direct adverse effect on riparian and wetland systems. Recreational activities will occur within less than one percent of all riparian/wetland communities in the planning area; therefore management actions common to all alternatives for recreation will have negligible adverse effects on riparian/wetland resources.

Lands with Wilderness Characteristics (negligible beneficial)
Areas recognized as having wilderness characteristics would be managed to maintain suitability for preservation as wilderness. This would have indirect, beneficial effects on riparian and wetland systems. Lands with wilderness characteristics encompass less than one percent of all riparian/wetland communities within the planning area; therefore, management actions common to all alternatives would have negligible beneficial effects on riparian/wetland resources.

Livestock Grazing Management (major beneficial)
Riparian and wetland systems are more susceptible to grazing impacts during the hot season (July and early August). Livestock are naturally attracted to areas with water and thermal cover. Many grazing management strategies, such as rotation, deferment, rest from use, and the manipulation of season of use and grazing intensity, would be implemented to manage vegetative composition, cover, and vigor to maintain or achieve PFC in riparian and wetland systems. Implementing riparian exclosures would increase the density, age class, and cover of desirable riparian plants, including willow, cottonwood, and herbaceous riparian/wetland plants, within the exclosures. Livestock grazing would reduce vegetative cover and cause surface disturbance from hoof action and compact soils in localized areas. Reducing vegetative cover also would result in increased sediment and salt loads in localized areas, increased surface runoff, and less storage and retention of soil moisture. Management actions include developing and implementing appropriate livestock grazing management actions to achieve Wyoming Standards for Healthy Rangelands, to improve forage for livestock, improve forage and habitat for wildlife, and enhance rangeland health. Management actions also include managing livestock grazing to sustain

riparian, wetland, mountain mahogany, special status species, or other special habitats. Wyoming Standards for Healthy Rangelands standard 2 addresses the health of riparian and wetland vegetation to include structural, age, and species diversity, resiliency and capability to recover from natural and human disturbance, to provide forage and cover, capture sediment, dissipate energy, and provide groundwater recharge. Managing livestock grazing to meet this standard and sustaining special habitats would direct benefit hydrophilic systems over the short and long terms. Short-term management would address each growing season according to precipitation levels and adjust grazing levels if necessary (drought conditions); and long-term management and benefits would be for the term of the grazing lease, generally 10 years. Livestock grazing allotments contain greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions common to all alternatives for livestock grazing management will have major beneficial effects on riparian/wetland resources.

Special Designations

Areas of Critical Environmental Concern and Wilderness Study Areas (negligible beneficial)
Management actions would emphasize primitive, nonmotorized activities to maintain current natural values. WSA management would prohibit surface-disturbing activities, and land use restrictions in ACECs would limit the extent of surface disturbance. This would directly benefit riparian and wetland systems over the long term because it would minimize potential adverse impacts to vegetation. ACECs and WSAs each contain less than one percent of all riparian/wetland communities in the planning area; therefore, management actions common to all alternatives for both ACECs and WSAs will have negligible beneficial effects on riparian/wetland resources.

Scenic or Back Country Byways and Wild and Scenic Rivers (negligible beneficial)
It is anticipated that these designations would have minimal overlap with riparian and wetland systems. These special designation areas would be managed to maintain or enhance their natural characteristics, which would indirectly benefit any associated riparian and wetland systems over the long term. Although human use of these special designation areas could increase and have an adverse effect on riparian and wetland systems, the affect would be minimal. Scenic or BCBs and Wild and Scenic Rivers each contain less than one percent of all riparian/wetland communities in the planning area; therefore; management actions common to all alternatives for both scenic or back country byways and Wild and Scenic Rivers will have negligible beneficial effects on riparian/wetland resources.

Socioeconomic Resources

Social and Economic Conditions (negligible adverse)
Multiple entities depend on public lands for their livelihoods or a portion of their livelihoods. Public land natural resources also can add to quality of life and monetary benefits can be directly and indirectly derived from activities such as hunting, outfitting, fishing, and guided hunts and tours. These activities can be beneficial and adverse to riparian and wetland systems.

Health and Safety (negligible adverse)
Management actions designed to prevent accidental spills of hazardous materials would protect riparian and upland systems. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely

succeed in recovering a riparian or upland area to its original condition; therefore, there would be long-term adverse effects.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above.

4.4.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to riparian and wetland systems from management of other resources under Alternative A.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Current management actions to prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams, unless the authorized officer waives the prohibition. This management action is adequate to protect these systems and waivers would only be granted as an exception. Waivers could allow direct, adverse effects on these systems and impact water quality over the short and long terms (days to years). Direct impacts result from surface-disturbing and other activities that cause removal of and/or mechanical damage to plants, soil medium, invertebrates, and biological soil crusts, both in terms of amount (overall biomass, density, cover) and in terms of diversity (species presence and richness). Direct impacts may also be the deposition of invasive species individuals or propagules (e.g., seeds or spores), soil compaction and/or erosion.

Physical Resources

Air Quality (negligible beneficial)
The types of effects to riparian/wetland resources from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (vegetation conservation). In Alternative A, though, these impacts would be analyzed on a project specific basis. Without monitoring or oversight on a programmatic level, lack of consistency would cause the beneficial effects to likely only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial effects on riparian/wetland resources.

Soil (major beneficial)
Alternative A soils management would prohibit surface-disturbing activities in established timeframes and on slopes equal to or greater than 25% unless the authorized officer waives the prohibition. Waivers allow for inconsistent application of management. Restricting surface-disturbing activities on soils with poor reclamation suitability on a project-specific basis and the closure and reclamation of roads and trails if they are heavily eroded or washed out, or encouraging the use of other access roads in better condition if available are decisions that would direct benefit and protect soils and would therefore benefit and protect vegetative resources. Waivers from these decisions would allow disturbance of the soil surface and removal of or mechanical damage to plants and would have an direct and adverse effect over the long term. These restrictions could occur within greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for soils could have major beneficial effects on riparian/wetland resources.

Water Resources (minor beneficial)
Prohibiting surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial

streams unless the authorized officer waives the prohibition would adequately protect these systems from erosion promoting activities, disturbance of habitat, and invasive species establishment. Waivers would be the exception but allow for inconsistent application of management and could allow activities at distances that could adversely affect water quality and quantity; remove or crush vegetation, thus reducing its ability to hold the soils and filter water. Alternative A does not include decisions addressing on-channel reservoirs; therefore, construction of on-channel reservoirs has become a common means of disposing of CBNG produced water and has resulted in direct adverse effects on vegetation and the overall watersheds. These sites are usually constructed on steep slopes where reclamation would be difficult, and the wetted areas below the dams are havens for invasive plant species such as Canada thistle and salt cedar. Prohibitions for water resources under Alternative A occur within greater than ten percent of all riparian/wetland communities in the planning area; therefore the management actions under Alternative A would have major beneficial effects on riparian/wetland resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Cave and Karst Resources (no effect)
There area no management actions under Alternative A for cave and karst resources; therefore, there would be no effect to riparian/wetland resources.

Mineral Resources

Locatable Minerals (major adverse)
Under Alternative A, withdrawing the Amsden Creek, E.O. Taylor, and Kerns game ranges 4,583 acres from mineral location and restricting locatable minerals activities in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) would have a direct, long-term, beneficial effect on riparian and wetland systems at these sites because surface-disturbing activities would not be permitted or would be restricted. Under the locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately 554 acres over the next 20 years (less than one percent of available acres). Reclamation would occur on 144 acres of BLM actions. These activities could occur within greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A would have major adverse effects on riparian wetland resources.

Leasable Minerals – Coal (negligible adverse)
Opening all federal coal lands (federal mineral estate for coal retained by the federal government) outside areas with high development potential to study and exploration, subject to license stipulations necessary to protect other resource values, would allow surface-disturbing activities and would have a direct adverse effect on riparian and wetland systems in these areas. These impacts would be long term for the life of the project. Under Alternative A, coal exploration and development would occur within less than one percent of all riparian/wetland communities; therefore, management actions for coal under Alternative A would have negligible adverse effects on riparian/wetland resources.

Leasable Minerals – Fluids (major adverse)
Alternative A would continue to lease and allow development of federal oil and gas on 1,040,223 acres and would make the WSAs (28,931 acres) administratively unavailable. Oil and gas wells avoid most riparian and wetland systems, but planning for linear construction projects such as

pipelines, utility corridors, and roads does not avoid these systems. The road system, pipelines, and utility corridors would affect the frequency and magnitude of runoff, sediment transport, and surface hydrology by generating excess overland flow from road surfaces and cut slopes and directing water into channels. Construction of reservoirs and ponds and other water disposal methods for CBNG development provide areas of soil disturbance and the perfect medium for establishment of invasive plant species, especially salt cedar. Under the leasable CBNG program for the planning area, overall it is estimated that BLM actions would disturb approximately 2,258 acres over the next 20 years (less than one percent of the total available acres). Reclamation will occur on 903 acres disturbed by BLM actions. Under the leasable oil and gas conventional program for the planning area, overall it is estimated that BLM actions would disturb approximately 8,317 acres over the next 20 years. Reclamation will occur on 5,575 acres disturbed by BLM actions (Appendix G (p. 1671)). Native grasses and forbs would dominate reclaimed sites initially, and forbs and shrubs would return over a longer period. Long-term disturbance, including roads that would be left in place after development, would have long-term effects on surface hydrology by removing vegetation and leaving bare ground, which would increase overland flow and sediment transport. There is no anticipated disturbance from geothermal-related activity. Under Alternative A, fluid mineral exploration and development could occur on greater than ten percent of all riparian/wetland communities; therefore, management actions for fluid mineral under Alternative A would have major adverse effects on riparian/wetland resources.

Salable Minerals (major adverse)
Alternative A would leave the entire planning area available for salable minerals leasing and the associated surface disturbance. This would have indirect and adverse effects on any riparian and wetland systems in these development areas for the term of the leases. However, this alternative prohibits salable minerals actions in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) which is a direct benefit to those vegetative communities. Over the next 20 years, the estimated acres of salable minerals surface disturbance would be relatively small – 530 acres disturbed, 99 acres reclaimed, and 431 acres long-term disturbance (Appendix G (p. 1671)). Under this alternative, salable mineral exploration could occur in greater than ten percent of all riparian/wetland communities; therefore, management actions for salable minerals under Alternative A would have major adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Because they are wet, riparian and wetland systems are seldom affected by wildfire or prescribed fires, and certainly not to the degree as their upland counterparts. Over the next 20 years, approximately 14,000 acres are expected to be affected by prescribed fires and all acres are anticipated to be successfully reclaimed. Most of these acres would be grasslands and shrublands, but localized riparian/wetland systems could be affected. Applying different levels of suppression and restricting the use of some types of suppression equipment would have a direct beneficial effect on the vegetation and soils over the short term after any fire. If affected by fire, the short-term effects on vegetation and soils from the fire itself would be direct and adverse. Prescribed fires would be less severe than wildfires because the burn is conducted under controlled conditions (e.g., air and soil temperatures, wind conditions, and fuel types); however, the fires would still destroy any litter on the surface and the current year's growth. All acres affected by fire are expected to be successfully reclaimed. Overall, wildfires would have a minor

adverse effect on riparian and wetland systems, and prescribed fires would have a negligible beneficial effect on riparian and wetland systems.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No management actions are proposed under Alternative A; therefore no effects are anticipated from forests and woodlands.

Vegetation – Grassland and Shrubland Communities (major adverse)
Currently there are no management actions addressing grassland and shrubland communities. The past decade of energy development has disturbed vast acreages of public land. Reclamation of these lands has been difficult because of a lack of soil structures, limited precipitation, soil textures, inversion of spoil piles, unavailability of seed of preferred species, herbicide application to reclaimed sites, drought, and other reasons. The absence of protective management actions for the vegetative communities has a direct, adverse effect for the long term. Due to the challenges of these projects, energy-development companies have inquired about the use of non-native species (mostly sterile, small-grain cereal crops such as oats, triticale, and barley) for temporary cover on exposed soils until successful reclamation with native species is achieved. Use of non-native species could be a direct benefit by quickly establishing vegetation on sites and reducing the opportunity for erosion and invasive plant establishment. This could indirectly benefit riparian and wetland systems by reducing erosion potential. However, non-native species also could invade outside plant communities and outcompete native plants for water and soil nutrients, which would then make the non-native species an invasive plant. This would be a direct adverse impact. Grassland and shrubland communities indirectly affect (due to their adjacency) greater than ten percent of all riparian/wetland communities in the planning area; therefore, the lack of management actions addressing restoration of grasslands and shrublands would have a major adverse effect on riparian and wetland systems.

Invasive Species and Pest Management (minor beneficial)
Under Alternative A, control of invasive plant species and pests on public lands (approximately 8,000 acres annually) in cooperation with county weed and pest districts would have direct, short- and long-term, beneficial effects on riparian and wetland systems. Most control efforts include the use of chemical, mechanical and biological means. Controlling weeds by chemical and mechanical methods can directly and adversely affect other plant species. For example, if an herbicide is nonselective for all broadleaf plants, the chemical also could adversely affect forb species. If mechanical methods are used, any plant in the direct path of the application would be affected. Biological methods are generally species specific and effects are adverse, direct, and long term to the host species; other plants benefit indirectly through from improving the health of the vegetative community through the removal of host pest species. Pest control is primarily by chemical application and the effects would be to riparian and wetland systems would be indirect and short term. The quality of habitat may be diminished from vegetation removal by the pest species but the effect would be short term.

Fish and Wildlife Resources – Fish (negligible beneficial)
Under Alternative A, enhancement of fisheries habitat is likely to have direct benefits to riparian and wetland systems. Less than one percent of all riparian/wetland communities in the planning area contain fish-bearing streams; therefore; management actions under Alternative A for fish would have a negligible beneficial effect on riparian and wetland resources.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Under Alternative A, prohibiting surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek Game Ranges, within 750 feet of sharp-tailed grouse leks, and within 0.5 mile of raptor nests, unless the authorized officer waives the prohibition has a beneficial effect for the long term. If the waiver is executed the surface-disturbing activities would have a direct, adverse effect on any riparian and wetland systems in those areas, and the effects would continue for the duration of the project or permit (usually 10 or more years). The prohibitions/restrictions would occur in greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for wildlife would have major beneficial effects on riparian/wetland resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Special Status Species – Plants (negligible beneficial)
Alternative A does not address the protection of special status plant species. Ute ladies'-tresses orchid can be found in riparian and wetland systems. Currently USFWS guidelines would be followed but there are no addition management actions to protect this or other potential sensitive plant species. Less than one percent of all riparian/wetland communities occur within special status plant habitats; therefore, management actions under Alternative A for special status plant resources would have negligible beneficial effects on riparian/wetland resources.

Special Status Species – Fish (no effect)
Alternative A does not directly address the protection of special status fish species.

Special Status Species – Wildlife (minor beneficial)
Providing and managing habitat for Threatened, Endangered, and special status wildlife species on all public lands in compliance with the ESA and BLM policy associated with management of habitat would have a direct, beneficial effect on riparian and wetland systems over the long term.

Prohibiting surface disturbance and occupancy with no exceptions would affect approximately 3,594 acres, and prohibiting surface disturbance except when the authorized officer waives the prohibition affects approximately 203,724 acres. Prohibitions leave the soil surface and plant communities intact. Waivers allowing surface-disturbing activities would mechanically damage soils and plants which could promote soil erosion, impair water quality, promote establishment of invasive species, loss of habitat and would have a direct, adverse effect on riparian and wetland systems in those areas, and the effects would continue for the duration of the project or permit (usually 10 or more years).

Establishing a year-round disturbance-free buffer zone for known bald eagle winter roosts would affect approximately 402 acres, and for activity zones for known roosts, would affect approximately 3,013 acres. This management would directly benefit riparian and wetland systems. Prohibiting surface disturbance or occupancy within a biologic buffer zone around active nests would affect approximately 28,437 acres, unless the authorized officer waives the prohibition. Prohibiting surface disturbance would protect plants and soils from mechanical damage, leaving plant communities intact and reducing the potential threat of soil erosion and invasive establishment. Waivers allowing surface-disturbing activities would have a direct adverse effect on riparian and wetland systems, and would the effects would continue for the duration of the project or permit (usually 10 or more years).

Alternative A does not address the protection of habitat for amphibians and reptiles. Not restricting or limiting surface-disturbing and disruptive activities would allow these habitats to be compromised, which would have a direct, adverse effect on riparian and wetland systems in these areas.

Overall, the prohibitions/restrictions under this alternative would encompass greater than ten percent of all riparian/wetland communities in the planning area; therefore, the management actions for special status wildlife species would have major beneficial effects on riparian/wetland resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
Management actions that protect sites of cultural significance would conserve riparian/wetland vegetation that occurs within them. This would have an indirect, beneficial effect on riparian and wetland systems over the long term. Sites of cultural significance and their protective buffers encompass one to five percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for cultural resources would have minor beneficial effects on riparian/wetland resources.

Paleontological Resources (no effect)
No effects are anticipated from paleontological resources management actions.

Visual Resources (major beneficial)
Under Alternative A, the BLM could prohibit or limit some surface-disturbing activities in VRM Class I and II areas and thereby protect any riparian and wetland systems in those areas. VRM Class III and IV areas would have minor limitations on surface-disturbing activities. Prohibitions on surface-disturbing activities for management of visual resources would have an indirect, beneficial effect on riparian and wetland systems over the long term. These visual resources classes encompass greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for visual resources would have major beneficial effects on riparian/wetland resources.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (minor adverse)
The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for lands and realty actions (habitat loss, fragmentation, and degradation). Under this alternative, lands available for tenure adjustments include those that contain one to five percent of all riparian/wetland communities in the planning area; therefore, the management actions under Alternative A for lands and realty would have minor adverse effects on riparian/wetland resources.

Renewable Energy (minor adverse)
Alternative A does not establish guidelines for the development of renewable energy resources.

Without management action related guidelines there are no protective measures in place for the resources. This would have an indirect, adverse effect on riparian and wetland systems due to potential loss of vegetation during facility construction. Renewable energy could be permitted within one to five percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for renewable energy would have minor adverse effects on riparian/wetland resources.

Rights-of-Way and Corridors (minor adverse)
Alternative A allows actions that would include installing linear surface-disturbing projects that can transect riparian and wetland systems. Disturbance is usually localized. This alternative could permit ROWs within one to five percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A would have minor adverse effects on riparian/wetland resources.

Travel and Transportation Management (negligible beneficial)
Alternative A limits motorized vehicle use to existing roads and vehicle routes. Closing areas with saturated soils and with slopes equal to or greater than 25% to motorized vehicles would directly benefit vegetation, soils, and water quality over the long term. Prohibiting vehicular travel in certain areas, limiting vehicular travel to designated roads and trails in other areas, and seasonally closing areas to vehicular travel would have a direct, beneficial effect on riparian and wetland systems over the long term as it would conserve these vegetative communities. These prohibitions/restrictions would occur in less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for recreation would have negligible beneficial effects on riparian/wetland resources.

Recreation (negligible adverse)
Recreation site development often is close to perennial water or other natural water systems. Runoff from roads, trails, and established campgrounds results in direct adverse impacts over the long term. Vegetation is removed from these sites and is trampled in adjacent areas. These effects are direct, adverse, and long term. Development of recreation sites is anticipated to disturb approximately 5 acres. Although the estimated impacted acreage is small, the localized impact would be adverse for the long term. Recreational areas occur within less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for recreation would have negligible adverse effects on riparian/wetland resources.

Lands with Wilderness Characteristics (no effect)
Alternative A does not manage for the protection of wilderness characteristics outside the three WSAs.

Livestock Grazing Management (minor beneficial)
With proper grazing management and implementation of rangeland improvement projects, the health of riparian and wetland systems can be sustained or improved. The degree and extent of grazing-related impacts to riparian and wetland systems over the long term are expected to continue to decrease. Improper livestock grazing practices adversely affect riparian and wetland systems through soil compaction, physical removal and destruction of vegetation, and trampling of stream banks, causing bank failure. Alternative A prohibits livestock grazing on approximately 10,000 acres where grazing has been determined to be incompatible with other resource uses, values, and locations. Excluding livestock grazing in these sensitive areas directly benefits vegetation. Most of these areas have fragile soil surfaces and steep slopes, and produce little vegetation. Under Alternative A, any permanent increases in the amount of forage produced would

be considered for wildlife and watershed protection before additional livestock use is authorized. Providing increases in forage toward habitats and watershed protection would facilitate the healthy ecological state for these resources. This would directly benefit vegetation over the short term. Alternative A does not address the placement of livestock supplements to prevent them from compromising other resource requirements. This alternative does not address proper rest periods from livestock grazing following prescribed fire and other vegetative treatments.

Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 70 acres (80 miles), with successful reclamation on approximately 50 acres (57 miles) and 20 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Overall, Alternative A management of livestock grazing would have a minor beneficial effect on riparian and wetland systems.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways (negligible adverse)
Currently there are no designated ACECs or scenic or BCBs. The lack of designations and lack of management actions leaves nothing to protect their natural values. Riparian and wetland systems can be a part of these special designated areas so a lack of protective management has an indirect adverse effect.

Wild and Scenic Rivers (negligible beneficial)
The Middle Fork Powder River was determined to be eligible and suitable as a WSR and is managed to protect those values. Riparian and wetland systems are a part of the special designation area, the protective management has an indirect beneficial effect. Wild and Scenic Rivers occur in less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A for Wild and Scenic Rivers would have negligible beneficial effects on riparian/wetland resources.

Wilderness Study Areas (negligible beneficial)
Alternative A management action make WSAs unavailable for mineral leasing in the interim until Congress decides whether to designate the WSAs as Wilderness. Riparian and wetland systems can be found in WSAs, so protection from mineral leasing is a direct benefit long term, unless Congress designates otherwise. Current WSAs contain less than one percent of all riparian/wetland communities in the planning area; therefore, management actions under Alternative A would have negligible beneficial effects on riparian/wetland resources.

Socioeconomic Resources (no effect)

No effects are anticipated from socioeconomic resources management actions.

4.4.3.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to riparian and wetland resources due to their implementation.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prohibiting surface-disturbing activities for minerals leasing within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains would directly benefit these systems by reducing the potential for soil and water erosion and the potential to impair water quality. Restoring vegetation on all CBNG-supported riparian and wetland systems, including areas receiving direct-discharge waters, would apply reclamation to all parts of the system. All systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle, and reclamation would establish competitive, native species that would keep the invasive species from establishing.

Physical Resources

Air Quality (major beneficial)
Under Alternative B, air quality modeling would be performed on a project-specific basis. In addition, projects expected to approach or exceed emissions standards would be evaluated for potential mitigation strategies, which would have a major beneficial effect on riparian/wetland resources.

Soil (major beneficial)
Alternative B soils management actions would include prohibiting surface-disturbing activities on slopes equal to or greater than 25%, on soils with a severe erosion hazard and on soils with poor reclamation potential, and on badlands, rock outcrops, or slopes susceptible to mass movement. All these actions would have a direct, beneficial effect on riparian and wetland systems over the long term as they would promote conservation of this vegetation. These prohibitions would occur in greater than ten percent of the riparian/wetland communities in the planning area; therefore, management actions under Alternative B for solid would have major beneficial effects on riparian/wetland resources.

Water Resources (major beneficial)
Alternative B water management actions would prohibit surface disturbance within 500 feet of any natural or man-made water feature. This action would prohibit removal of vegetation and disturbance of soil which would reduce potential for soil runoff into nearby water systems; soil runoff could contribute to the impairment of water quality. Other management actions include prohibiting activities that would result in surface discharge of water and prohibiting construction of on-channel reservoirs that could adversely affect natural flow regimes. These actions would have a direct, beneficial effect on riparian and wetland systems by preventing the natural transition of plant species from dry land species to more wetland-tolerant species in riparian and wetland systems, and minimizing the opportunity for invasive plant species to establish on these sites. These prohibitions would encompass greater than ten percent of all riparian/wetland communities in the planning area; therefore management actions under Alternative B for water would have major beneficial effects on riparian/wetland resources.

Cave and Karst Resources (no effect)
No effects are anticipated from cave and karst management actions.

Mineral Resources

Locatable Minerals (major adverse)
In addition to areas currently withdrawn or restricted from locatable minerals development, Alternative B includes a number of new areas to protect and preserve cultural, paleontological, recreation, lands with wilderness characteristics, and special designation resource values (ACECs, scenic or BCBs, WSRs, and WSAs). This would result in 618,256 public land acres withdrawn. Existing withdrawals and restrictions were implemented to protect and preserve other resource values. Under Alternative B, withdrawing or restricting additional areas from locatable minerals development would have a direct beneficial effect on riparian and wetland systems over the long term. Locatable minerals could still be permitted in greater than ten percent of all riparian/wetland communities in the planning area; therefore, the management actions for locatable minerals under Alternative B would have major adverse effects on riparian/wetland resources.

Leasable Minerals – Coal (major adverse)
Under Alternative B, closing all federal coal lands (federal mineral estate for coal retained by the federal government) outside the high development potential areas (approximately 753,364 acres of public land surface would be closed; approximately 28,738 acres would be available) to exploration and leasing. Where development does occur, vegetation would be directly and adversely affected over the long term for the life of the project and would require successful reclamation to ensure the native vegetative component was reestablished to predisturbance conditions. Under this alternative, approximately 186,600 acres would be disturbed (existing leases and new leases), with reclamation occurring on approximately 120,600 acres, 36,500 acres being actively mined, and approximately 66,000 acres disturbed over the long term (Appendix G (p. 1671)). Under Alternative B, coal exploration and development could occur within greater than ten percent of all riparian/wetland communities; therefore, management actions under Alternative B for coal would have major adverse effects on riparian/wetland resources.

Leasable Minerals – Fluids (moderate adverse)
Alternative B would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. This would result in 2,612,920 public land acres (41% of total public land) administratively unavailable to minerals leasing. This would directly benefit riparian and wetland systems because more acreage would be protected from development over the long term. There is no anticipated disturbance from geothermal-related activities. Overall, Alternative B management of leasable fluid minerals would allow exploration and development in five to ten percent of all riparian/wetland communities in the planning area; therefore, management actions for fluid minerals under Alternative B would have moderate adverse effects on riparian/wetland resources.

Salable Minerals (major adverse)
Alternative B would close 1,663,422 acres of mineral estate to salable mineral activity. Although a large portion of public land is unavailable, development is localized and small-scale. Under the salable minerals program for the next 20 years, the estimated areas of surface disturbance would be small; 114 acres disturbed, 21 acres reclaimed, and 5,163 acres of long-term disturbance (Appendix G (p. 1671)). Salable mineral exploration and development could be permitted in greater than ten percent of all riparian/wetland communities in the planning area; therefore, management actions for salable minerals under Alternative B would have major adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and **Planned Fire (Prescribed Fire)** (minor beneficial)
Alternative B management actions involving the application of full suppression in areas where fire is undesirable would affect approximately 42,232 acres. Monitoring fire behavior only in areas where fire can be used as a management tool based on resource goals and objectives would directly benefit riparian and wetland systems. Limiting suppression vehicles to existing roads and trails unless they are in identified full suppression areas would affect approximately 739,910 acres, and rehabilitating all fire-related damage also would directly benefit vegetative communities over the short and long terms by reducing the potential for water and soil erosion. Alternative B protected acres would be the same as under Alternative A. Long term, the application of prescribed fire to support riparian and wetland systems and wildlife habitat objectives is estimated to affect approximately 3,500 acres from BLM actions. All acres would be successfully reclaimed (Appendix G (p. 1671)). This management would have minor beneficial effects on riparian and wetland systems.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No effects are anticipated from forests and woodlands management actions.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Under Alternative B, authorizing only native plant species for all reclamation activities would promote native species and eliminate or reduce the opportunities for non-native species to be introduced and possibly cross pollinate with native species, outcompete native species for water and soil nutrients, and possibly move off reclamation sites. Native plants can be more difficult to establish than non-native species. Overall, Alternative B management of grasslands and shrublands would have a moderate beneficial effect on riparian and wetland systems.

Invasive Species and Pest Management (moderate beneficial)
Alternative B would control invasive plant species in cooperation with county weed and pest districts. Treating plants on the Wyoming Weed and Pest Control Act Designated List, the appropriate county lists, and other species of concern as determined by BLM resource specialists would treat all species that adversely affect native plant communities. Annual bromes (cheatgrass) are present throughout the planning area; therefore, a treatment management plan addressing cheatgrass should incorporate the entire planning area. Treatment of annuals would improve the ecological state of the vegetative communities. Application of herbicides can be beneficial and adverse, depending on the species being controlled and the herbicide itself. Nonselective herbicides could affect other broadleaf plants (forbs, special status species, and shrubs) along with the target species. Certain herbicides are safe for water application and others require certain buffers depending on application method (10 feet for hand, 25 feet for boom, and 100 feet for aerial are BLM standard buffer zones, unless the herbicide label recommends a wider buffer). The greater the buffer area around sensitive resources where chemicals are applied or mixed, the less potential for impacts associated with vegetation removal, soil disturbances, or chemical spills to the vegetative communities. Other implications for establishing buffers in wetlands, riparian systems, and aquatic habitats are the difficulty in treating invasive species in riparian and wetland systems. Invasive species left untreated have the potential to spread and could outcompete native species and potentially destroy riparian and wetland habitat. This would be a direct adverse impact. All other actions would have direct beneficial effects over the long term (Appendix G (p. 1671)). Overall, Alternative B invasive species and pest management would have a moderate beneficial effect on riparian and wetland systems.

Fish and Wildlife Resources – Fish (negligible beneficial)
Alternative B management actions include introducing, protecting, and enhancing fish populations and habitats and maintaining or enhancing fish habitat with actions that affect perennial waters, reservoirs, and riparian systems to improve or enhance potential fisheries. Management also includes managing fish habitat toward DFC, restoring important instream segments for fish habitat, and designing crossings to allow fish passage. Actions that would improve habitat for fish would directly benefit riparian and wetland systems capable of supporting fish. Prohibiting surface-disturbing and disruptive activities within 0.25 mile of naturally occurring waterbodies would also conserve the riparian/wetland communities within these buffers. The prohibitions encompass less than one percent of all riparian/wetland communities in the planning area; therefore, management action for fish under Alternative B would have negligible beneficial effects on riparian/wetland resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative B, a number of wildlife management actions could be implemented, including distance and timing limitations or prohibitions on surface disturbance or occupancy in and near established winter ranges or big game transition ranges, within traditional big game migration and travel corridors, and in calving areas. These actions would have a direct, beneficial effect by conserving riparian and wetland systems over the long term. These prohibitions/restrictions would encompass greater than ten percent of all riparian/wetland communities; therefore, management actions for wildlife under Alternative B would have major beneficial effects on riparian/wetland resources.

Special Status Species – Plants (negligible beneficial)
Alternative B management actions would prohibit surface-disturbing or disruptive activities in designated areas that contain special status plant habitat. Limiting activities in habitats with known populations of special status plant species would have a direct, beneficial effect on less than one percent of all riparian and wetland systems over the long term. Management actions for special status plants under Alternative B would have negligible beneficial effects on riparian/wetland resources.

Special Status Species – Fish (major beneficial)
Alternative B management actions would prohibit surface-disturbing activities, disruptive activities, impoundments, and instream structures on or near existing or potential fisheries sites and fish habitat. This would have a direct, beneficial effect greater than ten percent of all riparian and wetland systems over the long term through conservation of this vegetation. Management actions for special status fish species would have major beneficial effects on riparian/wetland resources.

Special Status Species – Wildlife (major beneficial)
Alternative B maintenance or enhancement of special status wildlife species habitat would usually have a direct, beneficial effect on riparian and wetland systems unless protective measures compromised the health of the other native species, such as limiting or prohibiting control measures on invasive or pest species.

Alternative B management actions would prohibit renewable-energy projects in Greater Sage-Grouse nesting, brood-rearing, and winter concentration areas. Nesting and brood-rearing activities are often close to riparian and wetland systems. The larger the area protected from surface disturbances the greater the benefit to these vegetative communities. This management

would have a direct, beneficial effect on any associated riparian and wetland systems over the long term.

The management action to allow no more than three percent removal of sagebrush habitats per 640-acre section might or might not benefit grassland and shrubland communities and any associated riparian and wetland systems in the affected areas, depending on the ecological condition of the systems and other resource objectives. Greater Sage-Grouse habitat restoration actions, though, would promote increased health of both grassland and shrubland and riparian/wetland systems

The Alternative B management action to establish a year-round disturbance-free zone for bald eagle roosting and nesting corridors would affect approximately 12,792 acres. This management action would have a direct, beneficial effect on riparian and wetland systems over the long term.

Alternative B management actions that prohibit surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats would affect approximately 176,636 acres. This management would have a direct, beneficial effect on these preferred riparian and wetland sites over the long term.

Overall, prohibitions/restrictions for the conservation of habitats important to special status species wildlife would also conserve over ten percent of all the riparian/wetland communities in the planning area; therefore management actions under Alternative B for special status wildlife species would have major beneficial effects on riparian/wetland resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Prohibiting surface disturbance in areas with historic properties, or within 5 miles or the visual horizon (whichever is closer), would affect approximately 330,592 public land acres of historic properties. This would have a direct, beneficial effect on riparian and wetland systems over the long term through vegetation conservation. These areas of restrictions would encompass greater than ten percent of all riparian/wetland systems in the planning area; therefore, management actions for cultural resources under Alternative B would have major beneficial effects on riparian/wetland resources.

Paleontological Resources (moderate beneficial)
Requiring paleontological field surveys to determine types and locations of classes, monitoring, and then initiating protective measures, including limiting or prohibiting surface-disturbing activities would protect vegetation from possible large-scale surface disturbance. This could affect up to 754,668 acres of public land. The effect on riparian and wetland systems would be direct and long term. Prohibitions could encompass five to ten percent of all riparian/wetland systems in the planning area; therefore management actions for paleontological resources under Alternative B would have moderate beneficial effects on riparian/wetland resources.

Visual Resources (major beneficial)
Under Alternative B, the BLM could prohibit or limit some surface-disturbing activities in VRM Class II areas on about 218,178 acres and thereby protect riparian and wetland systems. VRM Class III and IV areas encompass approximately 275,315 and 259,594 acres respectively on which the BLM would allow surface-disturbing activities with minor limitations. Prohibiting or limiting surface-disturbing activities for management of visual resources would have a beneficial effect on riparian and wetland systems as it would promote the conservation of these vegetative

communities. Visual resources class restrictions would encompass greater than ten percent of all riparian/wetland systems in the planning area; therefore management actions under Alternative B for visual resources would have major beneficial effects on riparian/wetland resources.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (no effect)
No effects are anticipated from lands and realty management actions.

Renewable Energy (moderate adverse)
Alternative B management actions would exclude development in specific areas on about 710,376 acres of public land. Renewable energy and the related infrastructure, namely roads and pipelines, would likely transect riparian and wetland systems, since the preferred location for development is the higher elevations where the headwaters for riparian systems are located. Under the renewable-energy program for the planning area, overall it is estimated that approximately 5,000 acres would be disturbed over the next 20 years. Reclamation would occur on 4,500 acres, leaving 500 acres of long-term disturbance (Appendix G (p. 1671)). Renewable energy development could be permitted in five to ten percent of all riparian/wetland system in the planning area and would, therefore, have a moderate adverse effect on riparian and wetland systems.

Rights-of-Way and Corridors (major adverse)
Management actions include prohibiting ROW on slopes equal to or greater than 25% and on highly erodible soils to minimize impacts to soil resources. Requiring co-location of new communication sites within designated areas, authorizing transmission lines in identified corridors, and avoid constructing facilities along major transportation routes. Linear features such as ROW and utility corridors will transect riparian and wetland systems. Actions that would reduce surface disturbance would directly benefit vegetation over the long term by avoiding or limiting removal or mechanical damage to vegetation and reduce the potential for water and wind to erode soil. ROW development on public land would be excluded on 370,088 acres and avoided on 395,444 acres of public land. Under Alternative B, ROW disturbances for pipelines, communications sites, roads, and powerlines are estimated to affect approximately 32,536 acres (5,750, 28, 9,275, and 2,458 acres, respectively), with successful reclamation on approximately 8,685 acres (5,750, 0, 2,690, and 245 acres, respectively) and 8,826 acres (0, 28, 6,585, and 2,213 acres, respectively) of long-term disturbance (Appendix G (p. 1671)). ROWs and corridors could be permitted in greater than ten percent of all riparian wetland communities in the planning area; therefore, management actions under Alternative B for ROWs and corridors would have major adverse effects on riparian/wetland resources.

Travel and Transportation Management (minor adverse)
Alternative B management actions would allow motorized vehicles off designated routes with a special use permit. Management actions would close areas with saturated soils or on slopes of 25% or greater, in habitat for special status species, special designation areas, and big game ranges during specific timeframes; also limit travel to designated roads and trails on 451,077 acres. These actions would have a direct, long-term, beneficial effect on riparian and wetland systems by protecting the resources during conditions when soil and plants are highly susceptible to erosion. Prohibiting vehicular travel on saturated soils and requiring closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are

available would directly benefit vegetative resources. Even with these prohibitions, transportation and access could be permitted in one to five percent of all riparian/wetland systems in the planning area; therefore, management actions for transportation and access under Alternative B would have direct, minor, adverse effects on riparian and wetland systems over the long term.

Recreation (negligible beneficial)
Alternative B management actions to designate eight specified areas as SRMAs (55,529 acres) and prohibit surface disturbance in designated SRMAs unless the disturbance is for administrative purposes would generally help protect, maintain, and enhance vegetative resources. However, the BLM promotes visitor use and access in SRMAs, which would increase the areas' popularity and visitation. This would increase vegetation disturbance from trampling and increase the potential for invasive plant species introduction and spread. The SRMAs would encompass less than one percent of all riparian/wetland systems in the planning area; therefore, management actions for recreation under Alternative B would have negligible beneficial effects on riparian/wetland resources.

Alternative B also proposes to close 372 acres along the Tongue River of the Welch Ranch Recreation Area to Grazing. In the short term this would increase vegetative cover in the riparian area. However over the long term, vegetation diversity may actually decrease with the absence of grazing. Overall the recreation management actions would have a negligible beneficial effect on riparian/wetland resources.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative B includes management actions for the LWC areas, which would directly benefit vegetative communities by limiting surface-disturbing activities in those areas on approximately 12,237 acres. This management would encompass less than one percent of all riparian/wetland systems in the planning area; therefore the management actions for lands with wilderness characteristics under Alternative B would have negligible beneficial effects on riparian and wetland systems.

Livestock Grazing Management (major beneficial)
Management actions include limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values; locating livestock salt and mineral supplements a minimum of 0.5 mile from water sources, riparian systems, and aspen stands; and authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and to livestock grazing as the second priority. All these management actions benefit vegetative communities over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long term-disturbance. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Livestock grazing allotments encompass greater than ten percent of all riparian/wetland systems in the planning area. Alternative B livestock grazing management would have a major beneficial effect on riparian and wetland systems.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Alternative B management actions include designating seven areas as ACECs, which would affect approximately 536,304 acres and less than one percent of all riparian/wetland systems in the planning area. The associated management plans for these sites would initiate specific conservation measures to protect soils and vegetation from adverse effects. This management would have a direct, negligible beneficial effect on any riparian and wetland systems in these special designated areas over the long term.

Scenic or Back Country Byways (no effect)
No effects are anticipated from scenic or BCB management actions.

Wild and Scenic Rivers (negligible beneficial)
Under Alternative B, management would continue in accordance with the Middle Fork Interim Management Plan to retain its free-flowing characteristics and outstanding remarkable values until Congress acts to release or designate the Middle Fork Powder River as a WSR. The Middle Fork Powder River is within less than one percent of all riparian/wetland systems in the planning area. Continuing interim management would have an indirect, negligible, beneficial effect on riparian and wetland systems over the long term.

Wilderness Study Areas (negligible beneficial)
There are three WSAs in the planning area totaling 28,931 acres, containing less than one percent of all riparian/wetland systems in the planning area. There are restrictions to preserve wilderness conditions in these areas until Congress acts on their Wilderness status. Designation of these areas and interim management is based on conservation of the natural resources, which would directly benefit vegetative communities and limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on riparian and wetland resources.

Socioeconomic Resources

No effects are anticipated from socioeconomic resources management actions.

4.4.3.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to riparian and wetland resources due to its implementation.

Vegetation – Riparian/Wetland Resources (moderate adverse)
Alternative C management actions would allow surface-disturbing and disruptive activities and apply standard lease terms for minerals leasing within 500 feet of riparian and wetland systems, aquatic habitats, and floodplains. These actions would remove any protective buffer and would directly and adversely affect riparian and wetland systems by promoting activities that lead to erosion of soils and water and impair water quality. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would apply reclamation only to a very small number and acreages of the affected systems. These systems would be a catalyst for water-tolerant invasive plant species such as salt cedar and Canada thistle. These management actions adversely effect riparian and wetland systems over the long term.

Physical Resources

Air Quality (major adverse)
There would be no air quality modeling under Alternative C. Industrial projects would be expected to approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse impacts to riparian/wetland vegetation. Vegetation is possibly more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, which can reduce photosynthesis by as much as fifty percent. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems. Plants also become more vulnerable to attacks by pests, disease, and environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. Adverse impacts to vegetation would be major.

Soil (major adverse)
There would be no soils, slopes, or land-type restrictions under Alternative C. Allowing surface-disturbing activities over greater than ten percent of riparian/wetland systems in the planning area would directly remove and mechanically damage vegetation, remove soils and soil microbes, decrease forage availability, remove habitat, and increase the opportunity for invasive species to establish. This would have a direct, major, adverse effect on riparian and wetland systems over the long term.

Water Resources (major adverse)
There would be no constraints on surface disturbance around springs, reservoirs, water wells, and perennial streams or on-channel reservoirs under Alternative C. Damage to vegetation could be allowed within greater than ten percent of all riparian/wetland systems in the planning area. This would have a direct, major, adverse effect on riparian and wetland resources.

Cave and Karst Resources (no effect)
No effects are anticipated from cave and karst management actions.

Mineral Resources

Locatable Minerals (major adverse)
Alternative C does not include recommendations for new withdrawals or restrictions on locatable minerals development. Lands open to mineral entry (open is about 3,305,032 acres and withdrawn are about 11,373 acres) are consistent with other resource values. Riparian and wetland systems would be directly and adversely affected by not protecting more areas from locatable minerals activities. Under the locatable minerals program for the planning area, overall it is estimated that approximately 1,455 acres would be disturbed over the next 20 years. Reclamation would occur on 378 acres. Locatable minerals could be permitted in greater than ten percent of all riparian/wetland systems in the planning area; therefore, Alternative C management actions for locatable minerals would have a major adverse effects on riparian and wetland resources.

Leasable Minerals – Coal (major adverse)
Alternative C would open all federal coal lands (federal mineral estate for coal retained by the federal government) to availability for exploration and leasing, subject to license stipulations necessary to protect other resource values. Though there are no constraints, development is only likely to occur in those area previously identified. Where development does occur there is a

direct and adverse impact to the vegetation through removal and mechanical damage. Effects are long-term until successful reclamation is achieved. Coal exploration and development could be permitted in greater than ten percent of all riparian/wetland systems in the planning area. Allowing these surface-disturbing activities would have a direct, major, adverse effect on riparian and wetland systems.

Leasable Minerals – Fluids (major adverse)
Alternative C makes all lands administratively available for fluid mineral development. Development would include surface-disturbing activities at the production sites and all necessary infrastructure. Surface-disturbing activities would have a direct and adverse effect on vegetation for the long term until successful reclamation is achieved. Linear infrastructure supporting these activities would directly and adversely affect riparian and wetland systems. Under the leasable CBNG program for the planning area, overall it is estimated that BLM actions would disturb 13,200 acres over the next 20 years. Reclamation will occur on 5,280 acres. It is estimated that leasable conventional oil and gas program actions would disturb approximately 9,055 acres over the next 20 years. Reclamation will occur on 6,070 acres. There is no anticipated disturbance from geothermal activities. Fluid mineral exploration and development could be permitted in greater than ten percent of all riparian/wetland systems in the planning area. Alternative C management of leasable fluid minerals would have a major adverse effect on riparian and wetland systems.

Salable Minerals (major adverse)
Alternative C does not recommend new closures or restrictions. The existing closures and restrictions were imposed to protect and preserve other resource values. Not adding areas to be protected from these minerals activities would have a direct, adverse effect on riparian and wetland systems. For salable minerals over the next 20 years, the estimated areas of surface disturbance would be small; 2,090 acres disturbed, 392 acres reclaimed, and 1,698 acres long-term disturbance (Appendix G (p. 1671)). Salable mineral exploration and development could be permitted in greater than ten percent of all riparian/wetland systems in the planning area; therefore, management actions for salable minerals under Alternative C would have major adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Under Alternative C, management actions that involve full suppression regardless of other resource objectives would have a direct adverse effect on riparian and wetland systems. The use of heavy equipment with few constraints would have a direct adverse effect on vegetative communities over the short and long terms by increasing opportunities for water and soil erosion, soil compaction, and invasive plant species establishment. Long-term estimates for the application of prescribed fire to support vegetative communities and wildlife habitat objectives is estimated to affect approximately 42,000 acres. All acres are expected to be successfully reclaimed.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No effects are anticipated from forests and woodlands management actions.

Vegetation – Grassland and Shrubland Communities (major adverse)
Under Alternative C, allowing non-native plant species, only if native species will not accomplish

initial reclamation objectives, would provide another tool for achieving reclamation goals, but also would provide an opportunity for non-native species to cross pollinate with native species, outcompete native species for water and soil nutrients, and move outside the reclamation area and become an invasive species. Helping to achieve reclamation objectives would directly benefit surrounding plant communities. Overall, Alternative C management of grasslands and shrublands would have a major adverse effect on riparian and wetland systems.

Invasive Species and Pest Management (minor adverse)
Under Alternative C, restricting aerial application to only insecticides would limit herbicide applications to motorized vehicle and hand application. This would restrict where application could occur and the size of treatments, therefore allowing vast acreages (in the case of leafy spurge, which inhabits thousands of acres across multiple landscapes, plant communities, remote locations, and a variety of terrain) to go untreated. This would have a direct adverse effect on upland and hydric plant communities over the long term. Treatments over the next 20 years are estimated to affect approximately 10,000 acres from BLM actions; reclamation would occur on 8,500 acres (Appendix G (p. 1671)).

Annually treating only designated areas for cheatgrass would be ineffective because there would be only small, scattered treatments and most of the cheatgrass would be unaffected. This would have an adverse effect on riparian and wetland systems.

Fish and Wildlife Resources – Fish (negligible adverse)
Alternative C would not apply constraints on surface-disturbing and disruptive activities, and would apply only the standard lease terms for minerals leasing in naturally occurring waterbodies. This lack of constraints would directly and adversely affect these systems over the long term by promoting surface disturbance, establishment of invasive species, lowering the ecological condition of the sites, and degrading the riparian/wetland communities. These effects would be adverse and long-term. Less than one percent of all riparian/wetland system in the planning area are near fish-bearing streams; therefore, management actions for fish under Alternative C would have negligible adverse effects on riparian/wetland resources.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Alternative C impacts to riparian/wetland resources from wildlife would be the same minor beneficial effects as described under Alternative A.

Special Status Species – Plants (negligible beneficial)
Alternative C impacts to riparian/wetland resources from special status plant species would be the same negligible beneficial effects as described under Alternative A.

Special Status Species – Fish (moderate beneficial)
Alternative C management actions would prohibit surface-disturbing and disruptive activities if impacts could not be mitigated. Other actions include designing impoundments and instream structures to minimize impacts on or near existing or potential sites and habitats. These actions would reduce, but not prevent, adverse effects. The prohibitions under Alternative C would encompass, and therefore conserve five to ten percent of all riparian/wetland systems in the planning area. Management actions for special status fish under Alternative C would have moderate beneficial effects on riparian/wetland resources.

Special Status Species – Wildlife (minor beneficial)
Alternative C impacts to riparian/wetland resources from special status wildlife species management would be the same minor beneficial effects as described under Alternative A.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
Alternative C impacts to riparian/wetland resources from cultural resource management would be the same minor beneficial effects as described under Alternative A.

Paleontological Resources (negligible beneficial)
Alternative C management actions that would require paleontological field surveys would affect 28,177 public land acres. Restricting protective measures, including limiting or prohibiting surface-disturbing activities, would subject riparian and wetland systems to possible large-scale, direct, adverse effects making the benefits negligible.

Visual Resources (negligible beneficial)
Under Alternative C, WSAs and WSRs are managed as VRM Class I, manage VRI Class II as VRM Class III, and manage all VRI Class III and IV areas as VRM Class IV. Management would be applied at a lower level of VRM class, therefore less surface-disturbing activities would be restricted which would have a direct, beneficial effect on vegetation over the long term. Surface-disturbing restrictions would occur in less than one percent of all riparian/wetland systems in the planning area; therefore, management actions for visual resources under Alternative C would have negligible beneficial effects on riparian/wetland resources.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (minor adverse)
Under Alternative C, disposing of lands with agricultural potential, water, or important natural resource values would have a minor adverse effect on riparian/wetland resources. Alternative C does not consider these values on a project-specific basis and does not require that these lands be retained based on these important values. Disposal of these lands would dispose of one to five percent of all riparian/wetland systems in the planning area. Management actions for lands and realty under Alternative C would have minor adverse effects on riparian/wetland resources.

Renewable Energy (minor adverse)
Alternative C would allow sites and areas for energy development, which would likely involve surface-disturbing activities. The majority of the disturbance would occur on upland sites but development could affect riparian and wetland systems in the southern Big Horn Mountains. This would have a minor adverse effect on riparian and wetland systems as it contains one to five percent of all riparian/wetland systems in the planning area. Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 40,000 acres over the next 20 years. Reclamation would occur on 22,500 acres. Management actions under Alternative C for renewable energy would have minor adverse effects on riparian/wetland resources. (Appendix G (p. 1671)).

Rights-of-Way and Corridors (major adverse)
Alternative C management actions would not place constraints on the development of or the location of ROW and corridors. This management would have a direct adverse effect on vegetation over the long term since there would be no protective measures in place to prevent removal or damage to the vegetation. This could promote erosion of soils by water which in

turn could impair water quality in the riparian and wetland systems. ROW disturbances from powerlines, pipelines, roads, and communications sites could occur in greater than ten percent of all riparian/wetland systems in the planning area. during the planning period (Appendix G (p. 1671)). Alternative C management would have major adverse effects on riparian and wetland resources.

Travel and Transportation Management (negligible adverse)
Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25%, and in special species habitat. Management actions would close or limit travel to designated routes to motorized vehicle use and would implement winter closures (November 15 – April 30) on designated big game ranges. These actions would have a direct, long-term, adverse effect on riparian and wetland systems by not protecting the soil or vegetation resources. Transportation and access management actions would be permitted in less than one percent of all riparian/wetland systems in the planning area; therefore management actions for transportation and access would have negligible adverse effects on riparian/wetland resources.

Recreation (negligible adverse)
Alternative C management actions include designation six areas as SRMAs with no consideration to additional lands for SRMA designation, leasing minerals in accordance with management for areas surrounding SRMAs, and allowing surface disturbance and salable minerals development in the six designated SRMAs. This would have a direct, adverse effect on riparian and wetland systems. The proposed SRMAs encompass less than one percent of all riparian/wetland systems in the planning area; therefore, management actions under Alternative C for recreation would have negligible adverse effects on riparian/wetland resources.

Lands with Wilderness Characteristics (negligible adverse)
Alternative C management actions include managing the LWC areas the same as the surrounding areas. Effects on riparian and wetland systems from these actions would be indirect, negligible and adverse over the long term.

Livestock Grazing Management (minor adverse)
Alternative C management actions include locating livestock salt or mineral supplements a minimum of 500 feet from water sources, riparian systems, and aspen stands; vegetative treatments would compromise the health of vegetative systems. Moving supplements only 500 feet away from these sensitive sites would not be adequate the sites. This would have a direct adverse effect on riparian and wetland systems over the long term.

Estimates of surface disturbances in the planning area over the next 20 years for range improvement projects include spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres as long-term disturbance. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

One to five percent of all riparian/wetland systems in the planning area would be protected by these smaller buffers, therefore, livestock grazing management actions under Alternative C would have a minor adverse effect on riparian and wetland resources.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
Alternative C would not designate ACECs. Lack of designation would allow these areas to be eligible for surface-disturbing activities and possibly other actions that could adversely alter or impair these systems. The lack of ACEC designation would fail to conserve vegetation in less than one percent of all riparian/wetland systems in the planning area; therefore management actions for ACECs under Alternative C would have negligible, adverse effects on riparian and wetland resources.

Scenic or Back Country Byways (no effect)
No effects are anticipated from scenic or BCBs management actions under Alternative C.

Wild and Scenic Rivers (negligible beneficial)
Alternative C management would be the same as management in the surrounding areas until Congress acts. Rather than developing a specific management plan for this area, these management actions would be generic. Riparian and wetland systems would indirectly benefit over the long term from this management action, but likely not to the same degree as the more protective measures under a specific management plan.

Wilderness Study Areas (negligible adverse)
There are three WSAs in the planning area totaling 28,931 acres. Alternative C management would be the same as management in surrounding areas, which would be generic and might not address all resource issues. This would have an indirect, negligible, adverse effect on riparian and wetland systems over the long term as these areas contain less than one percent of all riparian/wetland systems in the planning area.

Socioeconomic Resources (no effect)

No effects are anticipated from socioeconomic resources management actions.

4.4.3.6. Alternative D

This section describes management actions under Alternative D, which utilizes a combination of resource conservation and resource use, and the likely impacts due to their implementation and potential impacts to riparian and wetland systems from those management actions.

Vegetation – Riparian/Wetland Resources (major beneficial)
Alternative D would allow surface-disturbing activities and apply CSU stipulations for any mineral lease within 500 feet of springs, reservoirs, water wells, and perennial streams based on resource values if resource objectives can be met; this management would affect approximately 23,831 acres, greater than ten percent of riparian/wetland systems in the planning area. Reclaiming vegetation in all CBNG-supported riparian and wetland systems in accordance with ecological site protection would help return water-affected systems to their pre-CBNG natural state. This management would directly benefit riparian and wetland systems by limiting opportunities for invasive species to establish and spread. Reclaiming sites with appropriate native species would sustain vegetative communities over the long term. See Alternative B for systems capable of achieving DFC.

Physical Resources

Air Quality (major beneficial)
Alternative D impacts to riparian/wetland resources from the air quality management would be the same beneficial as impacts under Alternative B (vegetation conservation). Under Alternative D, though, modeling would only occur on a project-specific basis and mitigation strategies would then be developed. The modeling and mitigation would likely occur within greater than ten percent of riparian/wetland systems; therefore, management actions for air quality under Alternative D would have major beneficial effects on riparian/wetland resources.

Soil (major beneficial)
Surface-disturbing activities would be allowed under Alternative D in accordance when soil resource objectives can be met. Development on and disturbance of sensitive soils would have approved reclamation and stabilization plans and comply with CSU stipulations. Management actions under Alternative D would avoid surface disturbances on badlands, rock outcrops, and slopes susceptible to mass movement unless resource objectives could be met. Alternative D supported surface disturbance would have a direct, long-term, adverse effect on riparian and wetland systems. However, the established criteria under Alternative D would work toward ensuring projects are capable of being reclaimed before they are approved on greater than ten percent of all riparian/wetland systems in the planning area. Alternative D management actions would have a major beneficial effect on riparian and wetland systems.

Water Resources (major beneficial)
Alternative D water management actions would allow surface disturbance within 500 feet of any natural or man-made water feature in accordance when resource objectives can be met based on management decisions for other resource values; this would affect approximately 19,861 acres, greater than ten percent of all riparian/wetland systems in the planning area. Allowing disturbances in these areas would have a direct and adverse effect on vegetation and water quality at these sensitive sites. Effects would be long-term for the life of the project through approved reclamation. Alternative D would allow on-channel reservoirs. Under Alternative D, CBNG reservoirs would be evaluated to determine whether they could be converted to another use, or should be removed and reclaimed. All water management actions under Alternative D would have a direct, major, beneficial effect on riparian and wetland systems over the long term.

Cave and Karst Resources (no effect)
No effects are anticipated from cave and karst management actions.

Mineral Resources

Locatable Minerals (major adverse)
In addition to areas currently withdrawn or restricted under Alternative A, Alternative D includes a number of new areas to conserve other resource values; this would leave 3,232,508 acres open to mineral entry (greater than ten percent of all riparian/wetland systems in the planning area), with 115,614 acres recommended for withdrawal from mineral entry in addition to the 11,373 acres of existing withdrawals. Riparian and wetland systems would directly benefit over the long term from the additional withdrawn acreage. However, in areas where development did occur, any related actions that disturbed the surface would have a direct and adverse effect until successful reclamation is achieved. Under the locatable minerals program for the planning area, overall, it is estimated that BLM actions would disturb approximately 1,252 acres over the next 20 years. Reclamation would occur on 329 acres. This long-term disturbance would have a direct major adverse effect on the vegetation for the long term.

Leasable Minerals – Coal (major adverse)
Under Alternative D would open all federal coal lands (federal mineral estate for coal retained by the federal government) to exploration, subject to license stipulations necessary to protect other resource values (4,775,136 acres). Leasing is subject to unsuitability screening and is discretionary based on NEPA analysis. Though all acres are open, actual development is anticipated to occur only in the higher potential areas of north west Sheridan County and south central Campbell County, but still in greater than ten percent of all riparian/wetland systems in the planning area. The fewer acres available for development, the greater the direct benefit through conservation of vegetation. In areas where coal development does occur vegetation would be directly and adversely affected for the life of the project until reclamation goals and objectives are achieved. This management would have major adverse effects on riparian and wetland systems.

Leasable Minerals – Fluids (major adverse)
Alternative D would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. This management would make a total of 101,214 acres of federal land administratively unavailable for minerals leasing. Fluid mineral exploration and development could be permitted in greater than ten percent of all riparian/wetland systems in the planning area; therefore, management actions for fluid minerals under Alternative D would have major adverse effects on riparian/wetland resources. There is no anticipated disturbance from geothermal activities under Alternative D.

Salable Minerals (major adverse)
Alternative D would open 2,957,960 acres of federal minerals to salable minerals leasing (greater than ten percent of all riparian/wetland systems in the planning area) and close 390,162 acres. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would be 1,193 acres disturbed (Appendix G (p. 1671)). Management actions for salable minerals under Alternative D would have major adverse effects on riparian/wetland resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible beneficial) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Under Alternative D, impacts to riparian/wetlands systems would be similar to effects under Alternative B. However, Alternative D would decrease adverse impacts through rehabilitation after fires on an as-needed basis only; this could result in an increase in natural regeneration of riparian/wetland systems.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No effects are anticipated from forests and woodlands management actions.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Under Alternative D, allowing non-native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. Non-native species would be used on those sites where soils, topography, and timing are not conducive to native plant seed establishment. It is the anticipated that non-native species would be used on in the short term (1 to 3 years). Use of non-native species could have the direct benefit of quickly establishing vegetation on sites and reducing the opportunity for erosion and invasive species establishment. This would have a major,

beneficial effect on riparian and wetland systems as the overall health of these communities would improve in greater than ten percent of all riparian/wetland systems in the planning area.

Invasive Species and Pest Management (moderate beneficial)
Alternative D would allow aerial application in areas where topography, extent of infestation, target species, and timing limit other application methods. Areas with annual bromes would be designated and prioritized for treatment. These actions would have a direct, moderate, beneficial effect on riparian and wetland systems over the long term as the overall health of these communities would improve.

Fish and Wildlife Resources – Fish (major beneficial)
Alternative D management actions that would prohibit or limit surface-disturbing activities and project construction, and the application of practices that would enhance fisheries by limiting soil erosion and improving water quality within greater than ten percent of all riparian/wetland systems in the planning area would have a direct, major, beneficial effect on riparian and wetland systems over the long term.

Fish and Wildlife Resources – Wildlife (moderate beneficial)
Alternative D would prohibit surface disturbance and occupancy in established big-game winter ranges, without exception. Activities that enhance habitat for wildlife would likely have an indirect, moderate, beneficial effect on riparian and wetland systems over the long term.

Alternative D management actions would allow surface disturbance or occupancy within a biological buffer zone around nests of conservation concern raptor species with identified criteria. Surface disturbing activities would be prohibited within USFWS recommended buffers and time periods. These limitations and prohibitions would protect vegetative resources and would have a beneficial effect over the long term.

Any limitations, restrictions, or prohibitions on surface-disturbing activities and motorized travel would directly benefit five to ten percent of all riparian/wetland systems in the planning area over the long term.

Special Status Species – Plants (major beneficial)
Alternative D management actions would require plant surveys before placement of water developments, salt, and mineral supplements. Upon completion of surveys, surface-disturbing activities, mineral development, fire suppression activities (outside of human and property safety), and authorized ROWs, would be allowed in habitats but not in known populations. Currently the only known riparian and wetland system dependent sensitive plant species is Ute ladies'-tresses orchid, and these prohibitions would encompass eleven percent of all riparian/wetland systems in the planning area. Management actions for special status plant species under Alternative D would have a direct, long-term, major, beneficial effect on all riparian/wetland resources.

Special Status Species – Fish (moderate beneficial)
Alternative D management actions would prohibit surface-disturbing and disruptive activities within 0.25 mile of any water that contains special status fish species (818 acres), also conserving vegetation in five to ten percent of all riparian/wetland systems in the planning area. This action would have a direct, moderate, beneficial effect on riparian and wetland systems over the long term.

Special Status Species – Wildlife (major beneficial)
Alternative D management actions would prohibit surface-disturbing and occupancy in

established winter ranges; allow surface disturbance and disruptive activities only when resource objectives can be met; prohibit commercial renewable energy projects in big game winter range, calving areas and identified priority travel corridors. These management actions would be direct if the activities occurred in the riparian and wetland system and indirect if it occurred in the uplands. Effects would be beneficial and long term. Fluid mineral production and by-products are required to be piped out of crucial elk winter ranges and calving areas, unless a suitable alternative is developed. Construction of pipelines would have a direct and adverse effect on the vegetation for the long term.

Alternative D management actions would prohibit renewable-energy projects in Greater Sage-Grouse Priority Habitat Area. Actions also would prohibit or avoid surface-disturbing activities during specific periods within a specified distance from designated leks, identified nesting and early brood-rearing habitat, and Greater Sage-Grouse winter habitat. Inside current Priority Habitat Area are limitations on the amount of sagebrush removal and the number of disturbances allowed.

Alternative D management actions would prohibit surface disturbance and disruptive activities during nesting periods and around active nests for specific times for specific birds. Management actions also would include establishing a year-round disturbance-free buffer zone for known bald eagle winter roosts (402 acres), and a limited-activity zone for known roosts (3,013 acres). These actions would have an indirect, beneficial effect on riparian and wetland systems over the long term.

Alternative D management actions would allow surface-disturbing and disruptive activities only when resource objective can be met in known areas of special status amphibian and reptile species and their habitats. Known populations would be protected with an additional 1,640-foot (500 meter) buffer. This would affect approximately 176,636 acres, and would have a direct, beneficial effect on riparian and wetland systems over the long term.

Overall, management actions under Alternative D that prohibit or restrict surface-disturbing activities, also conserve greater than ten percent of all riparian and wetland systems in the planning area; therefore, they would have a major beneficial effect on riparian/wetland resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Alternative D would prohibit surface disturbance in areas with historic properties, or within three miles or the visual horizon (whichever is closer) of historic properties that retain their integrity of setting. This area would also conserve greater than ten percent of all riparian/wetland systems in the planning area and would have a direct, major beneficial effect on riparian and wetland resources over the long term.

Paleontological Resources (no effect)
Paleontological resources of high importance that will be managed under Alternative D are not located within any riparian/wetland systems.

Visual Resources (major beneficial)
Under Alternative D, VRI Class II areas and special emphasis areas (SRMAs, ACECs, etc.) would be managed as VRM Class II. All VRI Class III areas, plus the Powder River Breaks and Fortification Creek, would be managed as VRM Class III. VRM Class I and II areas could prohibit or limit some surface-disturbing activities. VRM Class III and IV areas would

have minor limitations that could allow surface-disturbing activities. Overall, the management actions restricting surface-disturbing activities would encompass greater than ten percent of all riparian/wetland systems in the planning area and would have a direct, major, beneficial effect on riparian and wetland systems over the long term.

Land Resources

Forest Products (no effect)
No effects are anticipated from forest products management actions.

Lands and Realty (no effect)
No effects are anticipated from lands and realty management actions.

Renewable Energy (moderate adverse)
Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatable, salables, ROW exclosures areas, and other areas where surface disturbance is prohibited for a total exclusion acreage of 413,001 public land acres. Renewable-energy development would also be avoided on 271,455 public land acres, leaving less than 6% of public land available for development (see Map 49 for specific locations). Under the renewable-energy program for the planning area, overall, it is estimated that BLM actions would disturb approximately 75,240 acres over the next 20 years within five to ten percent of all riparian/wetland systems in the planning area. Reclamation would occur on 50,240 acres (Appendix G (p. 1671)). This management would have a moderate adverse effect on riparian and wetland systems.

Rights-of-Way and Corridors (moderate adverse)
Alternative D management actions would exclude 101,081 acres from ROW development and avoid 290,336 acres. Newly proposed transmission lines and ground facilities would be allowed within existing ROW and other disturbance areas. ROW activities would be avoided on slopes equal to or greater than 25% and on highly erodible soils. All these actions would directly benefit vegetation. ROW disturbances are estimated to affect approximately 14,000 for pipelines and 56 acres for communications sites within five to ten percent of all riparian/wetland systems in the planning area during the planning period; successful reclamation is estimated to occur on all affected acres. Powerlines are estimated to affect approximately 4,916 acres (1,000 miles), with successful reclamation on approximately 491 acres, leaving 4,425 acres of long-term disturbance (Appendix G (p. 1671)). This management would have a moderate adverse effect on riparian and wetland systems.

Travel and Transportation Management (moderate beneficial)
Like Alternative B, Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in special status species habitat and on saturated soils or on slopes 25% or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. Alternative D management actions would limit access within five to ten percent of all riparian/wetland systems in the planning area and have a direct, moderate beneficial effect on riparian and wetland systems over the long term.

Recreation (negligible beneficial)
Alternative D designates seven areas as SRMAs (54,160 acres) and eight ERMAs (349,663

acres). Prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance riparian and wetland resources. Alternative D allows additional recreation facilities consistent with other resource values which would have a direct adverse effect on vegetation in and around the facilities over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation and increase vegetation disturbance from trampling and increase the potential for introduction and spread of invasive plant species. The SRMAs would encompass less than one percent of all riparian/wetland systems in the planning area; therefore, management actions for recreation under Alternative D would have negligible beneficial effects on riparian/wetland resources.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative D actions would include managing about 6,864 acres. Managing these lands would conserve vegetation in less than one percent of all riparian/wetland systems in the planning area and have an indirect, negligible, beneficial effect on riparian and wetland systems over the long term.

Livestock Grazing Management (major beneficial)
Under Alternative D, range improvements would be developed in accordance with resource needs and livestock management objectives, rather than developing range improvements and then monitoring to detect undesirable changes (as under Alternative A). AMPs would continue to be developed, but increases in vegetative production would be allocated for watershed protection first, then forage and habitat, rather than allocated for wildlife first, then livestock use (as under Alternative A). Livestock grazing would be allowed on all public lands except for areas described under Alternative A, with the addition of evaluated areas determined to be incompatible with other resource uses or values such as entrances of caves, campgrounds, and culturally significant sites. Permanent increases in forage allocations would be considered for watershed protection, livestock grazing, wildlife habitat, and other resource values; under Alternative D, any permanent increases in forage would be considered for wildlife and watershed protection before additional livestock use. Rest and deferment following wildfires, prescribed fires, and vegetative treatments would continue until resource objectives were met. Other management actions that do not address previous decisions include locating livestock salt and mineral supplements as described under Alternative C. Construction of range improvements would have a direct adverse effect on vegetation for the life of the project. All other livestock-related actions would have an indirect, beneficial effect on riparian and wetland systems over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 38 acres (150 miles), with successful reclamation on approximately 35 acres (140 miles) approximately 3 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Restrictions for livestock grazing conserve greater than ten percent of riparian/wetland systems; therefore management actions for livestock grazing under Alternative D would have major beneficial effects on riparian/wetland resources.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Alternative D management actions include evaluating four proposed areas as ACECs, which would affect approximately 35,451 acres, less than one percent of all riparian/wetland systems in the planning area. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities and would have a direct, negligible, beneficial effect on riparian and wetland systems over the long term.

Scenic or Back Country Byways (no effect)
No effects are anticipated from scenic or BCBs management actions.

Wild and Scenic Rivers (negligible beneficial)
Under Alternative D, management would continue in accordance with the Middle Fork Interim Management Plan to retain its free-flowing characteristics and outstanding resource values until Congress acts to release or designate the Middle Fork Powder River as a WSR. Continuing interim management in less than one percent of all riparian/wetland systems in the planning area would have an indirect, negligible, beneficial effect on riparian and wetland systems over the long term.

Wilderness Study Areas (negligible beneficial)
There are three WSAs in the planning area totaling 28,931 acres, less than one percent of all riparian/wetland systems in the planning area. There are restrictions to preserve wilderness conditions in these areas until Congress acts on these WSAs. Designation of these areas and interim management is based on conservation of the natural resources, which would limit vehicular travel and surface-disturbing activities. This management would have a negligible beneficial effect on riparian and wetland systems.

Socioeconomic Resources (no effect)

No effects are anticipated from socioeconomics management actions.

4.4.3.7. Cumulative Impacts

Chapter 4 describes effects to riparian and wetland systems from past and present actions, federal and non-federal as part of the affected environment. Non-federal actions will affect vegetation similar to federal actions but mitigation for effects to vegetation resources would differ between federal and non-federal actions. The scattered public land pattern in the planning area increases the potential for cumulative impacts from actions on BLM-administered lands, both in individual and between different grazing allotments, and on adjoining ownerships. Public ownership is rarely continuous along an entire watershed stream length; therefore, habitat conditions vary and can be quite fragmented. Management changes implemented on lands of other ownership(s) to improve riparian and wetland conditions also could improve conditions on BLM-administered lands if the same management is applied to those lands, and vise versa. If some uses are restricted or eliminated on BLM-administered lands, that could cause increased use on adjacent ownerships, which would lead to degradation of riparian and wetland conditions on these lands. Increases in livestock stocking rates on private lands could increase grazing pressure on public land riparian and wetland systems.

4.4.3.8. Conclusion

Table 4.41, “Summary of Impacts to Riparian/Wetland Resources” (p. 902) summarizes impacts to riparian/wetland systems.

Table 4.41. Summary of Impacts to Riparian/Wetland Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible beneficial	Major beneficial	Major adverse	Major beneficial
Soil	Major beneficial	Major beneficial	Major adverse	Major beneficial
Water Resources	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Leasable Minerals – Coal	Negligible adverse	Major adverse	Major adverse	Major adverse
Leasable Minerals – Fluids	Major adverse	Moderate adverse	Major adverse	Major adverse
Salable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor adverse	Minor beneficial	Minor adverse	Negligible beneficial
Planned Fire (Prescribed Fire)	Negligible beneficial	Minor beneficial	Negligible beneficial	Negligible beneficial
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	Major adverse	Moderate beneficial	Major adverse	Major beneficial
Vegetation – Riparian/Wetland Resources	Moderate beneficial	Major beneficial	Moderate adverse	Major beneficial
Invasive Species and Pest Management	Minor beneficial	Moderate beneficial	Minor adverse	Moderate beneficial
Fish and Wildlife Resources – Fish	Negligible beneficial	Negligible beneficial	Negligible adverse	Major beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Major beneficial	Minor beneficial	Moderate beneficial
Special Status Species – Plants	Negligible beneficial	Negligible beneficial	Negligible beneficial	Major beneficial
Special Status Species – Fish	No effect	Major beneficial	Moderate beneficial	Moderate beneficial
Special Status Species – Wildlife	Minor beneficial	Major beneficial	Minor beneficial	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Minor beneficial	Major beneficial	Minor beneficial	Major beneficial
Paleontological Resources	No effect	Moderate beneficial	Negligible beneficial	No effect
Visual Resources	Major beneficial	Major beneficial	Negligible beneficial	Major beneficial
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	Minor adverse	No effect	Minor adverse	No effect
Renewable Energy	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Rights-of-Way and Corridors	Minor adverse	Major adverse	Major adverse	Moderate adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Travel and Transportation Management	Negligible beneficial	Minor adverse	Negligible adverse	Moderate beneficial
Recreation	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Lands with Wilderness Characteristics	No effect	Negligible beneficial	Negligible adverse	Negligible beneficial
Livestock Grazing Management	Minor beneficial	Major beneficial	Minor adverse	Major beneficial
Special Designations				
Areas of Critical Environmental Concerns	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Scenic or Back Country Byways	Negligible adverse	No effect	No effect	No effect
Wild and Scenic Rivers	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Wilderness Study Areas	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.4. Invasive Species and Pest Management

This section describes potential impacts to invasive species and pest management from management actions under other resource programs. Chapter 3 provides a general discussion and information about invasive species and pest management. Objectives are to maintain and improve the condition and trend in plant communities that conserve soil and water, and provide forage, wildlife habitat, special status species habitat, recreation, scenic, ecological, and scientific benefits for consumptive and nonconsumptive uses.

Most management activities on BLM-administered lands have the potential to introduce or promote the proliferation of invasive plants. Motor vehicles; animal movement; roads; motorized vehicle, livestock, wildlife, and recreation trails; and all surface-disturbing activities increase the potential introduce and spread invasive species.

Actions that contribute to the decline in abundance, distribution, or functionality of native vegetation and promote invasive species result in adverse effects. Conversely, beneficial effects result from activities that protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

4.4.4.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for invasive species and pest management.

Most management activities on BLM-administered lands have the potential to introduce or promote the proliferation of invasive plants. Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, best professional judgement, review of existing literature, and information provided by other agencies. Existing literature

and analyses include the Buffalo RMP (BLM 1985c), the PRB EIS (BLM 2003c), Vegetation Treatment and Fuels Reduction on Western Public Lands EIS (BLM 2007h). Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. Effects are quantified where possible. In the absence of quantifiable data, best professional judgment was used. The term invasive species as used in this section refers to noxious and invasive weeds, including cheatgrass.

Allowable uses and management actions that could affect the spread and introduction of invasive species and pests include all surface-disturbing activities; concentrated livestock and native ungulate grazing; fire and fuels management; recreation, motorized vehicle use, and dispersed travel; and proactive management actions. As the management of invasive and pest species are affected by the alternatives, invasives and pests can, in turn, impact other resources.

Assumptions

- The introduction of invasive species can threaten the stability of ecosystems, create serious human health consequences, and cause substantial economic burdens.
- Surface-disturbing activities, recreation sites, and concentrated grazing (livestock and wildlife) contribute to the introduction and spread of invasive species.
- Invasive species occur in greatest density in areas of past or present surface disturbance. Reclaimed areas can continue to be host sites for these species.
- Invasive species and pest control would be carried out in coordination with the appropriate county weed and pest control district, owners of adjacent property, private industry, and other federal agencies.
- Annual bromes pose a major threat to most vegetative communities and habitats.
- Baseline inventory, establishment of planning units, and an integrated approach are needed for successful management of invasive species.
- Wetted areas provide a haven for invasive species.
- Transportation routes are directly proportional to the opportunities for invasive species to establish and spread.
- Grasshopper outbreaks generally cycle approximately every seven years, last approximately three years, and infest every land type.

Significance Criteria

- Extent of invasive species and pests exceeds the budget for controlling these species and pests.
- Activities or impacts that would encourage invasive species establishment or spread into or adjacent to special status species populations and habitat.
- Excessive limitations on control methods that prevent noxious weed treatment from occurring.

4.4.4.2. Impacts Common to All Alternatives

Management of **Visual Resources, Lands and Realty, Scenic and Back Country Byways, Wild and Scenic Rivers, Social and Economic Conditions, and Health and Safety** would have no effect on invasive species and pest management and are not further addressed in the Invasive Species and Pest Management sections.

Invasive Species and Pest Management (major beneficial)
Invasive species management actions include efforts to minimize surface-disturbing activities and enforce the use of vegetation products certified to be free of weed seed on all BLM-administered

projects and lands to reduce opportunities for invasive species to establish or spread. Pest management actions include managing designated pests on public lands using an IPM approach while working cooperatively with county weed and pest control districts, state agencies, private industry, grazing lessees, and other stakeholders, and working with APHIS as actions relate to insect and other pest control. These actions help mitigate adverse on invasive species and pest management because continued corporation and management of lands promotes restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Physical Resources

Soil and Water Resources (major adverse)
Management actions to evaluate the effects on soils from a proposed surface-disturbing activity using NRCS Soil Survey data and onsite investigation, and actions to ensure authorized surface-disturbing activities will include reclamation plans would facilitate activities in locations where soils are capable of supporting the activities and have the potential to be successfully reclaimed. Both these actions would reduce the potential for invasive species to establish or spread. Management actions include preventing degradation of water quality for all waters and managing water resources to meet the Wyoming Standards for Healthy Rangelands, to achieve PFC, and to meet Wyoming water quality standards. Taking appropriate actions to improve the biological, chemical, and geomorphic conditions of streams affected by BLM-authorized actions and permitted activities would help vegetative and riparian/wetland communities by improving or maintaining the present health of these plant communities. These mitigation measures will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. This would affect more than 10% of the area. All these actions would have a direct, major adverse effect on invasive species and pest management.

Cave and Karst Resources (negligible beneficial)
Management actions to conduct cave inventories and significance determination would gather information important to making management decision on activities near or around cave and karst resources. This would affect less than one percent of BLM-administered lands. Management actions that protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread would be negligible beneficial.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal, Leasable Minerals – Fluids, and Salable Minerals (major adverse)
Any lands not withdrawn from or closed to minerals exploration and development would be available to locatable, leasable, and salable minerals activities. Areas open to oil and gas leasing would be open to geothermal development. Minerals resource development includes surface-disturbing activities, which provide an opportunity for invasive plants to establish or spread. This would affect more than 10% of the area. All these actions would have a direct, major adverse effect on invasive species and pest management because surface-disturbing activity would allow for transport of invasive species seed, crush or removal of vegetation, and expose bare soils where invasive species could establish.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (negligible beneficial)
Management actions include rehabilitating firelines that were constructed using heavy equipment and firelines on steep slopes to prevent or control erosion. Rehabilitation would include, but not be limited to, water barring and reseeding. These actions would facilitate reclamation of soil disturbances, which would reduce the opportunity for invasive species to establish. Most wildfires are weather related and the primary ignition source is fine fuels (dormant grasses), especially cheatgrass. Cheatgrass responds positively (establishes and spreads) to burning and to surface-disturbing activities. The effects of wildfires are generally negligible because major events occur only every five to seven years. Rehabilitation and reclamation following wildfires, prescribed fires, surface disturbance associated with fireline construction and the use of heavy equipment, and other fire suppression activities are integral to protecting vegetative communities and watersheds from erosion. This would affect less than one percent of the area. This reduces the opportunity for invasive species to establish or spread, which would have an indirect, negligible, beneficial effect on invasive species and pest management.

Biological Resources

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Managing vegetative communities (Map 19) in accordance with the Wyoming Standards for Healthy Rangelands and managing to protect, preserve, or enhance plant communities would reduce opportunities for and reduce existing impacts from invasive species. Managing the planning and development of travel routes, recreational uses, minerals exploration and development, ROW, siting of facilities and related infrastructure (e.g., utility corridors and roads) to reduce impacts to vegetative resources also would reduce opportunities for invasive species to establish or spread. Using an integrated management approach (e.g., mechanical, chemical, and biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives, and developing a contingency plan to address catastrophic natural events all would help in managing invasives species. Working with landowners on split estate lands to reestablish disturbed sites to healthy plant communities in accordance with the ecological site potential includes control of invasive species. This would affect less than one percent of the area. All these actions would have a negligible beneficial effect on invasive species and pest management.

Vegetation – Riparian/Wetland Resources (negligible beneficial)
Riparian and wetland systems are favored locations for invasive species due to prolonged or continuous wet conditions and nutrient-rich soils. Management actions to prioritize management and develop activity and implementation plans to manage riparian and wetland systems to be at or above, or continue to be improving toward, PFC while achieving the Wyoming Standards for Healthy Rangelands includes managing any invasive plant or pest species. Actions also include managing riparian and wetland systems to enhance forage conditions and improve water quality, managing all riparian systems with sensitive species concerns; and preventing degradation, loss, or destruction of riparian/wetland habitat. These actions would indirectly benefit the control of invasive species and would minimize opportunities for invasive plant and pest species to establish and spread. This would affect less than one percent of the area. These negligible beneficial effects would be long term.

Fish and Wildlife Resources – Fish (negligible adverse)
Management actions address the introduction, protection, and enhancement of fish species, populations, and habitats. Actions also include managing harmful non-native riparian vegetation in river and stream systems; this would help to control the spread and establishment of invasive species. This will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management. Treatment and application methods need to be analyzed for potential unwanted adverse effects on non-target species. Establishing motorized vehicle and walking trails to provide public access to fish-bearing waters would directly and adversely affect vegetation by trampling or removal, and increase opportunities for invasive species to establish or spread. This would affect less than one percent of the area. This would have a negligible adverse effect on invasive species and pest management.

Fish and Wildlife Resources – Wildlife (negligible beneficial)
Management actions include developing appropriate mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management through use of defined mitigation guidelines. Actions also include maintaining or improving important wildlife habitats through vegetation manipulations, habitat improvement projects, livestock grazing strategies, and providing, to the extent possible, suitable habitat and forage to support wildlife population objectives. Enhancement of habitats would reduce opportunities for invasive species establishment and spread. These will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Wildlife trails, bedding areas, and concentration areas have a direct, adverse effect on vegetation over the long term. These areas would be conducive to invasive species establishment and spread. This would affect less than one percent of the area.

Special Status Species (major beneficial)
Management includes implementing actions in recovery plans, conservation measures, terms and conditions, and appropriate BMPs. These species would take priority in planning and implementing on-the-ground activities and projects that could conflict with or promote native vegetation. Actions that would enhance ecological health would indirectly benefit the management of invasive species. Managing habitats for special status species in a lower ecological state or in a degraded health condition could promote invasive species establishment or spread. Treatment and application methods would need to be analyzed for potential unwanted effects on non-target species. This would affect approximately four percent of the area. Management of special status species would have a major beneficial effect on invasive species and pest management because activities that protect or restore proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Heritage and Visual Resources

Cultural Resources, Paleontological Resources, and Visual Resources (negligible beneficial)
Management actions include completing site stabilization and implementing long-term protections for significant cultural and paleontological sites experiencing adverse effects, and managing identified areas important to tribes to minimize disturbance. Designating WSAs and the Middle Fork Powder River WSR as VRM Class I areas would help keep these areas natural and pristine, including prohibiting or limiting surface-disturbing activities. This would affect less than one

percent of the area. All these actions would have direct, long-term, negligible beneficial effects on invasive species and pest management by minimizing opportunities for their establishment and spread. Effects from management of visual resources would not differ by alternative and are not further addressed in this section.

Land Resources

Forest Products, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, Recreation, and Lands with Wilderness Characteristics (moderate beneficial)
Management actions include prohibiting timber harvest areas within 200 feet of surface waters. If this also prohibits associated roads, trails, and staging and work areas, then all actions would indirectly benefit invasive species management over the long term. Management actions also include: (1) limiting mechanical activity, recreation facilities and sites, and motorized vehicle activity in riparian/wetland areas; (2) prohibiting dispersed camping and commercial camps within 200 feet of surface water; (3) designating ROW corridors to minimize surface disturbance and impacts; (4) co-locating new ROW with existing ROW considering land use authorizations (e.g., permits and leases); (5) withdrawing areas from ROW and minerals development on a project-specific basis consistent with other resource objectives; (6) designing, constructing, and maintaining roads, including all BLM road easements, to meet or exceed BLM standards; and (7) determining road and trail closures, abandonments, reclamation, and needs for new roads. All prohibitions, reductions, and limitations on surface-disturbing and disruptive activities would have the direct benefit by reducing opportunities for invasive species to establish or spread. Increasing recreation opportunities could allow invasive species introduction and spread in new areas via vehicles, footwear, horses, dogs, clothing, and recreation equipment. Managing for wilderness characteristics likely would reduce opportunities for invasive species establishment and spread by prohibiting or limiting surface-disturbing activities in these areas over the long term. This would affect approximately eight percent of the area. Prohibiting or limiting surface-disturbing activities at recreation sites and special management areas would also have indirect benefits by limiting opportunities for invasive species establishment and spread over the long term. The effects would be moderate and beneficial.

Livestock Grazing Management (negligible adverse)
Livestock grazing management actions include achieving the Wyoming Standards for Healthy Rangelands; managing livestock grazing to sustain riparian, wetland, mountain mahogany, specials status species, or other special habitats; and implementing strategies that best protect rangeland resources during periods of drought. Proper livestock grazing can improve native vegetative cover and plant vigor, making plant communities more resistant to invasive species (Pittroff No Date). These management actions will help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because use of the lands promotes invasive species and pest establishment. Livestock can contribute to the introduction and expansion of invasive plant species by transporting seeds to new locations and disturbing soils and removing vegetation in areas of concentration, primarily around water sources, around supplement sites, and along trails. Range improvements that disturb large areas of soil surface could provide locations for invasive species to become established and spread if the areas are not properly reclaimed. This would affect less than one percent of the area. These actions would have indirect, negligible adverse effects on invasive species management over the long term.

Special Designations

Areas of Critical Environmental Concern and Wilderness Study Areas (moderate beneficial)
Management actions for special designations can contribute to the establishment and spread of invasive species by enticing recreationists and others to these areas, which usually involves establishing access trails for foot, hoof, nonmotorized, or motorized travel. These actions can have indirect, long-term adverse effects on invasive species management. However, special designation areas often have prohibitions, limitations, or restrictions on surface-disturbing activities, which have a direct, long-term, moderate beneficial effect by minimizing opportunities for invasive species to establish and spread. This would affect approximately five percent of the area.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above.

4.4.4.3. Alternative A

Alternative A would continue invasive species and pest management in accordance with the 1985 RMP as amended and maintained.

Invasive Species and Pest Management (minor beneficial)
Alternative A management actions include working cooperatively with county weed and pest control districts to set annual and long-term treatment priorities. Weed control treatments occur every year to reduce and control weed infestations over the long term. The goals for treatment are to maintain weed seed-free, native communities to sustain their natural values. Lack of a complete invasive species inventory and an overall invasive species and pest management plan to prioritize species, locations, treatment types, and application methods has led to a “band-aid” type of approach to short-term (1 to 3 years) planning of treatments.

Most control efforts include chemical, mechanical, and biological methods. Controlling weeds by chemical and mechanical methods can directly harm other plant species. For example, if an herbicide is non-selective for all broadleaf plants, the chemical also could harm forb species. If mechanical methods are used, any plant in the direct path of the application would be affected. Biological methods generally are species specific and effects are direct, long term, and harmful to the host species; other plants indirectly benefit from improving the health of the vegetative community by removal of the host pest species.

Control measures on invasive species and pests on public lands are done in cooperation with county weed and pest control districts and private energy companies. Herbicides applied to areas under mineral permits or leases are the responsibility of the private energy company. Over the next 20 years, it is estimated that BLM invasive species and pest management actions would disturb approximately one percent BLM acres.

Invasion of cheatgrass has adverse effects on the grassland and shrubland communities. Exact acreages are not known, due to a lack of vegetative inventory, but professional judgment estimates canopy cover to be 15% to 20% of the planning area. Control treatments have not been pursued because cheatgrass is not on the Wyoming Weed and Pest Control Act Designated List and a lack of funding. Cheatgrass management has not been addressed and populations are increasing.

Pest species (grasshoppers and Mormon crickets) primarily impact grassland and shrubland species. Pest control is primarily by chemical application and the effects are direct and beneficial to pest management, and indirect and beneficial to the host plants. Rangeland forage production can be drastically reduced if insect populations are above average. Annual rangeland forage production losses to grasshoppers average approximately 15 to 20%; in years of high grasshopper

populations (15 or more grasshoppers per square yard for above-average economic impact) losses can increase to 50 to 70% of annual forage production (APHIS). Unsuccessful reclamation, improper grazing, and large pest populations can impede native vegetation and promote the establishment and expansion of invasive plants and pests.

Alternative A would help mitigate adverse effects and manage invasive species and pests. Alternative A management actions would have a direct, minor beneficial effect on invasive species and pest management.

Physical Resources

Soil (moderate adverse)
Alternative A soils management would prohibit surface-disturbing activities on soils with slopes greater than or equal to 25% and would restrict surface-disturbing activities on soils with poor reclamation suitability unless the authorized officer waives the prohibition. Allowing waivers would be the exception but results in inconsistent application of management, which would have a direct and adverse effect on vegetation and soil resources. Reasonable foreseeable development predicts that a total of 37% of BLM-administered lands will be disturbed from BLM actions, 31% of BLM-administered lands will be reclaimed, and six percent of BLM-administered lands will be left with long-term disturbance.

Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Prohibition or restriction of surface disturbance would help prevent spread of invasive species and pest management for the long term because factors that allow for invasive species and pests to spread would be removed.

Development on soils greater than or equal to 25% or with poor reclamation suitability could present reclamation challenges. Reclamation in these areas could be limited or unattainable which would allow for the spread of invasive species and pests.

Alternative A management would help mitigate adverse effects by prohibiting or restricting surface-disturbing but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. Alternative A management actions would have a direct, moderate adverse effect on invasive species and pest management.

Water Resources (minor beneficial)
Alternative A water management would prohibit surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams on 2.54% of the area unless the authorized officer waives the prohibition allows for inconsistent application of management. Disturbances could remove or crush vegetation and impact water quality and quantity. A reduction in habitat for numerous plant and animal species that inhabit these systems would occur and a reduction in potential special status species. This would allow for invasive species to establish and spread. Therefore, the prohibition would have a direct beneficial effect for the long term. Waivers would be the exception in these areas. This would affect approximately three percent of the area.

Alternative A does not include decisions addressing on-channel reservoirs, which have become a common means of disposing of CBNG produced water. These sites are usually constructed on

steep slopes where reclamation would be difficult, thus providing opportunities for invasive species to establish and spread, and the wetted areas below dams are havens for invasive plant species such as Canada thistle and salt cedar. If on-channel reservoirs are allowed there could be direct adverse effects.

Alternative A management actions would have a direct, minor beneficial effect on invasive species and pest management.

Cave and Karst Resources (no effect)
There are no anticipated effects from cave and karst management actions.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative A management actions that do not withdraw or close lands make lands available for mineral leasing and development which promote surface-disturbing activities. Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Under the locatable minerals program for the planning area, overall it is estimated that the BLM actions would disturb less than one percent of BLM-administered lands. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life the lease or through surface-disturbing activities. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Leasable Minerals – Coal (moderate adverse)
Alternative A includes opening all federal coal and lands (federal mineral estate for coal retained by the federal government) outside high development potential areas to study and exploration, of which a very small portion would actually be developed. Under the leasable minerals (coal) program for the planning area, overall it is estimated that the BLM actions would disturb 25% of the area. Reclamation would occur on 15% of the area, leaving a total of 3.8% of the area of long-term disturbance. There is 5.8% of the area in active BLM mines. Those sites where development did occur would have impacts for the life of the project and would require successful reclamation to ensure the native vegetation component was reestablished to predisturbance conditions and to reduce the potential introduction and establishment of invasive species. This can have adverse effects on vegetation and soil resources by providing opportunities for invasive species to establish and spread during the life the lease or project through surface-disturbing activities that promote invasive species and pest spread. Alternative A management actions would have a direct, moderate adverse effect on invasive species and pest management.

Leasable Minerals – Fluids (negligible adverse)
Alternative A would continue to lease and allow for development of federal oil and gas minerals on but would make the WSAs administratively unavailable. Surface-disturbance from well sites, pipelines, and utility corridors will allow for transport of invasive species seed, crush or removal of vegetation, and expose bare soils where invasive species could establish. Construction of reservoirs and ponds and other water disposal methods for CBNG development provide areas of soil disturbance and the perfect medium for establishment of invasive plant species, especially salt cedar. These reservoirs and ponds can provide breeding habitat for mosquitoes carrying the WNv. Under the leasable CBNG program for the planning area it is estimated that BLM actions would

disturb less than one percent of the total available acres. Reclamation will occur on portions of that disturbance. Total CBNG and oil development would be less than one percent of the total available acres. The acres of long-term disturbance make these actions direct, negligible adverse effect on invasive species and pest management.

Salable Minerals (negligible adverse)
Under the salable minerals program, Alternative A would leave the entire planning area available for salable minerals leasing and the associated surface disturbance other that in the Fortification Creek, Gardner Mountain, and North Fork WSAs. Salables would involve surface-disturbance activities which would have direct, adverse effects on invasive species and pest management for the life of the project(s) because the disturbance associated with this action promotes the spread of invasive species and pests. Such actions include the creation of trails, crushing or removal of native vegetation, vehicle use, human presence, and equipment use. Over the next 20 years the estimated acres of salable minerals surface disturbance would be less than one percent of available acres. There is no anticipated disturbance from geothermal activities. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Fire and Fuels Management

Unplanned Fire (Wildfire) (moderate adverse) **and Planned Fire (Prescribed Fire)** (minor beneficial)
Under Alternative A, the application of different levels of suppression and restricting the use of some types of suppression equipment has the potential to allow for the spread of invasive species through road and trail construction, vehicles, equipment, and people. Even though there is potential to allow for the spread of invasive species rehabilitating fire and suppression damage would directly benefit invasive species and pest management over the long term, especially in vegetative communities where cheatgrass is a component because competitive native species would be established through rehabilitating fire and suppression. These plant communities help to prevent invasive species from establishing because they can outcompete invasive species for nutrients, space, and water. Implementing prescribed fires to support vegetation and wildlife habitat objectives also would have direct beneficial effects because burn conditions (air and soil temperatures, wind conditions, and fuel types) would be less severe than wildfires. However, in the short term, prescribed fire would still destroy any litter on the surface and the current year's growth. Improving ecological conditions through the application of prescribed fire and other vegetative treatments would directly benefit invasive species and pest management because through these actions healthier plant communities would be able to become established and help prevent invasive species from establishing. Long term, the application of prescribed fire to support plant communities and wildlife habitat objectives is estimated to affect approximately two percent of BLM-administered lands. All acres are expected to be successfully reclaimed. Prescribed fire would have minor beneficial effects on invasive species and pest management.

Unplanned fire would have adverse effects, with severity dependent on the fire sizes, soil types, types of vegetative communities, and burn conditions. Unplanned fire usually has more severe air and soil temperatures, wind conditions, and/or fuel types. Native vegetation can be destroyed allowing for invasive species and pest to establish. Overall level of effect is anticipated to be moderate.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Under Alternative A, forestry treatment actions in the planning area, including timber harvesting, firewood gathering, and other permitted activities related to forest products, could result in the introduction and spread of invasive species from road and trail construction, vehicles, equipment, animals, and people. The actions are estimated to affect less than one percent of BLM-administered lands. This would have a direct, adverse, negligible effect on invasive species and pest management over the long term.

Vegetation – Grassland and Shrubland Communities (major adverse)
Alternative A does not address grassland and shrubland communities. The past decade of energy development has disturbed tens of thousands of acres of public land. Reclamation of these lands has been difficult. Livestock and wildlife season-long and overgrazing can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. At present, there are no management actions addressing grassland and shrubland communities. Approximately 16% of BLM-administered lands are grassland and shrublands. Disturbance on this area would be permitted although unlikely to occur on all 16% of BLM-administered lands. Alternative A management of grassland and shrubland communities would have a major adverse effect on invasive species and pest management because invasive species and pests have been able to establish in a variety of plant communities due to ongoing development and multiple uses of the lands that promote invasive species and pest establishment.

Riparian/Wetlands Communities (minor beneficial)
Current management actions prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, or perennial streams unless the prohibition is waived by the authorized officer. Surface-disturbing activities and continuous wildlife and livestock grazing in these wet areas can promote the establishment of invasive species and stress native plants, making it easier for invasive species to compete for nutrients, space, and water. This would affect three percent of BLM-administered lands. Alternative A management of riparian and wetland communities would have direct, minor, beneficial effects on invasive species and pest management over the long term because activities that promote invasive species and pest establishment are not allowed within 500 feet of riparian/wetlands communities.

Fish and Wildlife Resources (negligible adverse)
Fish and wildlife resources include fish, wildlife, upland game birds, raptors, migratory birds, and amphibians and reptiles and their habitats. Alternative A management actions include prohibiting, limiting, and restricting surface-disturbing activities unless waived by the authorized officer, and timing limitations for disruptive activities. Restriction of surface-disturbing activities would leave soils and plant communities intact which would limit the opportunity for invasive species to establish. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development (from waivers, in surrounding areas, or with limited use) promote invasive species and pest establishment. The actions are estimated to affect less than one percent of acres. All acres are expected to be successfully reclaimed. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Special Status Species (major beneficial)
Alternative A does not address invasive species and pests in habitats known to have populations of special status species with the exception of Greater Sage-Grouse, bald eagles, and special status raptor species. Under Alternative A, treatment of invasive species in known populations of special

status species would not be likely unless analysis shows that the presence of the invasive plant or pest poses a greater threat to the special status species than the application of control methods. This would affect less than one percent of BLM-administered lands. Greater Sage-Grouse, bald eagles, and special status raptor species have surface-disturbance buffers unless waived by the authorized officer. Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Approximately 33% of BLM-administered lands contain special status raptor species. Prohibition or restriction of surface disturbance would have a direct beneficial effect on invasive species and pest management for the long term because factors that allow for invasive species and pests to spread would be removed. Alternative A management actions for special status wildlife species would have a direct, major beneficial effect on invasive species and pest management. Special status plant and fish management would have a negligible beneficial effect due to their limited occurrence within the planning area.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Alternative A would apply NSO stipulations to mineral leases along the Bozeman Trail and within the Crazy Woman Battle Sites. Prohibition or restriction of surface disturbance would have a direct beneficial effect on invasive species and pest management for the long term because factors that allow for invasive species and pests to spread would be removed. The actions are estimated to affect less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Paleontological Resources (negligible adverse)
Paleontological management actions were not addressed in Alternative A, therefore there are no protective measures for these sites and surface-disturbing activities would be allowed. This would allow for transport of invasive species seed, crush or removal vegetation, and exposure of bare soils where invasive species could establish. The actions are estimated to affect less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Land Resources

Forest Products (negligible adverse)
Alternative A management actions include prohibiting timber harvest within 200 feet of surface water. All other timber harvest is allowed in suitable areas. Surface-disturbing activities associated with timber harvest would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread. The development of trails and roads could crush or remove native vegetation. Vehicles, humans, and equipment could import invasive species. The application of forestry treatment actions is estimated to affect approximately up to one percent of BLM-administered lands. All acres are expected to be successfully reclaimed. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Renewable Energy (minor adverse)
Alternative A does not address renewable-energy development. Under Alternative A, activities

that involve surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread. The development of primitive motorized, hoof, and foot trails could crush or remove native vegetation and vehicles, animals (horses and dogs), humans, and equipment could import invasive species. Surface disturbance from BLM action would be approximately three percent of BLM-administered lands, with reclamation on approximately two percent of BLM-administered lands, with long-term disturbance of one percent of BLM-administered lands. Alternative A management actions would have a direct, minor adverse effect on invasive species and pest management.

Rights-of-Way and Corridors (minor adverse)
Alternative A actions address ROW for pipelines, roads, powerlines communication sites, and other facilities. Under Alternative A, communication site locations would be prohibited on the North Middle Butte (Pumpkin Buttes area) unless necessary. Communication site locations would be allowed on the South Middle Butte only. Transmission lines would be within in identified corridors where feasible. Soil disturbance would be prohibited on slopes greater than or equal to 25% and timing stipulations on areas that are highly erodible. Surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread.

Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. BLM actions would disturb three percent of BLM-administered lands. Reclamation would occur on two percent of BLM-administered lands, leaving a total of one percent of BLM-administered lands with long-term disturbance. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life the lease or project. Alternative A management actions would have a direct, minor adverse effect on invasive species and pest management.

Travel and Transportation Management (negligible adverse)
Under Alternative A vehicle travel on saturated soils and slopes greater than 25% would be prohibited and damage would result. There will be winter motor vehicle closures from November 15th to April 30th in North Fork, Barnum Mountain, Middle Fork, E.O. Taylor, and Fort Creek.

Surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities invasive species introduction and spread. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Prohibition or restriction of surface disturbances limit spread and establishment on invasive species and pests because factors that allow of invasive species and pests to spread and establish would be removed.

It is estimated that the BLM actions would disturb less than one percent of BLM-administered lands. Reclamation would not occur on the area leaving the area affected with long-term disturbance. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life of the lease or project. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Recreation (negligible adverse)
Under Alternative A recreation would prohibit camping within 200 feet of surface water, prohibit livestock grazing within developed recreation sites, prohibit oil and gas development in Mosier Gulch, prohibit surface disturbance, and occupancy within 0.5 mile of Dry Creek Petrified Tree.

Surface-disturbing activities would have a direct adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread.

Surface-disturbing activities can stress native vegetation and allow established invasive species to outcompete native plants for nutrients and water, thus allowing the locations and densities of invasive species to increase. Additionally, surface-disturbing activities can allow for the spread of invasive species through road and trail construction, vehicles, equipment, animals, and people. Prohibition or restriction of surface disturbance limits invasive species and pest spread and establishment because factors that allow for invasive species and pests to spread would be removed. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment.

It is estimated that BLM actions would disturb less than one percent of BLM-administered lands. Reclamation would not occur on the area leaving the areas affected with long-term disturbance. This can have direct adverse effects over the long term by providing opportunities for invasive species to establish and spread during the life the lease or project. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Lands with Wilderness Characteristics (negligible adverse)
Alternative A does not address invasive species and pests in areas with wilderness characteristics. Activities in these areas involving surface-disturbing activities would have a direct, minor adverse effect on invasive species and pest management because they could provide opportunities for invasive species introduction and spread. The development of primitive motorized, hoof, and foot trails could crush or remove native vegetation and vehicles, animals (horses and dogs), humans, and equipment could import invasive species. It is estimated that BLM actions would disturb less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Livestock Grazing Management (negligible adverse)
Alternative A management actions include increasing available forage, implementing range improvements, and requiring rest following vegetative treatments. All these actions would contribute to healthier ecological conditions that would make plant communities more resistant to invasive species. Alternative A would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because livestock grazing of the lands promotes invasive species and pest establishment. It is estimated that BLM actions would disturb

less than one percent of BLM-administered lands. Alternative A management actions would have a direct, negligible adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Currently there are no designated ACECs in the planning area. The lack of designations and lack of management actions makes management of invasive species and pests easier to administer due to the absence of any constraints. Alternative A management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Wilderness Study Areas (minor beneficial)
Alternative A management actions make WSAs unavailable for mineral leasing in the interim until Congress decides to designate the WSAs as wilderness or not. Protection from mineral leasing is a direct benefit long term, unless Congress designates otherwise. If Congress decides not to designate the WSAs as wilderness, Alternative A would allow leasing for minerals. This would allow for surface-disturbing activities of development and needed infrastructure. At present, there are no decisions addressing motorized travel in these areas. It is important to establish guidance for the protection of the natural resources in these areas. Limiting motorized travel would benefit invasive species management by reducing opportunities of invasive species to establish and spread even though it restricts the application of herbicides to control invasive species in the plant communities. Alternative A management actions would have a direct, minor beneficial effect on invasive species and pest management.

4.4.4.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to invasive species and pest management due to their implementation.

Invasive Species and Pest Management (minor beneficial)
In addition to the Alternative A management actions, Alternative B management actions include developing a pest management plan for the planning area. Specific management areas would be delineated based on native, invasive, and pest species, treatment methods, resource concerns, geographic features and limitations, and goals and objectives for each area. Treating plants on the State of Wyoming Designated Noxious Weed List, the appropriate county lists, and other species of concern as determined by BLM resource specialists would treat all species that adversely affect native plant communities and habitats. Cheatgrass is present throughout the planning area; therefore, the management plan would incorporate the entire planning area, including adjacent landowners and agencies. Goals would include improving the ecological condition of vegetative communities and wildlife and special status species habitat. The benefit of aerial application of pesticides would include treatment of large acreages for widely distributed species such cheatgrass, leafy spurge, grasshoppers and mountain pine beetle, access to remote locations, and lower rates of herbicide application. All these actions would have direct, minor beneficial effects on invasive species and pest management over the long term. Over the next 20 years it is estimated that BLM actions would disturb approximately two percent of BLM-administered lands. Reclamation would occur on approximately two percent of BLM-administered lands, leaving less than one percent of BLM-administered lands with long-term disturbance. Alternative

B management actions would have a direct, minor beneficial effect on invasive species and pest management.

Physical Resources

Soil (minor adverse)
Alternative B soils management actions prohibit surface disturbing activities on soils with severe erosion hazard, prohibit surface-disturbing activities on soils with slopes greater than or equal to 25%, prohibit surface-disturbing activities on soils with poor reclamation suitability, prohibit surface-disturbing activities on badlands, rock outcrops, and slopes subject to mass failure, prohibit vehicle travel on saturated soils, and prohibit prescribed fire on highly erodible soils. Reasonable foreseeable development predicts that a total of 30% of BLM-administered lands will be disturbed from BLM actions, 25% of BLM-administered lands will be reclaimed, and five percent of BLM-administered lands will be left with long-term disturbance. This would reduce the opportunity for the introduction of invasive species. Prohibiting surface-disturbing activities on soils with severe erosion hazard would reduce opportunities for invasive species to establish or spread.

Alternative B management would mitigate adverse effects by prohibiting or restricting surface-disturbing but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. Alternative B management actions would have a direct, minor adverse effect on invasive species and pest management.

Water Resources (minor beneficial)
Alternative B water management actions would prohibit surface disturbance within 500 feet of any natural or man-made water feature and prohibit on-channel reservoirs. This would affect three percent of the area. Alternative B does not include the waiver option further helping invasive species and pest management because it reduces the opportunity for the introduction of invasive species. Alternative B management actions would result in a minor beneficial effect on invasive species and pest management.

Cave and Karst Resources (major beneficial)
Alternative B cave and karst management actions would manage human activity in caves with significant resources through cave specific Cave Management Plans, prohibit surface-disturbing activities in areas containing cave and karst resources, prohibit timber harvest in areas containing cave and karst resources, and restrict livestock from entrances to significant caves. People using trails that lead to popular cave and karst areas could trample and remove vegetation, and possibly promote the introduction of invasive species. Livestock use can also trample and remove vegetation, and possibly promote the introduction of invasive species. Current management practices do not have any prohibitions or restrictions to cave and karst trails. Prohibiting surface-disturbing activities would prevent such activities from occurring and protect proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread. This would affect 13% of the area. Alternative B would have a direct, major beneficial effect on invasive species and pest management.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative B includes a number of new areas to protect and preserve cultural, paleontological,

recreation, wilderness, and special designation resource values (ACECs, Scenic or BCBs, WSRs, and WSAs). These withdrawals and restrictions would be for the protection and preservation of other resource values. This would result in 12% withdrawn from mineral exploration and development. Existing withdrawals and restrictions were implemented to protect and preserve other resource values. Under Alternative B, withdrawing or restricting additional areas from locatable minerals would help to minimize the spread of invasive species and pests because by restricting or withdrawing these areas proper ecological conditions in vegetative communities and habitat types would remain intact and limit opportunities for invasive species establishment and spread. Locatable minerals management would affect less than one percent of the area. Alternative B management would help mitigate adverse effects by prohibiting or restricting surface-disturbing activities but would still have an adverse effect on invasive species and pest management because continued development promotes invasive species and pest establishment and spread. Alternative B management actions would have a direct, negligible adverse effect on invasive species and pest management.

Leasable Minerals - Coal (minor adverse)
Under Alternative B, invasive species and pest management actions could include area- and/or species-specific treatment strategies, applied on a project-specific basis to public lands. Successful treatments will decrease the spread of undesirable species. However, where development does occur, vegetation would be directly and adversely affected over the long term for the life of the mining and would require successful reclamation to ensure the native vegetative component was reestablished to predisturbance conditions. Surface-disturbing activities have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands in surrounding areas promote invasive species and pest establishment. Under this alternative, approximately 39% of solid leasable mineral acres would be disturbed from BLM actions (existing leases and new leases). Reclamation will occur on approximately three percent solid leasable mineral acres. One percent solid leasable mineral acres are actively being mined. Less than one percent solid leasable mineral acres would be disturbed over the long term. Alternative B management actions would have a direct, minor adverse effect on invasive species and pest management.

Leasable Minerals – Fluids (negligible adverse)
Alternative B would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. This would result in 2,612,920 acres of BLM-administered lands closed to minerals leasing. More acreage would be protected from development over the long term and would help native vegetation to remain intact. Under the leasable CBNG program for the planning area, overall it is estimated that BLM and non-BLM actions would disturb approximately less than one percent of available acres over the next 20 years. There is no anticipated disturbance from geothermal-related activities. Alternative B would help mitigate adverse effects but would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Alternative B management actions would have a direct, negligible adverse effect on invasive species and pest management.

Salable Minerals (negligible adverse)
Alternative B would make mineral materials unavailable in accordance with management identified to conserve other resources, would result in 1,663,422 federal mineral acres closed. Management under Alternative B would help mitigate adverse effects because the alternative would protect additional acreage from development over the long term, but would still have an adverse effect on invasive species and pest management because continued development of the

lands promotes invasive species and pest establishment. Under the salable minerals program for the next 20 years, the estimated areas of surface disturbance less than one percent of available acres. Overall, Alternative B management would have a negligible adverse effect over the long term.

Fire and Fuels Management

Unplanned Fire (Wildfire) (moderate beneficial) and **Planned Fire (Prescribed Fire)** (negligible beneficial)
Alternative B management actions involving the application of full suppression of unplanned fires in areas where fire is undesirable would affect approximately six percent of the area. Full suppression in these areas would directly benefit vegetation communities by reducing the potential for soil erosion. These vegetation communities are important because they can outcompete invasive species. Additionally, limiting suppression vehicles to existing roads and trails unless they are in identified full suppression areas would reduce the opportunity for the introduction of invasive species. Rehabilitating all fire-related damage also would directly benefit vegetation communities over the short and long terms by reducing the potential for soil erosion. This management would have moderate beneficial effects.

Long term, the application of prescribed fire to improve the health of the vegetation community and/or enhance habitat is estimated to affect approximately less than one percent of BLM-administered lands. All acres would be successfully reclaimed. This management would have negligible beneficial effects over the long term because competitive native species would be established and prevent invasive species from establishing because they can outcompete invasive species for nutrients, space, and water.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Alternative B management actions allowing fire and natural pathogens to take their natural course could result in massive destruction of vegetation. This would have a direct adverse effect on invasive species and pest management over the long term because invaders and fire would move regardless of land status and the economic impact could be massive. Non-native species could move out of their original niche and become an invasive species requiring control. The actions are estimated to affect less than one percent of BLM-administered lands. This management would have negligible adverse effects.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Alternative B authorizes only native plant species for all reclamation activities. Management actions for grassland and shrubland communities that would allow native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. Timely reclamation (1 to 3 years) would limit opportunities for invasive species to establish and spread but not prevent them. Alternative B would help mitigate adverse effects on grassland and shrubland communities but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. The actions are estimated to affect less than one percent of the area from BLM actions. This management would have negligible adverse effects.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative B prohibits surface-disturbing activities within 500 feet of springs, reservoirs, water

wells or perennial streams in riparian and wetland communities. Alternative A allows waivers to this prohibition; not including the waiver option makes this alternative more restrictive than Alternative A. Additionally, restoring vegetation in all CBNG-supported riparian and wetland systems would have a direct beneficial effect on invasive species and pest management over the long term because it allows native plant species to develop and outcompete invasive species. These systems are very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle. Under Alternative B, reclamation actions would have a direct, long-term, beneficial effect on invasive species and pest management by establishing competitive native species. This would affect three percent of BLM-administered lands. Overall, Alternative B vegetation management actions would have a minor beneficial effect on invasive species and pest management.

Fish and Wildlife Resources (negligible adverse)
Alternative B wildlife management actions apply appropriate wildlife seasonal restrictions on disruptive activities to maintenance and operation of developed projects. This alternative does not allow disruptive activity in crucial elk winter range between November 15 and April 30, and in elk calving areas from May 1 to June 30 (Map 23). Actions also prohibit disruptive activities within 0.5 mile of big game migration corridors. Treatment of invasive species and pests would be considered a disruptive activity. These specific locations and timing restrictions would encumber the management of invasive species and pests and would have a direct adverse effect. Timing restrictions could affect the effectiveness of the treatment and would increase costs. Prohibiting or limiting surface-disturbing activities in designated areas, improving the ecological condition of plant communities and associated habitats, and reducing fragmentation of grassland and shrubland communities would help mitigate adverse effects on grassland and shrubland communities but would still have an adverse effect on invasive species and pest management because it is likely these surface-disturbing activities would relocate to other plant communities or to soils at higher risk to invasive species and pest establishment. Continued development and multiple uses of the lands promote invasive species and pest establishment. The actions are estimated to affect less than one percent of BLM-administered lands. This management action would have a direct, negligible, adverse effect over the long term.

Special Status Species – Plants and Wildlife (major adverse)
Alternative B management actions prohibit the aerial application of herbicides in areas with habitat for special status plant species. Invasive species would be allowed to thrive because of the potential for special status plants to be present. Surveys for special status plant species would be required prior to approving any project or activity that may impact the habitat for these species. By definition (Glossary) treatment of invasive species and pests would be considered a disruptive activity. The requirement to survey for special status plants prior to treatments, prohibiting aerial application of herbicide treatments within areas containing habitat, and the number of acres and locations encumbered by distances or date limitations would have a major adverse impact on the treatment management of invasive species and pests.

Management actions would also prohibit or restrict disruptive activities and occupancy in the perimeter of Greater Sage-Grouse leks, establish a disturbance-free zone in corridors consistently used by bald eagles, and prohibit or restrict disruptive activities raptors. Treatment of invasive species could affect Greater Sage-Grouse habitat. Preferred herbicides are not species specific, and other broadleaf plants (forbs) can be affected. Greater Sage-Grouse, especially chicks feed on forbs, these plants also attract insects upon which Greater Sage-Grouse do feed. The control of invasive species, including cheatgrass, would need to be assessed for the potential impacts of treating versus the impacts of not treating areas with significant populations of Greater Sage-Grouse and in habitats where Greater Sage-Grouse dwell. Large populations and

significant numbers will be defined depending on the USFWS status (Sensitive, Threatened, or Endangered) of the Greater Sage-Grouse at the time of assessment. Timing limitations that address disruptive activities could postpone invasive species treatments, which could diminishing the effectiveness of the treatment and increase the cost of treatments. This could affect up to 33% of BLM-administered lands. Overall, Alternative B management of special status plant and wildlife species would have a major adverse effect on invasive species and pest management.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible beneficial)
Alternative B management actions would limit or prohibit salable minerals exploration and development in areas with significant paleontological resources and prohibit surface disturbance in areas with cultural or historic properties. Closing leasing, withdrawing lands from minerals development, and prohibiting surface-disturbing activities would have a direct, minor, beneficial effect on invasive species and pest management over the long term by keeping invasive species from establishing and spreading. The actions are estimated to affect less than one percent of the area from BLM actions. This management would have negligible beneficial effects.

Land Resources

Forest Products (negligible adverse)
Alternative B management actions would limit timber harvests to five acres per group harvest and manage product sales within ecologically sustainable limits. Timber harvest projects requiring the development of roads, trails, and staging and work areas, would increase the opportunities for invasive plant establishment and spread. The actions are estimated to affect less than one percent of the area from BLM actions. This management would have an indirect, negligible adverse effect on invasive species and pest management over the short term for the life of the project(s).

Renewable Energy (negligible adverse)
Alternative B management actions would exclude development in specific areas of public land. Exclusion or limiting energy development and the related infrastructure, namely utility roads and transportation pipelines, would limit surface disturbance. These actions would then limit the opportunity for invasive plant establishment and spread in these areas. Alternative B would help mitigate adverse effects in specific area but would still have an adverse effect on invasive species and pest management because development of renewable outside these specific area promote invasive species and pest establishment. Estimated renewable-energy development would disturb less than one percent of the area from BLM actions. This management would have negligible adverse effects.

Right-of-Way and Corridors (negligible adverse)
Management actions include prohibiting ROW on slopes equal to or greater than 25% and on highly erodible soils to minimize impacts to soil resources. Requiring co-location of new communication sites within designated areas, authorizing transmission lines in identified corridors, and avoids constructing facilities along major transportation routes. All these actions would reduce surface disturbance where ROWs are permitted and would help improve invasive plant management by limiting removal or mechanical damage to vegetation and reduce the opportunities for invasive plant establishment and spread. Mitigation measures will help reduce the spread of invasive species and pests but not eliminate the potential for spread because disturbance for ROWs will occur in other areas. Alternative B would have an adverse effect

on invasive species and pest management because development of ROWs promotes invasive species and pest establishment through removal of vegetation, soils, and invasive seed transport. ROW disturbances from BLM actions would be from pipelines, communications sites, roads, and powerlines. These disturbances are estimated to affect approximately one percent of BLM-administered lands. This would have a negligible adverse effect on invasive species and pest management.

Travel and Transportation Management (negligible adverse)
Alternative B management actions would allow motorized vehicles off designated routes with a special use permit. Management actions would close areas with saturated soils or on slopes of 25% or greater, in habitat for special status species, special designation areas, and big game ranges during specific timeframes; also limit travel to designated roads and trails. These actions will help reduce the spread of invasive species and pests by protecting the resources during conditions when soil and plants are highly susceptible to erosion but not eliminate the potential for spread. Alternative B would have an adverse effect on invasive species and pest management because invasive species and pest establishment would be promoted through removal of vegetation, soils, and increase invasive seed transport. These disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative B management of transportation and access would have negligible adverse effects on invasive species and pest management.

Recreation (negligible adverse)
Alternative B management actions limiting recreation facilities and prohibiting surface disturbance in the eight designated SRMAs will help reduce the spread of invasive species and pests by protecting the resources in these areas. However, the BLM promotes visitor use and access in SRMAs; this would increase the popularity of and visitation to these areas, which would result in increased vegetation disturbance from trampling and increased potential for the introduction and spread of invasive plant species. These disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative B would have negligible adverse effects on invasive species and pest management.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative B includes management actions for the LWC areas, which would directly benefit vegetative communities by limiting surface-disturbing activities in those areas. These disturbances are estimated to affect less than one percent of BLM-administered lands. This management would have a negligible beneficial effect over the long term.

Livestock Grazing Management (negligible adverse)
Alternative B management actions include providing a minimum of two years rest from livestock grazing, with additional rest if needed following prescribed fires and other vegetative treatments. This would improve the ecological condition of vegetative communities and help prevent the spread of invasive species and pests. Limiting or prohibiting livestock grazing where it would incompatible with other resource values, and locating salt, water sources, and mineral supplements a minimum of 0.5 mile away from sensitive sites would also help keep invasive species from establishing. Management actions base allotment objectives on allotment health and other resource objectives rather than on AUMs and forage allocations. This management emphasizes healthy habitat and ecological conditions, which would indirectly reduce the opportunities for invasive species to establish and/or spread. Annual plants (mustards) would be the first to take root, followed by cheatgrass or other perennial invasive species. Successful reclamation would reduce opportunities for invasive species to establish and spread. These mitigation measures will help reduce the spread of invasive species and pests but not eliminate the potential for spread

because disturbance will occur from livestock grazing. These disturbances are estimated to affect less than one percent of BLM-administered lands. Alternative B would have negligible adverse effects on invasive species and pest management.

Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. These disturbances are estimated to affect less than one percent of BLM-administered lands. Overall, Alternative B management of livestock grazing would have a negligible adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
Alternative B management actions include designating seven areas as ACECs, which would affect approximately nine percent of BLM-administered lands. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities, including minerals development, vehicular travel, ROW, and any other activity not compatible with retaining or enhancing the area's values. These restrictions would protect proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread. All these restrictions would have direct, moderate beneficial effects on invasive species and pest management over the long term.

Wilderness Study Areas (minor beneficial)
There are three WSAs in the planning area totaling four percent of BLM-administered lands. There are restrictions to preserve wilderness conditions in these areas until Congress acts on their wilderness status. Designation of these areas and interim management is based on conservation of the natural resources, which would directly benefit vegetative communities and limit vehicular travel and surface-disturbing activities. This management would have a minor beneficial effect on invasive species and pest management.

4.4.4.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to invasive species and pest management due to its implementation.

Invasive Species and Pest Management (negligible adverse)
Alternative C would limit aerial application to just the use of insecticides and would restrict application methods for herbicides to motorized vehicles and foot travel. Large tracts of land would be inaccessible due to topography and would therefore go untreated. In the case of leafy spurge, which inhabits thousands of acres across multiple landscapes and plant communities, in remote locations, and in various terrains, Alternative C management would greatly limit where herbicides can be applied and the number of treated acres. This would have a direct, adverse effect on invasive species and pest management over the long term because invasive species would not be controlled and able to spread. Annually treating only designated areas for cheatgrass would not be effective and would leave large landscapes of this annual grass untreated having a direct, adverse effect on native plant communities. Lack of constraints would increase opportunities for invasive species to establish and spread. Remote and sensitive areas and sites could transition to monocultures of invasive species. Over the next 20 years disturbances are estimated to affect less

than one percent of BLM-administered lands. Alternative C management actions would have negligible adverse effects on invasive species and pest management.

Physical Resources

Soil (major adverse)
Under Alternative C, there would be no constraints on surface-disturbing activities, which would greatly increase the opportunity for invasive species infestation. Soils that have limiting factors such as severe erosion hazard, slopes greater than 25%, poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement are especially susceptible to invasive species infestation because activities on these soils increase the potential for vegetation to be trampled or removed exposing bare soil. Bare soil is a prime area for invasive species to inhabit because there is a lack of native species to outcompete invasive species thus allowing the locations and densities of invasive species to establish and increase. Surface-disturbing activities would be allowed on 100% of the area. Although 100 percent of soils will be allowed to have surface-disturbing activities it is unlikely that 100% of these soils will utilized. Reasonable foreseeable development predicts that 47% of BLM-administered lands will be disturbed from BLM actions, 38% of BLM-administered lands will be reclaimed, and nine percent of BLM-administered lands will be left with long-term disturbance. Alternative C management actions would have a direct, major adverse effect on invasive species and pest management over the long term.

Water Resources (minor adverse)
Under Alternative C, there would be no constraints on surface-disturbing activities or on-channel reservoirs. Disturbances could directly and adversely affect water quality and quantity by removing or crushing vegetation. A reduction in habitat for numerous plant and animal species that inhabit these systems would occur and a reduction in potential special status species. This would allow for invasive species to establish and spread. This would affect less than three percent of the area. Alternative C would have a direct, minor adverse effect on invasive species and pest management over the long term.

Cave and Karst Resources (negligible beneficial)
Alternative C management actions include establishing project-specific buffers (100 feet from entrances to significant caves) to minimize effects from surface-disturbing activities. People using trails that lead to popular cave and karst areas could trample and remove vegetation, and possibly promote the introduction of invasive species. Livestock use can also trample and remove vegetation, and possibly promote the introduction of invasive species. Alternative C management actions limit surface-disturbing activities thus reducing the opportunity for the introduction of invasive species. This would affect less than one percent of the area. Alternative C management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative C does not include recommendations for new withdrawals or restrictions on locatable minerals development. Lands open to mineral entry are consistent with other resource values.

Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. Under the locatable minerals program for the planning area,

overall it is estimated that BLM actions would disturb approximately less than one percent of BLM-administered lands over the next 20 years. Alternative C management of locatable minerals would have a negligible adverse effect on invasive species and pest management.

Leasable Minerals - Coal (minor adverse)
Alternative C would open all federal coal lands (federal mineral estate for coal retained by the federal government) outside the high development potential areas to study and exploration, subject to license stipulations necessary to protect other resource values. Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. It is estimated that BLM actions would disturb approximately four percent of BLM-administered lands, reclaim approximately three percent of BLM-administered lands, and leave less than one percent of BLM-administered lands with long-term disturbance. One percent of BLM-administered lands are active mines. Alternative C management of leasable coal minerals would have a minor adverse effect on invasive species and pest management.

Leasable Minerals - Fluids (negligible adverse)
Alternative C would continue to lease and allow development of federal oil and gas. This would result in the disturbance of predominantly grassland and shrubland systems. Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. Most surface-disturbing activities, including linear infrastructure supporting oil and gas development, would require successful reclamation. Under the leasable CBNG program for the planning area, overall it is estimated that BLM actions would disturb less than one percent of acres over BLM leasable minerals over the next 20 years. There is no anticipated disturbance from geothermal activities. Alternative C management of leasable fluid minerals would have a negligible adverse effect on invasive species and pest management.

Salable Minerals (negligible adverse)
Alternative C does not recommend new closures or restrictions. The existing closures and restrictions were imposed to protect and preserve other resource values. Not adding areas to be protected from these minerals activities would have a direct adverse effect over the long term. Alternative C would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. For salable minerals over the next 20 years, the estimated areas of surface disturbance would be less than one percent of acres over BLM minerals. Alternative C management of salable minerals would have a negligible adverse effect on invasive species and pest management.

Fire and Fuels Management

Unplanned Fire (Wildfire) (moderate adverse) **and Planned Fire (Prescribed Fire)** (minor beneficial)
Under Alternative C, management actions involving full suppression of wildfires and the use of heavy equipment with few constraints. Unplanned fire usually has more severe air and soil temperatures, wind conditions, and/or fuel types. Native vegetation can be destroyed allowing for invasive species and pest to establish. The use of heavy equipment increases the chance for invasive species to be spread in these areas. Unplanned fire with the use of heavy equipment with few constraints would have a direct adverse effect on invasive species and pest

management over the short and long terms. Unplanned fire would have moderate adverse effects, depending on the fire sizes, soil types, types of vegetative communities, and burn conditions.

Under Alternative C, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately five percent of BLM-administered lands. All acres would be successfully reclaimed. Even though there is potential to allow for the spread of invasive species rehabilitating fire and suppression damage would directly benefit invasive species and pest management over the long term because competitive native species would be established through rehabilitating fire and suppression. These plant communities help to prevent invasive species from establishing because they can outcompete invasive species for nutrients, space, and water. This would have a minor beneficial effect on invasive species and pest management.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Alternative C management actions would include intensive tactics to reduce natural events and control pathogens; this could minimize the destruction of vegetation, which would directly benefit vegetation. The actions are estimated to affect less than one percent of the area from BLM actions. This would have a direct, beneficial, negligible effect on invasive species and pest management over the long term.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Management actions for grassland and shrubland communities that would allow non-native plant species for initial reclamation practices would provide another tool for achieving reclamation goals. Timely reclamation (1 to 3 years) would limit opportunities for invasive species to establish and spread. Successfully reclaiming disturbed areas would have a direct beneficial effect on invasive species and pest. The actions are estimated to affect less than one percent of the area from BLM actions. This would have a direct, beneficial, negligible effect on invasive species and pest management over the long term.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Alternative C would apply no constraints on surface-disturbing and disruptive activities in riparian and wetland systems; this would have a direct adverse effect on these systems over the long term because the actions would allow for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would reclaim a very small portion of each system, and large acreages would not be reclaimed. This would have a direct adverse effect on the health of the riparian and wetland systems and an indirect adverse effect on adjacent grassland and shrubland communities, which also would be susceptible to invasive species establishment and spread. The actions are estimated to affect less than one percent of the area from BLM actions. This would have a direct, adverse, negligible effect on invasive species and pest management over the long term.

Fish and Wildlife Resources (negligible adverse)
Alternative C fish and wildlife management actions would not constrain any impacts to habitat of fish, big game animals, upland game birds, raptors, and migratory birds in designated areas, and during designated periods. Special areas would be managed to be consistent with other resource values, rather than primarily for big game. Management actions would consider other

resources a higher priority than fish and fish habitat in reservoirs, riparian and wetland systems, and perennial water management. This lack of constraints would directly and adversely affect these systems and habitats over the long term by promoting the establishment of invasive species, lowering the ecological condition of the sites, and degrading potential habitat. Surface-disturbing activities would impact less than one percent of BLM-administered lands. Lack of constraints for fish and wildlife management actions would have a negligible adverse effect on invasive species and pest management over the long term.

Special Status Species – Plants and Wildlife (negligible adverse)
Alternative C would allow aerial application of herbicides in areas with habitat for special status plant species, and would restrict such treatments in areas of known special status plant populations. Restrictions in areas of known special status plant populations would encumber the management of invasive species and pests and would have a direct adverse effect on control of invasive species populations.

Alternative C management actions to provide habitat for prairie dogs or for special status species that depend on prairie dog colonies would maintain vegetation at a lower ecological condition and with a large cheatgrass component. Limiting constraints would allow surface-disturbing activities in prairie dog habitat, this would further adversely affect vegetation and increase the opportunity for resident cheatgrass to spread and other invasive species to establish because surface-disturbing activities would allow for the spread of invasive species seed, crush or remove vegetation, and exposing bare soils where invasive species could establish.

Surface-disturbing activities would affect less than one percent of BLM-administered lands. Overall, Alternative C management of special status plant and wildlife species would have a negligible adverse effect on invasive species and pest management because surface-disturbing activities would allow for the spread of invasive species seed and restricting treatments encumber the management of invasive species and pests.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible adverse)
Alternative C management actions would allow development in areas with significant paleontological resources and allow surface disturbance in areas with cultural or historic properties. BLM actions would disturb less than one percent of the total available acres. Allowing these surface-disturbing activities would have an indirect, negligible adverse effect on invasive species and pest management over the long term because surface-disturbing activities would allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish.

Land Resources

Forest Products (minor adverse)
Under Alternative C, timber harvests would not be limited and forest product sales would be conducted to maximize economic return. There would be an increase in roads, trails, and staging areas which would allow for seed transport. Vegetation would be crushed or removed and bare soils would be exposed allowing for species establishment. BLM actions would disturb approximately three percent of the total available acres. All areas are expected to be reclaimed. These actions would have an indirect, minor, adverse effect on invasive species and pest management over the long term.

Renewable Energy (moderate adverse)
Alternative C management actions would allow renewable-energy development anywhere in the planning area consistent with other resource values. This lack of restrictions would have direct adverse effects on invasive species and pest management over the long term because it would allow for surface-disturbing activities that would allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish. Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately five percent of BLM-administered lands over the next 20 years. Reclamation would occur on three percent of BLM-administered lands, leaving a total of two percent of BLM-administered lands with long-term disturbance. These actions would have an indirect, moderate, adverse effect on invasive species and pest management over the long term.

Rights-of-Way and Corridors (minor adverse)
Alternative C management actions would not constrain ROW and corridor locations. ROW disturbances from powerlines, pipelines, roads, and communications sites from BLM actions will adversely affect ROWs because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish. Disturbances are estimated to affect approximately four percent of BLM-administered lands, with successful reclamation on approximately four percent of BLM-administered lands, leaving one percent of BLM-administered lands with long-term disturbance. This management would have a direct, minor adverse effect on invasive species and pest management over the long term.

Travel and Transportation Management (negligible adverse)
Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25%, and in special species habitat. Management actions would close or limit travel to designated routes to motorized vehicle use and would implement winter closures (November 15 – April 30) on designated big game ranges. Travel and transportation will adversely affect ROWs because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. Alternative C management actions would disturb less than one percent of the total of BLM-administered lands. These actions would have a direct, long-term, negligible, adverse effect by not protecting the soil or vegetation resources.

Recreation (negligible adverse)
Alternative C management actions include the establishment of six SRMAs with no consideration for more. Actions also included leasing of minerals in accordance with management for areas surrounding SRMAs, allowing surface disturbance and salable minerals development in designated SRMAs, and allowing additional recreation facilities. Alternative C management for recreation will adversely affect these areas because they would allow for surface-disturbing activities that allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. Alternative C management would disturb less than one percent of the total available BLM-administered lands. These actions would have a direct, long-term, negligible, adverse effect by not protecting the protecting the soil or vegetation resources.

Lands with Wilderness Characteristics (negligible adverse)
Alternative C management actions include managing LWC areas the same as the surrounding areas. Alternative C management for lands with wilderness characteristics will adversely affect these areas because they would allow for surface-disturbing activities that allow for transport

of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. Alternative C management would disturb less than one percent of the total available BLM-administered lands. These actions would have an indirect, long-term, negligible, adverse effect by not protecting the protecting the soil or vegetation resources.

Livestock Grazing Management (negligible adverse)
Alternative C would focus primarily on livestock management. Management actions include providing a minimum of 2 years rest from livestock grazing following prescribed fires and other vegetative treatments, which would improve the ecological condition of vegetative communities. Alternative C management would continue to limit or prohibit livestock grazing where it is currently not authorized, but would not consider limits or prohibitions in new areas. Locating salt, water sources, and mineral supplements a minimum of 500 feet away from sensitive sites would likely increase the presence of invasive species in these areas where livestock would congregate.

Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. The actions are estimated to affect less than one percent of the area from BLM actions.

Overall, Alternative C management of livestock grazing would have a negligible adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern (moderate adverse)
Alternative C would not designate ACECs. Lack of designation would allow these areas to be eligible for surface-disturbing activities and other actions. Surface-disturbing activities allow for transport of invasive species seed, crush or remove vegetation, and expose of bare soils where invasive species could establish. This would adversely affect approximately eight percent of BLM-administered lands. Alternative C management actions would have a direct, moderate adverse effect on management for invasive species and pests.

Wilderness Study Areas (minor adverse)
Alternative C management would be the same as management in surrounding areas, which would be generic and might not address all resource issues. The lack of special management actions including treatments of existing invasive species would increase the opportunity for invasive species to spread and outcompete native species. There are three WSAs in the planning area totaling four percent of BLM-administered lands. Alternative C management of WSAs would have an indirect, minor, adverse effect on invasive species and pest management.

4.4.4.6. Alternative D

This section describes management actions under Alternative D, which balances resource use with resource enhancement and protection, and the potential impacts to invasive species and pest management from those management actions.

Invasive Species and Pest Management (minor beneficial)
Alternative D would allow aerial application of herbicides and pesticides in areas where topography, extent of infestation, target species, and timing limit other application methods. Pest management plans would be developed to establish long-range goals and set priorities in

cooperation with stakeholders. Plants treated would include those identified under Alternative B. Annual bromes would be addressed as described under Alternative C. Over the next 20 years it is estimated that BLM actions would render approximately two percent of BLM-administered lands of treated disturbance. Reclamation would occur on one percent of BLM-administered lands from BLM actions, leaving less than one percent of BLM-administered lands with long-term disturbance. Control efforts would be beneficial because controlling invasive species and pest would prevent or hinder their growth and/or spread. Alternative D management actions would have a direct, minor beneficial effect on invasive species and pest management.

Physical Resources

Soil (moderate adverse)
Under Alternative D, surface-disturbing activities on soils with severe erosion hazard, with poor reclamation potential, and on slopes equal to or greater than 25% would have to have an approved reclamation and stabilization plan and comply with CSU stipulations. Alternative A would prohibit, but allow waivers on prohibitions, surface-disturbing activities on slopes equal to or greater than 25%, on soils with poor reclamation, potential, and on soils with severe erosion hazard. Alternative A does not address surface-disturbing activities in miscellaneous areas such as badlands, rock outcrops and slopes susceptible to mass movement. Alternative D addresses these areas as described above.

Alternative A prohibits or restricts development on these areas unless the authorized officer waives the prohibition or restriction. Alternative D would protect badlands, rock outcrops, and slopes susceptible to mass movement. Alternatives A and D both allow development, but Alternative D requires that certain criteria be met. The established criteria under Alternative D help ensure project disturbances are capable of being reclaimed before the project is approved. Alternative A has fewer restrictions on the locations and types of development, with no assurances of reclamation success. The criteria requirements would help control invasive species and pest spread but would not prevent spread. Surface-disturbing activities would adversely affect invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment.

Surface-disturbing activities would be allowed on all other soils but it is unlikely that 100% of these soils will be utilized. Reasonable foreseeable development predicts that 47% of BLM-administered lands will be disturbed from BLM actions, 37% of BLM-administered lands will be reclaimed, and nine percent of BLM-administered lands will be left with long-term disturbance. Alternative D management actions would have a direct, moderate adverse effect on invasive species and pest management over the long term.

Water Resources (minor adverse)
All wet and water sites and systems have high potential for invasive species establishment and spread. Alternative D water management actions would allow surface disturbances within 500 feet of such sites in accordance with identified criteria and based on management decisions for other resource values. This would affect approximately three percent of BLM-administered lands. Allowing disturbances in these areas would have a direct adverse effect on vegetation and water quality in these sensitive areas; however, meeting the stipulations and criteria would reduce the areas where development could occur and would minimize adverse effects. Alternative C would allow on-channel reservoirs. Under Alternative D, CBNG reservoirs would be evaluated to determine if they could be converted to another use or removed and reclaimed. This would reduce the areas where development occurs and would minimize adverse effects. Although

Alternative D minimizes adverse effects surface-disturbing activities will still occur and adversely affect invasive species and pest management through activities that would allow for transport of invasive species seed, crush or remove vegetation, and exposure of bare soils where invasive species could establish. Alternative D water management actions would have a direct, minor adverse effect on invasive species and pest management.

Cave and Karst Resources (negligible beneficial)
Alternative D stipulations include site-specific buffers around cave and karst resources for timber sales and surface-disturbing activities. People using trails that lead to popular cave and karst areas could trample and remove vegetation, and possibly promote the introduction of invasive species. Livestock use can also trample and remove vegetation, and possibly promote the introduction of invasive species. Disturbances around cave and karst resources would affect less than one percent of the area, the same as under Alternative C. Alternative D management of cave and karst resources would have a negligible beneficial effect on invasive species and pest management because by having site-specific stipulations limits surface-disturbing activities thus reducing the opportunity for the introduction of invasive species.

Mineral Resources

Locatable Minerals (negligible adverse)
In addition to areas currently withdrawn or restricted under Alternative A, Alternative D includes a number of new areas to conserve other resource values; this would leave 41% of leasable mineral acres open to mineral entry, with approximately 2% of leasable mineral acres recommended for withdrawal from mineral entry in addition to existing withdrawals. These areas would protect proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread. However, in areas where development did occur, any related actions that disturbed the surface would have a direct and adverse effect because surface-disturbing activity would allow for transport of invasive species seed, crush or removal of vegetation, and expose bare soils where invasive species could establish. Under the locatable minerals program for the planning area, it is estimated that BLM actions would disturb approximately less than one percent of leasable mineral acres over the next 20 years. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Leasable Minerals – Coal (minor adverse)
Under Alternative D all federal coal lands (federal mineral estate for coal retained by the federal government) would be open to exploration and leasing. Though all acres are open, actual development is anticipated to occur only in the higher potential areas of northwest Sheridan County and south central Campbell County. In areas where coal development does occur vegetation would be directly and adversely affected for the life of the project until reclamation goals and objectives are achieved. Alternative D would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. It is estimated that BLM actions would disturb approximately four percent of BLM-administered lands, reclaim approximately three percent of BLM-administered lands, and leave less than one percent of BLM-administered lands with long-term disturbance. One percent of BLM-administered lands are active mines. Alternative D management of locatable minerals would have a minor adverse effect on invasive species and pest management.

Leasable Minerals - Fluids (negligible adverse)
Alternative D would make lands available for fluid minerals leasing and exploration in accordance with management identified to conserve other resources. Alternative D would help mitigate adverse effects by being in accordance with management identified to conserve other resources communities but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. Alternative D would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. This would affect approximately less than one percent of leasable mineral acres over the next 20 years. There is no anticipated disturbance from geothermal activities under Alternative D. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Salable Minerals (negligible adverse)
Alternative D would open 2,957,960 acres of federal minerals to salable minerals leasing and close 390,162 acres. Alternative D would adversely affect invasive species management by allowing for transport of invasive species seed, crushing or removal vegetation, and exposure of bare soils where invasive species could establish. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would be less than one percent of total salable mineral acres. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Fire and Fuel Resources

Unplanned Fire (Wildfire) (negligible beneficial) **and Planned Fire (Prescribed Fire)** (negligible beneficial)
Alternative D response to wildland fires would be the same as under Alternative B. Alternative A would restrict the use of some types of suppression equipment in some areas and Alternative D would prohibit heavy equipment use in specifically identified areas except when human safety is at risk or if the expected effects of fire would cause more resource damage than the use of heavy equipment. Prohibiting the use of heavy equipment would directly benefit vegetation over the short and long terms. Under Alternative D, full protection strategies and tactics would be used in designated areas, while priority suppression strategies and tactics would be used in Alternative A. All protection measures would directly benefit vegetation over the long term, unless fire would improve vegetative health. All fires would be evaluated for rehabilitation and severity of impacts. All rehabilitation efforts would have the direct beneficial effect of reducing invasive species, especially cheatgrass. Under Alternative A, only prescribed fire would be utilized to support vegetation and wildfire habitat objectives; Alternative D would use wildfire and other vegetative treatments to meet management objectives. Both unplanned fire and prescribed fire would affect less than one percent of the area. Alternative D management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Alternative D would implement intensive management tactics to reduce or circumvent events such as insect infestations, disease, and wildfire. This would affect less than one percent of the area. This management would have a direct, negligible beneficial effect on invasive species and pest management over the long term because these activities protect or restore proper ecological

conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Alternative D management actions address the use of non-native species for initial reclamation as a portion of an approved reclamation plan. This would affect less than one percent of the area. This management would have a direct, negligible beneficial effect on invasive species and pest management over the long term because the use of some non-native species for initial reclamation can help native species to establish improving ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Alternative D would allow surface-disturbing activities with defined criteria. Reclaiming vegetation in all CBNG riparian and wetland systems in accordance with ecological site protection would return all water-affected systems to their pre-CBNG natural state. Alternative D would help mitigate adverse effects on riparian and wetland communities but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment. This would affect less than one percent of the area. These actions would have a direct, negligible, adverse effect on invasive species and pest management over the long term.

Fish and Wildlife Resources (negligible adverse)
Alternative D wildlife management actions allow surface-disturbing and disruptive activities to occur throughout the entire life of projects during seasons important for wildlife in accordance with identified criteria; criteria includes a resource protection plan which includes an IPM plan. Historic uses would be exempted from prohibitions in crucial big game winter range (and in elk calving areas). Disruptive activities within big game migration corridors would not be prohibited. Locations and timing restrictions would not encumber the management of invasive species and pests and would help limit opportunities for invasive species establishment and spread. Alternative D would help mitigate adverse effects on fish and wildlife resources but would still have an adverse effect on invasive species and pest management because continued surface disturbance promotes invasive species and pest establishment. This would affect less than one percent of the area. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Special Status Species (major beneficial)
Alternative D special status species management actions include managing disruptive activities to mitigate impacts on special status wildlife species and their habitats, allowing disruptive activities within active prairie dog colonies on BLM-administered lands, in accordance with identified criteria, that do not adversely impact suitable habitat for special status species dependent upon prairie dog colonies, restricting disruptive activities and occupancy near occupied Greater Sage-Grouse leks, and prohibiting disruptive activities during specific timeframes. Alternative D would manage within occupied Greater Sage-Grouse habitat outside of Core Population Area and Connectivity Corridor by restricting disruptive activities within the perimeter of occupied Greater Sage-Grouse leks. Prohibitions addressing raptor nests are as stated in Alternative B. Surveys would be required for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species. Allow disruptive activities where special status amphibian, reptile, and bat species occur in accordance with defined criteria.

Prohibitions and limitations on these locations could help mitigate invasive species spread because it would limit activity that can spread invasive species seed. These actions would protect ecological conditions habitat types and limit opportunities for invasive species establishment and spread. Although these limitations can benefit invasive species management they could postpone invasive species treatments, which could diminishing the effectiveness of the treatment and increase the cost of treatments. Overall, prohibitions and limitations on these locations will benefit invasive species and pest management by preventing activity in these areas and therefore limiting the spread of invasive species. This would affect up to 23% of the area. Alternative D management actions would have a direct, beneficial effect on invasive species and pest management.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible beneficial)
Alternative D management actions would place limitations, stipulations, mitigations, prohibitions, and allowances for surface-disturbing activities as part of cultural and paleontological resources management with defined criteria. These actions would protect ecological conditions habitat types and limit opportunities for invasive species establishment and spread. This would affect less than one percent of the area. Alternative D management actions would have a direct, negligible beneficial effect on invasive species and pest management.

Land Resources

Forest Products (negligible adverse)
Under Alternative D, timber harvest areas would be adapted to natural features and product sales would be ecologically sustainable while maximizing economic return. Any areas of surface disturbances would have to be reclaimed to their natural state. This management minimizes opportunities for invasive species to establish and spread. This would affect less than one percent of the area. Alternative D would help mitigate adverse effects on forest products but would still have an adverse effect on invasive species and pest management because uses of the lands promote invasive species and pest establishment. Alternative D management actions would have a direct, negligible adverse effect on invasive species and pest management.

Renewable Energy (moderate adverse)
Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatables, salables, ROW areas, and other areas where surface disturbance is prohibited. Renewable-energy development would also be avoided on public lands leaving less than six percent of public land available for development. These restrictions would limit invasive species and pest management spread and establishment (see Map 49 for specific locations). Under the renewable-energy program for the planning area, overall it is estimated that BLM actions would disturb approximately 10% of BLM-administered lands over the next 20 years. Reclamation would occur on six percent of BLM-administered lands disturbed by BLM actions, leaving a total of three percent of BLM-administered lands with long-term disturbance. Alternative D would help limit adverse effects because where renewable energy is excluded proper ecological conditions, vegetative communities, and habitat types will remain intact, limiting invasive species establishment and spread. Although adverse effects will be limited, Alternative D would still have an adverse effect on invasive species and pest management because continued development of the lands promotes invasive species and pest establishment. Alternative D management actions would have a direct, moderate adverse effect on invasive species and pest management.

Rights-of-Way and Corridors (minor adverse)
Alternative D management actions would avoid on slopes equal to or greater than 25% and on highly erodible soils. Newly proposed transmission lines and ground facilities would be allowed within existing ROW and other disturbance areas. All these actions would limit spread of invasive species and pest because where ROWs are limited or avoided proper ecological conditions, vegetative communities, and habitat types will remain intact limiting invasive species establishment and spread. ROW disturbances from BLM actions and non-BLM actions are estimated to affect approximately three percent of BLM-administered lands, with successful reclamation on approximately two percent of BLM-administered lands and one percent BLM-administered lands left with long-term disturbance. Alternative D would help mitigate adverse effects on ROW corridors but would still have an adverse effect on invasive species and pest management because continued development of the lands promote invasive species and pest establishment and spread. Alternative D management actions would have a direct, minor, adverse effect on invasive species and pest management.

Travel and Transportation Management (negligible adverse)
Like Alternative B, Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in special status species habitat and on saturated soils or on slopes 25% or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. All these actions would limit spread of invasive species and pests because where ROWs are limited or avoided proper ecological conditions, vegetative communities, and habitat types will remain intact limiting invasive species establishment and spread. This would affect less than one percent of the area. Alternative D would help mitigate adverse effects travel and transportation management but would still have an adverse effect on invasive species and pest management because continued use of the lands promote invasive species and pest establishment and spread. Alternative D management actions would have a direct, negligible, adverse effect on invasive species and pest management.

Recreation (negligible adverse)
Alternative D management actions designate the eight areas as SRMAs, with possible consideration of additional lands for SRMA designation. Prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance vegetative resources. Alternatives C and D allow additional recreation facilities consistent with other resource values and would have a direct adverse effect on vegetation in and around the facilities over the long term. Visitor use and access is promoted in SRMAs, which would increase popularity and visitation and increase vegetation disturbance from trampling and increase the potential for introduction and spread of invasive plant species. This would affect less than one percent of the area. Alternative D management actions would have a negligible adverse effect on invasive species and pest management over the long term because there would be increased vegetation disturbance.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative D actions would include managing non-WSA lands with wilderness characteristics to emphasize vegetative health, natural values, and primitive recreational opportunities on about three percent of BLM-administered lands. Managing these lands to those standards would have an indirect, negligible beneficial effect on invasive species and pest management over the long term because Alternative D will protect or restore proper ecological conditions to vegetative

communities and habitat types and limit opportunities for invasive species establishment and spread.

Livestock Grazing Management (negligible adverse)
Alternative D management actions would add areas where livestock grazing is not allowed and would allow for rest or deferment following vegetative treatments. This would help invasive species and pest management by limiting opportunities of invasive species to establish and spread. Alternative D also allows for flexibility in livestock grazing practices both before and after vegetative treatments occur. This will increase opportunities to use livestock grazing management as a tool to build plant communities resistance to invasive species establishment and to control invasive species populations. Alternative D stipulations for locating livestock salt or mineral supplements would be the same as described for Alternative C. Alternative D would help mitigate adverse effects on where livestock grazing occurs but would still have an adverse effect on invasive species and pest management because continued development and multiple uses of the lands promote invasive species and pest establishment.

Surface disturbances from installation of range improvements, if not properly reclaimed, could have direct adverse effects on invasive species and pest management by providing opportunities for invasive species to establish and spread. Estimations for surface disturbance in the planning area over the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. This would affect less than one percent of BLM-administered lands. Alternative D management actions would have a negligible, adverse effect on invasive species and pest management.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Alternative D management actions include evaluating three proposed areas as ACECs, which would affect approximately five percent of BLM-administered lands. The associated management plans for these sites would initiate specific conservation to protect soils and vegetation from surface-disturbing activities; this would have direct, minor, beneficial effects over the long term because protection from surface-disturbing activities would maintain proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

Wilderness Study Areas (minor beneficial)
There are three WSAs in the planning area totaling four percent of BLM-administered lands. There are restrictions to preserve wilderness conditions in these areas until Congress acts on these WSAs. Designation of these areas and interim management is based on conservation of the natural resources, which would limit vehicular travel and surface-disturbing activities. This management would have a minor beneficial effect on invasive species and pest management because conservation of the natural resources would maintain proper ecological conditions to vegetative communities and habitat types and limit opportunities for invasive species establishment and spread.

4.4.4.7. Cumulative Impacts

Chapter 4 describes effects to invasive species and pest management from past and present actions, federal and non-federal, as part of the affected environment. Non-federal actions will affect invasive species management similar to federal actions but mitigation for effects to

vegetation resources would differ between federal and non-federal actions. The more activity on the public lands, the greater the chance for establishment and spread of invasive plants whether it be from motorized transportation, surface disturbance, animal or human activity. As the demands on public land increases from recreational needs, energy development, desire for open spaces, and economic livelihood; these demands can contribute to the spread or management of invasive species. Once a pest establishes, it is difficult to pinpoint the source, therefore responsibility of controlling or managing infestations is difficult. As an example, roads developed for energy development can also be used by hunters, recreationists, and ranchers. As more activities occur in more confined spaces, the likelihood of the presence of invasive plants increases. Motorized travel and recreational use of horses with feed can transport invasive species.

Pest species are usually more mother nature driven and proactive measures can be taken to reduce opportunities but most pest species management is reactive, addressing the pest once populations have reached an economic threshold. Pest management is often large scale and expensive to administer. The costs of preventing invasive species and pests is considered to be less than the costs of control.

4.4.4.8. Conclusion

In general, alternatives B and D management actions would be more conservative than management under alternatives A and C for soils, water, riparian and wetland communities, special status species, fish, wildlife, cultural and paleontological resources, ROW, grazing, recreation, and special designations. Alternatives B, C, and D do not include the waiver option included in multiple conservation management actions under Alternative A. Alternatives B and D include a number of restrictions on surface-disturbing and disruptive activities (e.g., timing and location). Increases in recreation sites, facilities, and opportunities under alternatives D and C would likely increase the presence and spread of invasive species.

Under alternatives B and D, motorized travel is limited to designated roads and vehicle routes and closing areas to motorized vehicles would reduce soil and vegetation disturbance and reduce opportunities for invasive species to establish and be transported. The use of designated roads and vehicle routes would result in closure (and reclamation) or road maintenance of existing roads in poor locations, which would eliminate or minimize degradation of vegetation in these areas and therefore decrease opportunities for invasive species to establish and spread.

Treatment of invasive plant species including cheatgrass and other annual grasses, as stated under alternatives B and D, would benefit vegetation systems and improve the habitat for the aquatic and terrestrial species that inhabit these plant communities. Alternative C limits application methods and the species to be treated.

Alternatives B and D allow aerial application of herbicides within areas containing special status plant species; Alternative D allows only narrow spectrum (selective) herbicide treatments.

Management actions associated with Alternative D would allow surfacing-disturbing activities if defined criteria can be met or there is an approved reclamation plan. Other management actions would be allowed if project and resource objectives were met. Alternative D does not include the option for the authorized officer to waive prohibitions, and the management action must meet certain criteria to be allowed. There would be fewer acres of vegetation and soil disturbance under Alternative D than under Alternative A, more than under Alternative B, and fewer than under Alternative C. Leasing and permitting have few limitations under alternatives A and C, which

would have an overall adverse effect on invasive species and pest management because there would be few limitations on surface disturbances.

Alternatives C and D locate salt or mineral supplements a minimum of 500 feet from defined sensitive sites and Alternative B states 0.5-mile distance from defined sensitive sites. These areas of livestock concentration can be sites where invasive species establish and spread.

SRMAs and other special designation areas would in most cases protect and enhance vegetative resources. More restrictive management under Alternative B and Alternative D with qualifiers, would reduce surface disturbance, which would reduce the opportunity for invasive species to be introduced or spread. Under Alternative C these areas would be available for minerals leasing and permitting thus subverting invasive species and pest management.

The following conclusions are based on meaningful differences in short- and long-term disturbance acreage; surface disturbance and limiting activities on highly erosive soils, on soils with a severe erosional potential, on soils with poor reclamation suitability, and on slopes equal to or greater than 25%; use of certified weed seed-free products, timing, and reseeding requirements in reclamation of disturbed areas; management of livestock, including areas unavailable for livestock grazing, for resource protection; motorized vehicle use limitations; and management of soil disturbance during fire suppression activities. Potential adverse impacts under Alternative A are anticipated to be the most adverse, followed by alternatives C and B, with impacts under Alternative D anticipated to be the least adverse regarding the introduction and spread of invasive species.

Table 4.42, "Summary of Impacts to Invasive Species and Pest Management" (p. 939) summarizes impacts to invasive species and pest management by alternative.

Table 4.42. Summary of Impacts to Invasive Species and Pest Management

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Moderate adverse	Minor adverse	Major adverse	Moderate adverse
Water Resources	Minor beneficial	Minor beneficial	Minor adverse	Minor adverse
Cave and Karst Resources	No effect	Major beneficial	Negligible beneficial	Negligible beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	Moderate adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Fluids	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Moderate adverse	Moderate beneficial	Moderate adverse	Negligible beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Negligible beneficial	Minor beneficial	Negligible beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Negligible adverse	Negligible adverse	Negligible beneficial	Negligible beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Grassland and Shrubland Communities	Major adverse	Negligible adverse	Negligible beneficial	Negligible beneficial
Vegetation – Riparian/Wetland Resources	Minor beneficial	Minor beneficial	Negligible adverse	Negligible adverse
Invasive Species and Pest Management	Minor beneficial	Minor beneficial	Negligible adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fish and Wildlife Resources – Wildlife	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Plants	Major beneficial	Major adverse	Negligible adverse	Major beneficial
Special Status Species – Fish	Major beneficial	No effect	No effect	No effect
Special Status Species – Wildlife	Major beneficial	Major adverse	Negligible adverse	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Paleontological Resources	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Minor adverse	Negligible adverse	Moderate adverse	Moderate adverse
Rights-of-Way and Corridors	Minor adverse	Negligible adverse	Minor adverse	Minor adverse
Travel and Transportation Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Recreation	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Lands with Wilderness Characteristics	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Livestock Grazing Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Designations				
Areas of Critical Environmental Concern	Moderate beneficial	Moderate beneficial	Moderate adverse	Minor beneficial
Scenic or National Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Area	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.5. Fish and Wildlife Resources – Fish

Various management actions under the alternatives could affect fish in the planning area. This section describes potential effects on fish from management of other resources. See Map 22 for a depiction of the distribution of fish in the planning area. Effects would be adverse if they contribute to the decline in fish abundance or range; effects would be beneficial impacts if they increase fish population numbers or viability, protect habitats, or reduce the risk of harm to fish species in the planning area.

Surface-disturbing activities, water depletions, changes in stream hydrology, increased sedimentation, changes in water quality (including clarity), and introduction of exotic species (e.g., mussels or whirling disease) can adversely affect fish. The primary means by which fish could be directly affected are surface development (e.g., mining and urbanization), loss of sufficient upland and riparian/wetland vegetation that increases sedimentation; barriers to fish passage; discharged water; and storm water runoff. Indirect impacts to fish species would result from actions that aid or compromise the protection of these species. Indirect impacts to potential habitats for fish species also could occur when actions, such as those listed above, change habitats in a way that makes them unsuitable.

For purposes of this analysis, short-term impacts to fish species result from activities that contribute to the decline in abundance or distribution of a species within five years after the activity. Long-term impacts to fish species plants require more than five years to manifest on the surface.

Effects to Fish from Sedimentation

Excessive sediments deposited on stream and lake bottoms can choke spawning gravels, impair sources of food for fish (macroinvertebrates), fill in rearing pools, and reduce the complexity of habitat instream channels. Large quantities of suspended sediment also can make it more difficult for fish to find prey and can cause direct physical harm, such as clogged gills. In some cases, man-made disturbances that result in hydrologic modifications can cause sediment deficits that create stream-channel scour and cause loss of habitat structure (EPA 1999). Erosion rates in stream channels increase along with instream flows, which can augment sedimentation in streams. Increased sedimentation can affect aquatic resources by filling interstitial (intergravel) spaces and pool habitats. This increase in sedimentation can reduce the availability of suitable spawning and rearing habitats. Aquatic macroinvertebrates also are highly dependent on interstitial spaces for different life stages, and sedimentation can cause large decreases in population and change species composition. Benthic invertebrates are excellent candidates for monitoring sediment conditions in streams because substrate is believed to be the most important factor in regulating invertebrate distribution and abundance at the local or reach scale (BLM 2003c). Changes in invertebrate communities caused by deposited sediment can be difficult to isolate and quantify because they often accompany other modifications in the stream, such as removal of riparian vegetation, alterations of flow and temperature regimes, and nutrient enrichment (BLM 2003c). These community changes can be detrimental to fisheries that depend on macroinvertebrates as primary food supplies and can change the abundance and diversity of fish populations. Increased sedimentation also can reduce the productivity of, or eliminate, rooted and unrooted aquatic vegetation upon which many species of macroinvertebrates and fish depend for food and habitat; this could reduce populations of fish and macroinvertebrates. An increase in sediment load in the streams in the planning area can impact fish and macroinvertebrates and their habitats. The density and taxa richness of benthic invertebrates substantially decreased in three of four Missouri study streams well before 30% deposited sediment was reached (BLM 2003c). As deposited

sediment increases, the community structure and diversity also can be altered. Community changes generally involve a shift in dominance from Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) to Oligochaetes (worms) in general (BLM 2003c). Management of the riparian zone has a strong influence on the degree to which streams behave as sources or sinks of fine sediment (Rabeni and Smale 1995).

It is likely that an increase in sediment loads would favor such species as the black bullhead, common carp, flathead chub, northern plains killifish, plains minnow, goldeye, river carpsucker, sand shiner, sturgeon chub, and white crappie. Such species as the brassy minnow, common shiner, creek chub, mountain whitefish, northern redhorse, brown trout, brook trout, cutthroat trout, Yellowstone cutthroat trout, rainbow trout, smallmouth bass, and walleye could be adversely affected by an increase in sediment.

Proper management of soil, water, and vegetative resources would benefit fish. Implementing mitigation measures to protect soils, water, and vegetation on a project-specific basis, particularly in the riparian zones of watersheds, would reduce disturbance to fish habitats and aid in the recovery of aquatic habitats from permitted uses. Improper management of soil, water, and vegetative resources can lead to increased sediment loads in affected watersheds. Evaluating surface disturbance to soils, applying mitigation, relocating to better soils, and including reclamation plans would minimize sedimentation. Approximately 2,800,000 acres in fish-bearing watersheds within the planning area have soils with poor reclamation potential that if disturbed could increase sediment loads.

Water Quality

Water management actions could be beneficial or detrimental to fish species. Depletions would almost always be detrimental, whereas increased flows would generally be beneficial. Actions that protect water quality would be beneficial. Increased salt concentrations can alter the algae and macroinvertebrate composition of streams and, if sufficiently elevated, can change the abundance and diversity of fish species. Parameters such as electrical conductivity, total dissolved solids, or salinity are used as a measure of the concentrations of common ions in fresh water (Mount et al. 1997). The toxicity of water high in total dissolved solids to some aquatic invertebrates depends on the specific ionic composition. Ion imbalance can result from the composition and concentration of anions and cations that make up salinity (Goodfellow et al. 2000). Toxicity is affected by the ionic composition of the effluent and the species and life history stage (Chapman et al. 2000; Pillard et al. 1999). The EPA Phase 1 Toxicity Identification Evaluation (TIE) can be used to measure concentrations of specific inorganic ions. Based on cost and timing, most effluent toxicity testing methods generally do not attempt to segregate the effects of salinity or ionic strength on test and species performance. Mount et al. (1997) developed models to test individual and combined ion toxicity on invertebrates such as *C. dubia* and *D. magna* and vertebrates such as the *P. promelas* (fathead minnow). The models followed the general guidelines of the EPA for performing acute whole effluent toxicity (WET) tests (EPA 1994). These models can be used to project changes in toxicity that result from modifications in industrial processes, effluent treatment, or other remedial measures. As a general screening tool, the concentration of total dissolved solids can be high enough to adversely affect freshwater test species if the conductivity of a freshwater effluent is above 2,000 micro siemens per cubic meter (Goodfellow et al. 2000).

Water Temperature

Water temperature can affect growth, metabolism, reproduction, emergence, and the distribution of aquatic species (Vannote and Sweeney 1980). The magnitude and pattern of historical, annual, seasonal, and daily fluctuations in temperature can be important in selecting and maintaining a

variety of aquatic insects in a stream reach (Vannote and Sweeney 1980). Sudden increases or decreases in water temperature could result in population- and community-level changes in aquatic insects in the planning area.

4.4.5.1. Methods and Assumptions

This section describes the methods and assumptions used in the analysis of impacts to fish. The assumptions and methods include, but are not limited to:

- The fish-bearing streams geographic information system layer used for analysis is representative of fish-bearing streams.
- The BFO waterbodies identified as perennial in the geographic information system layer support fish.
- The term "lake" refers to any impoundment (e.g., reservoir, pond, and natural lake); "fish" refers to any fish species.
- In general, analysis is performed on a watershed scale. Resource management actions which would result in surface disturbance occurring within 0.25 mile of a fish bearing stream would directly impact fish habitat, and are used to quantify acres impacted.
- Impacts to fish are representative of impacts to aquatic community health. Organisms at lower trophic levels (periphyton and invertebrates) respond more quickly to environmental stressors than fish. To detect changes in aquatic systems over 1 to 5 years, monitoring periphyton and invertebrates would better allow for the implementation of management actions where there are impacts to fish.
- The total amount of new surface disturbance allowed by an alternative is an index of potential impacts to fish. Success of reclamation measures varies. It is assumed that BLM-applied reclamation will be successful in preventing impacts to fish
- Activities that cause substantial disturbance to soils and vegetation can 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.
- Increasing sedimentation adversely affects fish adapted to clear-water systems (those originating from the Big Horn Mountains) in the planning area.
- Decreasing turbidity can adversely affect fish adapted to turbid waters (streams with prairie origins).
- Activities that affect water quantity are regulated by the Wyoming State Engineer's Office.
- Activities that affect 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 the implementation of BMPs.

Significance Criteria

In addition to the scale of impacts listed in the beginning of this chapter, an adverse impact on fish species as a result of project actions would be considered potentially significant if there was: (1) substantial loss of the biological integrity and habitat function of aquatic ecosystems that would make species eligible for listing under the ESA; (2) substantial loss (more than 10%) of habitat function or disruption of life history requirements of fish species that would preclude maintenance or improvement of their status; (3) a degrading change in the Wyoming DEQ classification for a stream or river reach.

4.4.5.2. Impacts Common to All Alternatives

This section describes management actions and resulting impacts to fish species common to all alternatives. The following paragraphs describe the sources and types of potential impacts. The section then describes management actions and impacts to fish from management of other resources. Management actions common to all alternatives that are administrative processes (e.g., development and prioritization of plans, providing outreach and education, updating existing habitat management plans (HMPs), and adherence to rules, regulations, and agreements such as MOUs) would have negligible to moderate beneficial effects.

Due to a lack of overlapping resources, management of **Air Quality** would not affect fish and is not further addressed in the **Fish and Wildlife Resources – Fish** section.

Fish and Wildlife Resources – Fish (negligible beneficial)
Managing barriers to fish passage in cooperation with the WGFD and other stakeholders would have a beneficial effect on fish species because removing or bypassing these barriers can allow fish to move into new habitats, or complete critical life history requirements. Impacts from the management of activities potentially affecting native and desirable non-native fish species in collaboration with the WGFD and other stakeholders should be beneficial as it would likely result in increased populations, protected habitats, and reduced risk of harm to fish.

Managing public access to fish-bearing waters that protect crucial habitats could have an adverse effect on fish. Future access routes would increase the likelihood of introducing whirling disease and invasive species to fish-bearing waters. These impacts could be mitigated to negligible through education and enforcement programs for fisheries.

Physical Resources

Soil (moderate beneficial)
Evaluating the effects to soil resources from a proposed surface-disturbing activity using NRCS Soil Survey data and onsite investigation would help identify mitigation measures, relocate the activity to a more suitable soil type, or deny the authorization. Reclamation plans also would minimize impacts. This management of soil resources would reduce the risk of harm to fish on five to ten percent of the fish-bearing streams in the planning area; therefore, management actions Common to All Alternatives for soil would have a moderate beneficial effect on fish.

Water Resources (major beneficial)
Water management actions would beneficially affect fish by reducing sedimentation, increasing aquatic vegetation and macroinvertebrates through (1) providing an alternative or "off-source" water supply (e.g., piping water to troughs, tanks, or ponds) in locations where BLM-authorized uses are fenced out of water sources; (2) installing flow-control devices on new and existing BLM-authorized water wells and spring developments and evaluating the need for additional flow-control devices on a project-specific basis; (3) managing water resources to meet the Wyoming Standards for Healthy Rangelands and achieve PFC; (4) taking appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely affected by BLM-authorized actions and permitted activities; and (5) designing and managing land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats. All these actions influence greater than ten percent of the fish-bearing streams in the planning area and would have a major beneficial effect on fish.

Cave and Karst Resources (no effect)
The management actions common to all alternatives for cave and karst resources are administrative and would have no effect on fish resources.

Mineral Resources

Locatable Minerals (major adverse)
Leaving lands open to locatable minerals exploration and development could lead to increased sedimentation, removal of riparian vegetation, changes instream channel morphology, and decreased water quality. This would have a major adverse effect on fish resources, depending on the scale of exploration and development. A 2009 MOU between the BLM and the U.S. Nuclear Regulatory Commission to address uranium development and reclamation activities would moderately benefit fish by increasing protections to fish-bearing streams from runoff and decreased water quality. Locatable minerals occur within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore the management actions Common to All Alternatives for locatable minerals would have a major adverse effect on fish resources.

Leasable Minerals – Coal (moderate adverse)
Making the federal coal estate with high development potential available for consideration for competitive coal leasing could impact five to ten percent of the fish-bearing streams in the planning area. If coal mining affected these streams, the effects (increased sedimentation and surface disturbances) could rise to a population or community level and have a moderate adverse effect.

Leasable Minerals – Fluids and Salable Minerals (major adverse)
Opening mineral estate to fluid minerals leasing and mineral materials exploration (unless the mineral estate is specifically identified as administratively unavailable for minerals leasing during the planning period) could adversely affect fish if fluid or other leasable minerals, and mineral materials were developed in fish-bearing watersheds.

In general, surface mining activities increase erosion and accelerate sedimentation into nearby lakes and streams. Streams could be dewatered or rechanneled to accommodate surface mines. Surface mining operations also have the potential to increase pollution that can enter streams through runoff and disrupt subsurface and surface water flow patterns. Bridges, culverts, and low-flow crossings are integral features to road development associated with surface mining. If improperly designed, these features also can interfere with fish migrations to spawning, feeding, rearing, and overwintering sites. Proper placement of these structures is critical to minimizing impacts to fish.

Increasing streamflows from produced water could have beneficial and adverse effects on aquatic species. Oil and gas produced water can be beneficial in enhancing or creating fish habitat, and adverse if water quality suffers, hydrologic regimes are modified to an extent that affects fish, or naturally turbid waters are clarified. The primary beneficial effect would be to provide habitat to fish and macroinvertebrates in areas that are normally dry. This new habitat could provide opportunities for population growth. Increased flows also could benefit fisheries where containment or flow-through ponds are developed for fisheries. With proper water quality, these ponds could serve as sport fisheries or be used for breeding native species.

Produced water can change turbidity, water quality, and the hydrography. Decreased water quality (for example increases in Sodium Absorption Ratio or TDS) can adversely impact fish. A change in streamflow translates to a change in the water depth and velocity for any specific

location in a stream. Consequently, changes in streamflow can be regarded as modifications to the physical composition of the aquatic habitat (Bain and Finn 1988). Fish that inhabit streams in the planning area are frequently exposed to disturbances from floods and droughts, and must persist in environments characterized by fluctuating flows. Produced water can stabilize flows in a system adapted to fluctuations. Potential adverse effects to fish and invertebrates caused by changes in flow could be physical, behavioral, habitat, and food changes that could occur if streamflows change substantially, especially during spawning. Increased flows in rearing areas could make survival more difficult for young fish. Bain and Finn (1988) and Fausch and Bramblett (1991) reported that shallow- and slow-water fish were adversely affected by an artificially high variability in flow.

Streams and rivers receiving clear (low turbidity) discharge could become less turbid because produced water is relatively low in sediments. This decrease in turbidity could be detrimental to fish that depend on turbid waters and could allow changes to the fish community. Increased clarity provides an advantage to predatory fish such as centrarchids (e.g., bass and sunfish), resulting in higher predation rates to native fish adapted to turbid waters.

Leasable fluid minerals and salable minerals each occur within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore, the impacts described here would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
Adhering to the National Wildland Fire Management Policy and current Fire Management Plan for the Wyoming High Plains District, ensuring all prescribed-fire activities comply with Wyoming DEQ standards and rules, and using a fire resource advisor would help reduce impacts to fish species to a minor level. Prohibiting the use of retardants or foam within 300 feet of surface water sources would reduce impacts to fish to a minor level. Some runoff into occupied stream segments would be likely, which would kill individual fish, but population-level effects are not anticipated. Implementation of the BLM Emergency Stabilization and Burned Area Rehabilitation standards and rehabilitation of fire lines would reduce sedimentation from runoff to a minor level. Landscape treatments to enhance fuels management and restore fire-adapted ecosystems could result in a short-term, minor adverse effect on fish and fisheries from sedimentation during fire treatments. Long-term effects from treatments would be moderately beneficial because the threat of catastrophic wildfire would be reduced.

Fire affects fish populations through both physical and chemical changes (increased siltation, altered water quality [dissolved oxygen, pH, suspended and dissolved solids, total hardness, and turbidity], and changes in water temperature). Nutrient flow changes that adversely affect aquatic insect production also would affect fish populations. Although there is limited BLM surface estate congruent with fish streams (615 stream miles in the planning area on BLM-administered lands), the threat of adverse effects from unplanned ignitions and prescribed fires occurs on all lands surrounding fish streams, and therefore could affect any fish populations in BLM-administered streams. The extent of surface erosion after fire depends largely on the topography and soil types in the immediate area. Stream siltation can occur following fire. Siltation is a particular problem where severe burns occur on steep or moderate slopes, in riparian habitats, or where heavy equipment is used in fire suppression activities. Water temperature in cold-water fisheries, such as the upper forks of the Powder River and the Tongue River tributaries, could change if shading vegetation is removed from the sides of the stream. Generally, fish will rapidly recolonize

fire-affected areas. Fuels management projects are designed and implemented in a non-emergency manner that minimizes impacts to aquatic resources. Competent planning and implementation would minimize the effects on fish from fuels treatments. For example, prescribed fires conducted in spring and fall are less likely to escape containment and are therefore less of a threat to riparian vegetation and less likely to contribute to erosion.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No management actions common to all alternatives have been identified for forests and woodlands.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Managing vegetative communities in accordance with Wyoming Standards for Healthy Rangelands and siting facilities and related infrastructure, travel routes, recreational uses, mineral exploration and development, and ROW to reduce impacts to vegetative resources would minimize sedimentation and channel modifications within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area. Maintaining sustainable forage levels for livestock and wildlife habitat would minimize sedimentation. Management actions common to all alternatives for grassland and shrubland communities would have major beneficial effects on fish resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prioritizing and developing activity and implementation plans to manage riparian and wetland systems to be at or above, or continue to be improving toward, PFC while achieving the Wyoming Standards for Healthy Rangelands would minimize sedimentation and channel modifications. Managing riparian and wetland systems to enhance forage conditions and improve water quality, to a succession stage appropriate for that system, including vertical and horizontal vegetative structure and composition, would minimize sedimentation and channel modifications. These actions would influence greater than ten percent of the fish-bearing streams in the planning area; therefore, they would have major beneficial effects on fish resources.

Invasive Species and Pest Management (moderate adverse)
BLM weed and pest control work on public lands adjoining deeded and state lands could have an adverse effect on fish if chemical applications encounter fish-bearing waters and alter the water quality in these areas. Proper use of chemicals, for example not applying them within 200 feet of fish-bearing waters, would minimize this risk. Specific, careful and appropriate grasshopper and Mormon cricket treatments can prevent over-utilization and thereby limit erosion, resulting in a beneficial effect in some areas. Moderate adverse impacts to fish resources will result from management actions common to all alternatives for invasive species and pest management.

Fish and Wildlife Resources – Wildlife (major beneficial)
Management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species, and would have beneficial effects on fish. Management actions common to all alternatives support efforts to protect and improve various ecosystems throughout the planning area. These actions include managing vegetative diversity, minimizing disturbances to springs and riparian zones, and improving riparian plant communities.

Special Status Species – Plants (moderate beneficial)
Management actions common to all alternatives for special status plant species include allowing treatments that would benefit the plant species. Special status plant species occur along five to ten percent of the fish-bearing streams in the planning area. Treatments that improve the health of vegetation would also improve the health of the neighboring stream; therefore, management actions common to all alternatives for special status plant species would have moderate beneficial effects on fish resources.

Special Status Species – Fish (minor adverse)
Prioritizing special status fish species over other fish species in planning and management actions may be a minor adverse effect for those fish-bearing waters that are not identified as a priority as it would leave one to five percent of the fish-bearing streams as a lower priority.

Special Status Species – Wildlife (major beneficial)
Avoidance areas, whether for the application of broad-spectrum insecticides or for the protection of nesting bald eagles, would have a major beneficial effect on fish where these resources overlap. Due to the overlap of wildlife and fish habitats (greater than ten percent), the overall beneficial effects of habitat protection would be major.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Management actions include completion of site stabilization and long-term protection of significant sites. This would benefit fish through habitat conservation when the sites occur within close proximity to fish habitats. Currently, significant sites occur within 0.25 mile of less than one percent of the fish-bearing streams in the planning area. Management actions for cultural resources would have negligible beneficial effects on fish resources.

Paleontological Resources (negligible beneficial)
Management actions common to all alternatives would occur on less than one percent of habitats important to fish species, and would have a negligible beneficial effect on fish resources by retaining public lands under the management of the BLM.

Visual Resources (negligible beneficial)
Management of WSAs and the Middle Fork Powder River as VRM Class I could prohibit or limit some surface-disturbing activities in those areas, thereby protecting fish habitats. VRM Class IV areas have minor limitations. Managing visual resources would indirectly affect fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions common to all alternatives would occur on less than one percent of habitats important to fish species, and would therefore have negligible beneficial effects on fish resources.

Land Resources

Forest Products (major beneficial)
Prohibiting forest management areas within 200 feet of surface waters on approximately 10,318 acres will protect streams and rivers from sedimentation, soil erosion, and increased water temperatures, and result in a major beneficial effect to fish, as this would affect over 10% of fish-bearing streams.

Lands and Realty (minor adverse)
Negotiating with willing landowners to obtain access across non-BLM-administered lands to isolated parcels of public land that contain fish would increase the risk of spreading whirling disease or unwanted species (e.g., zebra mussels). This could have an adverse effect on fish. Project-specific analysis of lands and realty actions, such as approval of R&PP permits, land use authorizations, and withdrawals and land disposals require NEPA analyses, which would identify any conflicts before adverse effects could occur. Potential lands and realty actions could occur along one to five percent of the fish-bearing streams in the planning area; therefore, management actions common to all alternatives would have minor adverse effects on fish resources.

Renewable Energy (no effect)
Management actions common to all alternatives for renewable energy are administrative and will have no effect on fish resources.

Rights-of-way and Corridors (moderate adverse)
Reasonable access could be provided for ROWs and corridors within 0.25 mile of five to ten percent of the fish-bearing streams in the planning area. ROWs cause habitat degradation through vegetation removal and trampling. Adverse effects to fish-bearing waters from ROWs would occur when these accesses cause increased sedimentation in the streams. Management actions common to all alternatives for ROWs and corridors would have moderate adverse effects on fish resources.

Travel and Transportation Management (major adverse)
Because roads typically are void of vegetation and exhibit impervious surfaces 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. Inventory and evaluation of all existing roads and trails into one transportation plan would designate those to be upgraded, maintained, or abandoned. These actions would reduce erosion, protect and stabilize soils and vegetation, and reduce opportunities for invasive plants and weeds to establish. Restricting motorized vehicles and implementing temporary closures would contribute to stabilizing soils and reducing erosion. All new roads would be designed to minimize surface disturbance and surface runoff and erosion potential. Constructing new roads and trails have a direct, long-term adverse impact on fish-bearing streams. Roads and trails for motorized vehicles result in localized direct and adverse impacts on fish habitats, such as reducing vegetation cover and density and changing community compositions. Reclaiming abandoned roads and trails with appropriate herbaceous and shrubby vegetation and upgrades on utilized roads would promote soil stabilization and reduce opportunities for erosion and for invasive plant and weed species to establish; this would have a direct beneficial impact on fish resources over the long term. Overall, transportation and access could be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore, management actions for transportation and access would have major adverse effects on fish resources.

Recreation (moderate beneficial)
There is minimal public access at present to BLM waters in the planning area that containing fish. The Middle Fork Powder River, North Fork Powder River, Pass Creek, Bear Trap Creek, Crazy Woman Creek, Poison Creek, Eagle Creek, Bachus Creek, Blue Creek, Tongue River, Belle Fourche River, and the main stem Powder River all have public access and fishing pressure. The South Fork Tongue (15 miles on the Bighorn National Forest), North Fork Powder (13.2 miles), and Middle Fork Powder (12.8 miles) are classified as Wyoming Game and Fish designated Blue Ribbon fishery - meaning a fishery of national importance. The Powder River

segments include BLM-administered lands. The North Fork Tongue River (20.2 miles on the Bighorn National Forest), Tongue River (13 miles on mixed ownership), Sheely Creek (3.5 miles on National Forest Service land), Wolf Creek (6.7 miles on the Bighorn National Forest), South Fork Tongue River (7.2 miles on the Bighorn National Forest), Piney Creek (3.2 miles), Clear Creek (10 miles), North Fork Powder River (17.3 miles in two segments), Blue Creek (2.5 miles), and Buffalo Creek (10.5 miles) are classified by WGFD as Red Ribbon waters, a WGFD designation meaning a fishery of regional importance as trout fisheries. Only the last three include BLM-administered lands.

The primary adverse effect from recreation would be the introduction of diseases such as whirling disease, and invasive species such as zebra mussels. Humans, particularly fishermen, can transport infected sediments or water on boots, bait, boats, and other equipment. The effect on fish and fisheries from introducing diseases and invasive species can be adverse. Invasive species and disease introductions can be avoided and minimized through education, and educational opportunities will increase with increased recreational access to fisheries.

Avoiding riparian habitat or developing and managing recreation sites, recreation facilities, and recreation access in a manner that minimizes impacts to riparian habitats, and prohibiting dispersed camping and commercial camps within 200 feet of surface water would moderately benefit fish.

Lands with Wilderness Characteristics (no effect)
Management actions common to all alternatives for lands with wilderness characteristics are administrative and will have no effect on fish resources.

Livestock Grazing Management (major adverse or beneficial)
Improper livestock grazing management could adversely impact stabilization of riparian vegetation, which can lead to stream instability and an associated loss of habitat complexity, and the loss of shading vegetation, which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris. Dispersed grazing from construction of water developments for livestock use, will reduce impacts to riparian habitats. The degree of adverse impact, if any, would depend on livestock grazing timing and intensity, site characteristics, and species habitat requirements. Stock driveways tend to concentrate high levels of livestock use that can cause significant degradation (e.g., near-complete removal of vegetation and soil compaction), impacting wildlife habitats. Beneficial impacts of proper grazing include reducing competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removing wildfire fuels; and controlling invasive plant and weed species with properly timed grazing rotations and species (e.g. goats). There are 779,034 acres of BLM surface lands in grazing allotments in the planning area, which occur along greater than ten percent of the fish-bearing streams in the planning area. Management actions common to all alternatives for livestock grazing would have major adverse and beneficial effects on fish resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
Management actions common to all alternatives for ACECs will have no effect on fish resources.

Scenic or Back Country Byways (negligible adverse)
Increased road maintenance and human activity on byways would have adverse impacts to fish habitat from dust, soil erosion, and spread of invasive species, adversely impacting water quality and aquatic plant communities. Management actions common to all alternatives associated with scenic or BCBs will have a negligible adverse effect on fish resources.

Wild and Scenic Rivers (no effect)
Management actions common to all alternatives for Wild and Scenic Rivers will have no effect on fish resources.

Wilderness Study Areas (minor beneficial)
WSAs will be managed to preserve natural conditions and processes, and restrict motorized activities. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions common to all alternatives for wilderness study areas will have minor beneficial effects on fish resources.

Socioeconomic Resources

Social and Economic Conditions (no effect)
Management actions common to all alternatives are administrative processes and will have no effect on fish resources. Impacts to social and economic resources will be quantified on a project specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section.

Health and Safety (major beneficial)
Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials or environmental contamination would have beneficial impacts to fish by protecting riparian and wetland areas and water quality across the resource area. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or wetland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts.

Only management actions common to all alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.5.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes management actions and potential impacts to fish from implementing Alternative A.

Fish and Wildlife Resources – Fish (minor beneficial)
Cooperating with the WGFD stocking programs and designing reservoirs to enhance fisheries where there is a potential to do so would benefit fish. Maintaining or improving reservoirs and riparian areas could increase population numbers or viability in one to five percent of the fish-bearing streams in the planning area and have a minor beneficial effect on fish resources.

Physical Resources

Soil (major beneficial)
Under Alternative A, prohibiting surface-disturbing activities in areas with severe erosion hazard (215,496 acres) from March 1 through June 15, on slopes equal to or greater than 25% (170,590 acres), and on soils with poor reclamation potential (455,090 acres) would limit erosion and subsequent sedimentation. The scope of these actions, in combination with the limited timing restriction for areas with severe erosion hazard (i.e., allowing disturbance from June 16 through February 28) could result in increased sedimentation. These prohibitions/restrictions, in general, would reduce the risk of harm in greater than ten percent of the fish-bearing streams in the planning area and constitute a major beneficial effect on fish.

Water Resources (minor beneficial)
Under Alternative A, reservoir construction in historic or existing fish habitat would require site-specific analysis through BLM and EPA authorities. The management of produced water from oil and gas development does overlap with fish habitat. Current prohibitions regarding the placement of oil and gas wells and facilities prohibit these elements within 500 feet of streams and lakes. This prohibition reduces impacts to fish habitat from sedimentation.

Prohibiting surface disturbance within 500 feet of any spring, reservoir, water well, or perennial stream, unless the authorized officer waives the prohibition, would have a beneficial effect by reducing sedimentation. Application of waivers without defined criteria can result in inconsistent application of management and unknown levels of protection. These prohibitions/restrictions currently contain greater than ten percent of the fish-bearing streams in the planning area; therefore, management actions for water under Alternative A would have major beneficial effects on fish resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Cave and Karst Resources (no effect)
There are no management actions for cave and karst resources under Alternative A.

Mineral Resources

Locatable Minerals (major adverse)
Under Alternative A, withdrawing the Amsden Creek (525 acres), Ed O. Taylor (approximately 3,896 acres, and a Wyoming Game and Fish designated Blue Ribbon fishery - meaning a fishery of national importance), and Kerns game range (163 acres) from mineral locations and restricting locatable minerals activities in the approximately 28,931 acres of Fortification Creek, Gardner Mountain, and North Fork (a Wyoming Game and Fish designated Blue Ribbon fishery - meaning a fishery of national importance). Locatable mineral activities (causing surface disturbance and increased sedimentation) under Alternative A could be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planing area. Management actions for locatable minerals under Alternative A would have major adverse effects on fish resources.

Leasable Minerals – Coal (major adverse)
Alternative A would open the entire federal coal estate (federal mineral estate for coal retained by the federal government) to study and exploration, subject to license stipulations necessary to protect other resource values; this could affect greater than ten percent of the fish-bearing streams

in the planning area. Coal mining in drainages that contain fish could decimate local populations through dewatering, increased sedimentation, and pollution.

Leasable Minerals – Fluids (major adverse)
Continuing to lease and allow development of federal oil and gas could adversely affect greater than ten percent of the fish-bearing streams in the planning area through increased sedimentation from surface disturbing activities near fish-bearing streams, changes instream hydrology and water quality from produced water discharge. Virtually all warm-water fish-bearing streams in the planning area are over surface with CBNG potential. Current knowledge of the distribution of coalbeds harboring natural gas indicate drainages containing fish-bearing waters would continue to be developed, potentially resulting in a major adverse effect on fish.

Salable Minerals (major adverse)
The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable minerals (habitat degradation). Salable mineral development under Alternative A would be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area; therefore, salable mineral management actions under Alternative A would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
Under Alternative A, limiting fire suppression on BLM-administered land where fire control would be very difficult or extremely hazardous to firefighting personnel could allow fires to damage streams in occupied fish range. Suppressing unwanted wildland fires would prevent sedimentation from post-fire erosion. Use of fire retardants could adversely affect fish if the chemicals reach occupied streams. Rehabilitating fire and fire suppression damage would benefit fish by decreasing runoff and sedimentation. Conducting prescribed fires to support vegetation and wildlife habitat objectives would have either an adverse or beneficial effect on fish. Prescribed fires could increase runoff and sedimentation in the short term, adversely affecting fish; however, prescribed fires could benefit fish over the long term by removing invasive plant species and increasing streamflows. Overall, Alternative A fire and fuels management would have a minor adverse effect on fish.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
Treatments including cutting, thinning, and prescribed burning may pose an adverse short-term impact on fish resources resulting from soil erosion and potential sedimentation in streams and rivers. However, improved forest health (vegetation composition, soil stability, decreased risk of wildfire) resulting from the treatments would be beneficial. Actions would impact over ten percent of habitat important to fish species, having major beneficial effects on fish resources over the long-term.

Vegetation – Grassland and Shrubland Communities (no effect)
There are no management actions for grassland and shrubland communities under Alternative A.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, or perennial streams would benefit fish by preserving the riparian and adjacent upland communities

of all the fish-bearing streams in the planning area. Management actions for riparian/wetland resources under Alternative A would have major beneficial effects on fish resources.

Invasive Species and Pest Management (moderate beneficial)
IPM, as currently practiced and when appropriately applied in the planning area, complies with restrictions on chemical labels that provide adequate buffers from fish-bearing water. Aggressive treatment of invasive plants, particularly riparian plants, could adversely affect fish in the short term by increasing sedimentation and removing shade. Over the long term, these treatments would benefit fish by replacing invasive plants with native species that generally require less water and by increasing stream flow. Overall, Alternative A management of vegetative resources would result in a major beneficial effect on fish, but the short-term adverse effects reduce this to moderate.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative A, seasonally prohibiting surface disturbance and disruptive activities and limiting timber harvest in crucial elk ranges would have a beneficial effect on fish in the Fortification Creek drainage. Prohibiting surface disturbance or occupancy within a biologic buffer zone around active nests of raptor species of high federal interest unless the authorized officer waives the prohibition would limit surface disturbance and oil and gas activities in association with these nests. Approximately 303 miles, greater than ten percent, of fish-bearing streams intersect identified raptor buffers. Overall, Alternative A management of wildlife resources would have a major beneficial effect on fish.

Special Status Species – Plants and Fish (no effect)
There are no management actions for special status plants or special status fish under Alternative A.

Special Status Species – Wildlife (major beneficial)
Managing vegetation resources to comply with the ESA and BLM policy associated with management of habitat for special status species would have beneficial effects to fish. Surface disturbance restrictions for Greater Sage-Grouse breeding grounds and raptors nests would have beneficial effects on fish. Protections afforded Threatened, Endangered, and sensitive species, such as oil and gas disturbance-free zones around bald eagle nests and roosts, would prevent surface disturbance and have beneficial effects on fish. Overall, these protection zones for special status wildlife habitats encompass greater than ten percent of the fish-bearing streams in the planning area. Management actions for special status wildlife species under Alternative A would have major beneficial effects on fish resources.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cultural resources (habitat conservation). NSOs are currently applied to the Bozeman Trail and Crazy Woman Battle Site only. These restrictions would be beneficial to any fish habitats they encompass as they would reduce the risk of harm to the fish resource. All other management of cultural resources is considered on a project specific basis. Under Alternative A, cultural resource protection would encompass less than one percent of the fish-bearing streams in the planning area. Management actions for cultural resources under Alternative A would have negligible beneficial effects on fish resources.

Paleontological Resources (negligible beneficial)
Under Alternative A, management of lands containing paleontological resources would be considered on a site-specific basis. In areas where mineral development was not allowed, water quality would remain unchanged, having a negligible beneficial effect on fish resources.

Visual Resources (major beneficial)
Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect fish habitats. VRM Class III and IV areas have minor limitations. Managing visual resources would indirectly affect fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions associated with Alternative A would occur on approximately 67,089 acres, over ten percent of habitats important to fish resources and would therefore have major effects.

Land Resources

Forest Products (minor adverse)
Management actions associated with Alternative A have the potential to have both adverse and beneficial impacts to fish. Sedimentation and soil erosion can result from access roads and techniques used to harvest forest products, reducing water quality. Limiting areas of clear cuts to 20 acres, rehabilitation of harvested areas, and protecting regeneration from over utilization will all serve to limit the amount of sedimentation, and will result in beneficial long-term effects to fish by increasing forest health (increased soil stability, plant community composition and structure). Management actions will occur on approximately 3,430 acres, five to ten percent of habitat important to fish; however, beneficial effects to forest health would lessen the adverse effects to some of the habitat. Overall, a minor adverse effect to fish would result.

Lands and Realty (negligible adverse)
Lands identified for acquisition or disposal and pursuing easements to BLM-administered lands may impact fish resources by changing public access to fisheries. Acquisitions and easements would increase access to fisheries, while disposals would reduce public access. In both cases, potential increases in sedimentation and surface disturbance near fish-bearing streams would be negligible. Changes in land status current could occur along less than one percent of the fish-bearing streams in the planning area.

Renewable Energy (no effect)
There are no management actions for renewable energy under Alternative A.

Rights-of-Way and Corridors (major adverse)
ROWs could be permitted, under this alternative, within greater than ten percent of the fish-bearing drainages in the planning area. ROW and corridor construction would cause surface disturbance and increase sedimentation. Management actions for ROWs and corridors under Alternative A would have major adverse effects on fish resources.

Travel and Transportation Management (minor adverse)
Under Alternative A, there would be indirect effects on fish species from travel management and OHV use. OHV use on and off designated trails has the potential to destroy vegetation, compact soils, and lead to soil erosion and ponded water. By designating areas where OHV use is limited to designated roads and trails, adverse effects on fish habitats can be reduced. In cases where motorized vehicle use is closed for only portions of the year, these closures would not be as

great a benefit to special status fish species. Regardless of intensity of management, OHV use is still anticipated to have an adverse effect on one to five percent of fish habitats. Management actions for travel and transportation management under Alternative A would have minor adverse effects on special status fish resources.

Recreation (negligible beneficial)
Under Alternative A, pursuing easements to provide access to BLM-administered lands for recreation and administrative purposes could expose occupied fish streams to whirling disease, zebra mussels, or other introduced species and disease, which would have a moderate adverse effect on fish. Prohibiting surface disturbance and occupancy on slopes equal to or greater than 25% or more would minimize sedimentation. Areas where OHV use is limited to designated roads and trails would limit access to fisheries and reduce the potential for introduction of invasive species and disease. Prohibiting oil and gas leasing and development in the Mosier Gulch Recreation Area would provide some protection from the impacts of oil and gas development along a section of Clear Creek, which would have beneficial effect on fish. Recreational areas occur within 0.25 mile of less than one percent of the fish-bearing streams in the planning area. The overall management actions for recreation under Alternative A would have negligible beneficial effects on fish resources.

Lands with Wilderness Characteristics (negligible adverse)
No lands with wilderness characteristics have been identified. Lands would be evaluated and managed on a project-specific basis. Adverse impacts to fish resources would occur if surface-disturbing activities were permitted; however, the low potential for mineral development, commercial timber, and renewable-energy projects to be proposed in remote, road less areas would make these impacts negligible.

Livestock Grazing Management (major adverse)
Under Alternative A, suspending or adjusting livestock grazing use in areas where timber harvest has occurred whenever grazing would impair forest regeneration would moderately benefit the Billy Creek, North Fork Powder, and Pass Creek areas by reducing sedimentation.

Managing Category M allotments to continue the current authorized livestock use on 98 Category M allotments at 43,573 AUMs would continue to affect fish in some areas by continued livestock use of riparian habitats.

Alternative A management of Category I allotments would include performing baseline inventories; developing, implementing, and monitoring AMPs; and increasing available forage first to wildlife after range condition class has been upgraded to good on allotments now rated poor to fair, would benefit fish.

Under Alternative A, livestock grazing is not authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of rough terrain and steep slopes. Allowing livestock grazing on all public lands in the planning area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values would have an adverse effect on fish due to continued sedimentation, reduced water quality, removal of riparian habitat, and transport of invasive plant species.

Cumulatively the livestock grazing management actions could occur within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area. Management actions for livestock grazing under Alternative A would have major adverse effects on fish resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are no ACECs proposed under Alternative A.

Scenic or Back Country Byways (no effect)
No scenic or BCBs are proposed near fish habitat under Alternative A.

Wild and Scenic Rivers (negligible beneficial)
If Congress releases the Middle Fork Powder River from WSR designation, management will continue to retain free-flowing characteristics and outstanding resource values. This would be a negligible benefit to fish as it represents less than one percent of the fish-bearing streams in the planning area.

Wilderness Study Areas (no effect)
Under Alternative A, if Congress decides not to designate the North Fork and Gardner Mountains WSAs as wilderness, there would be no effect to fish resources as oil and gas potential is low.

4.4.5.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to fish resources due to their implementation.

Fish and Wildlife Resources – Fish (major beneficial)
Under Alternative B, prohibiting surface-disturbing and disruptive activities within 0.25 mile of any waters rated by the WGFD as Blue or Red Ribbon streams (trout streams of national or statewide importance) would benefit these fisheries by minimizing sedimentation. Designing crossings of waterbodies identified as supporting fish to allow fish passage would benefit fish. Managing riparian and uplands in historically perennial systems to restore perennial flows or standing water could increase fish distribution and benefit fish. Restoring important instream segments for fish habitat in accordance with WGFD priorities could increase fish densities and distribution and benefit fish. Overall, these management actions would have a major beneficial effect on fish.

Physical Resources

Soil, Water Resources (major beneficial), **and Cave and Karst Resources** (moderate beneficial)
Alternative B would analyze impacts to soil, water, and cave and karst resources on a project-specific basis. In addition, Alternative B would prohibit surface-disturbing activities or apply NSO stipulations to activities on badlands, rock outcrops, and slopes susceptible to mass movement, and prohibit prescribed fires on highly erodible soils; prohibit such activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat; and prohibit activities in cave and karst areas. Under Alternative B, applying an NSO stipulation on soils with poor reclamation suitability, in badlands, on rocky outcrops, on slopes susceptible to mass movement, and on slopes equal to or greater than 25% would prevent sedimentation and have a major beneficial effect on fish. These soil types overlap almost all the fish-bearing drainages in the planning area. Prohibiting surface-disturbing activities for the protection of water resources under Alternative A would conserve all the fish-bearing drainages in the planning area. Prohibiting surface-disturbing activities for the protection of

cave and karst resources under Alternative A would conserve vegetation in five to ten percent of the fish-bearing drainages in the planning area. Overall, Alternative B management of soils and water would result in major beneficial effects on fish resources and cave and karst resources would result in moderate beneficial effects on fish resources.

Mineral Resources

Alternative B recommendations to withdraw addition lands from minerals entry would protect portions of the Tongue River. Decreasing the availability of BLM-administered mineral reserves for leasable fluid minerals, leasable coal, and salable minerals would not affect fish if minerals were not developed or were developed with sufficient protective measures to prevent adverse effects.

Locatable Minerals, Leasable Minerals – Fluids, and Salable Minerals (major adverse)
Under Alternative B, 2,612,920 acres would be administratively unavailable for minerals leasing; 812 acres would be subject to the standard lease terms and conditions; 124,467 acres would be subject to moderate constraints; and 642,232 acres would be subject to major constraints. These acreages do not all coincide with fish-bearing waters; however, the restrictions on surface disturbance are already in place in much of the Tongue River drainage and Middle and North Forks Powder River. These restrictions would mostly benefit cold water fish (trout) and most of the recreational fisheries in the planning area. Locatable minerals, leasable fluid minerals, and salable minerals could all be permitted within 0.25 mile of greater than ten percent of the fish-bearing streams in the planning area. Management actions for locatable, fluid, and salable minerals under Alternative B would have major adverse effects on fish resources.

Leasable Minerals – Coal (moderate adverse)
Closing coal outside the high development potential areas to coal exploration and leasing would protect fish habitat in those areas and only subject lands in the high development potential areas to the adverse effects from coal mining. Coal exploration and development could occur within 0.25 mile of five to ten percent of the fish-bearing drainages in the planning area. Management actions for coal minerals under Alternative B would have moderate adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (moderate beneficial)
Under Alternative B, using full suppression in areas where fire would be undesirable to monitoring fire behavior in areas where fire could be used as a management tool based on resource goals and objectives; limiting the use of heavy equipment in certain areas; rehabilitating all fire-related damage; and using wildland fire and other vegetative treatments to restore fire-adapted ecosystems and reduce hazardous fuels would reduce sedimentation from catastrophic wildfires. This would have a moderate beneficial effect on fish.

Biological Resources

Vegetation – Forests and Woodlands (minor adverse)
Using natural processes to manage forests and woodlands is a short-term beneficial impact to fish resources; however, managing forests and woodlands for old growth and climax vegetation communities may result in an increased risk of wildland fire which would result in unstable soil conditions and poor water quality having adverse impacts overall. Management actions would

occur in over ten percent of habitat important fish species, however, wildland fire is unpredictable and likely to only occur in localized areas reducing those effects to minor.

Vegetation – Grassland and Shrubland Communities (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat improvement). Under Alternative B, native plant species would be the only type authorized for reclamation activities. This would be beneficial to fish habitats as it would promote natural reclamation and regeneration of vegetative communities in the fish-bearing drainages. Under Alternative B, native plant reclamation would occur within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for grassland and shrubland communities would have major beneficial effects on fish resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would benefit fish by preserving the riparian and adjacent upland communities. Using produced water, where reasonable and practical, to develop and enhance waterfowl habitat and fisheries would benefit fish, provided water quality is adequate. Identifying and managing systems capable of achieving DFC could have a major beneficial effect on fish. Prohibitions for water would encompass all fish-bearing streams in the planning area. Management actions for riparian/wetland resources would have major beneficial effects on fish resources.

Invasive Species and Pest Management (moderate adverse)
Not limiting aerial application of pesticides and herbicides could decrease water quality and have a moderate adverse effect on fish populations in those waters.

Fish and Wildlife Resources – Wildlife (major beneficial)
The types of effects to fish from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wildlife. Under Alternative B, though, NSOs prohibit or restrict surface-disturbance within greater than ten percent of fish-bearing drainages; therefore, management actions for wildlife would have major beneficial effects on fish resources.

Special Status Species – Plants (moderate beneficial)
Management actions for special status plants that restrict grazing, herbicides and surface disturbance would benefit fish. Restricting fire suppression could result in larger fires that would increase sedimentation and create an adverse impact. Prohibiting disturbance within a mile of Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River would be considered a benefit to fish by reducing sources of sedimentation. Overall, these actions would occur within five to ten percent of the fish-bearing drainages in the planning area. Management actions for special status plants under Alternative B would have moderate beneficial effect on fish resources.

Special Status Species – Fish (moderate beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status fish resources (habitat improvement and conservation). Under Alternative B, stream segments important to special status fish species would be improved or enhanced and surface-disturbing restriction would be applied within 0.25 mile of water bodies containing special status fish species. These restrictions would also encompass five to ten percent of all fish-bearing streams in the planning area; therefore, special status fish species management actions under Alternative B will have moderate beneficial effects on fish resources.

Special Status Species – Wildlife (major beneficial)
Under Alternative B, protections for identified elk, bald eagles, big game ranges, raptor nests, Greater Sage-Grouse, special status reptiles and amphibians and Threatened and Endangered species would have a beneficial effect on fish. Establishing a year-round disturbance-free zone of at least 0.5 mile for Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River would reduce sedimentation and have a beneficial effect on fish.

Overall, Alternative B special status wildlife management actions would encompass greater than ten percent of the fish-bearing drainages in the planning area and would have a major beneficial effect on fish.

Heritage and Visual Resources

Cultural Resources (no effect)
Management actions under Alternative B would have no effect on fish resources.

Paleontological Resources (no effect)
Under Alternative B, areas with high quality paleontological resources do not overlap habitat important to fish species and would therefore have no effect on fish resources.

Visual Resources (major beneficial)
Under Alternative B, management of VRM Class II areas could prohibit or limit some surface-disturbing activities and therefore protect fish habitats. VRM Class III and IV areas would have minor limitations. Alternative B visual resources management would benefit over ten percent of habitats important to fish resources; therefore, visual resource management actions under Alternative B would have major beneficial effects on fish resources.

Land Resources

Forest Products (moderate adverse)
Under Alternative B, limited harvest of forest products would occur and natural regeneration would be utilized on five to ten percent of fish habitat. Although less soil disturbance may occur, forest health would not be actively managed, and would have a moderate adverse effect on fish over the long-term.

Lands and Realty (negligible beneficial)
Under Alternative B, retaining land identified for disposal (which occurs in less than one percent of fish-bearing drainages), but having important natural resource values, until all other lands identified for disposal are disposed of, regardless of difficulty or cost to manage, could have a negligible beneficial effect on fish by subjecting these lands to federal management, which would be more protective.

Renewable Energy (minor adverse)
Alternative B would have the fewest adverse impacts to fish through the exclusion of renewable-energy development in areas also closed to other forms of energy development (minerals leasing, locatable minerals, salable minerals, ROW, and other areas where there are restrictions on surface disturbance). Renewable energy would be allowed on 4,407 acres. This would impact one to five percent of the fish-bearing drainages in the planning area; therefore renewable-energy management actions under Alternative B would have minor adverse effects on fish resources.

Rights-of-Way and Corridors (moderate adverse)
Requiring co-location of facilities and identifying and implementing specified utility corridors in coordination with the resource specialist would decrease the potential for adverse impacts to fish-bearing drainages by ensuring their complete avoidance. Acreages of ROW avoidance and exclusion areas would be greatest under this alternative. Excluding ROWs on slopes of 25% or greater and highly erodible soils would benefit fish through reduced erosion and sedimentation. Limiting linear ROW development to existing routes would protect habitat quality, minimize fragmentation in sensitive areas, and help protect riparian areas. Under Alternative B, ROWs and corridors would be permitted in five to ten percent of the fish-bearing drainages in the planning area; therefore ROW and corridor management actions under Alternative B would have moderate adverse effects on fish resources.

Travel and Transportation Management (moderate beneficial)
Under Alternative B, closing areas with saturated soils or on slopes equal to or greater than 25% to motorized vehicles and closing areas in fish habitat, including activities related to fire suppression and geophysical exploration, would reduce sedimentation. This would have beneficial effect on fish. Limiting motorized vehicle use to designated routes within stock driveways would have a beneficial effect on fish by reducing sedimentation and nutrient loads. Allowing travel off designated routes in areas limited to designated routes only under a special use permit would reduce sedimentation and pollution, and have a beneficial effect on fish. Closing the Middle Fork Powder River area to motorized vehicle use to protect sensitive resources would limit the spread of invasive species; the importance of the Middle Fork Powder River fishery and the combination of all of the other management actions for transportation and access under Alternative B would have a moderate beneficial effect on fish.

Recreation (negligible beneficial)
Limiting development of additional recreation facilities to SRMAs and other high-use areas would have a beneficial effect on fish by limiting fishing pressure and reducing the risk of establishing invasive aquatic species. SRMAs proposed in Alternative B encompass less than one percent of the fish-bearing drainages in the planning area; therefore, management actions for recreation under Alternative B would have negligible beneficial effects on fish resources.

Lands with Wilderness Characteristics (negligible beneficial)
Approximately 12,237 acres of BLM-administered lands has been identified for management of lands with wilderness characteristics under Alternative B, 3,596 acres of which occur near a fish bearing stream. Management actions include closing the area to mineral development, motorized use, ROWs, renewable energy development, commercial woodcutting, and all other surface disturbing activities not compatible with retaining natural values. Emphasizing ecosystem health and retaining natural values will retain or enhance fish habitat and would have a beneficial effect on fish resources. Management actions would occur in five to ten percent of habitats important to fish, but effects would be localized, making the effects negligible.

Livestock Grazing Management (minor beneficial)
Under Alternative B, authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and livestock grazing as a second priority; locating livestock salt or mineral supplements a minimum of 0.5 mile away from water sources, riparian areas, and aspen stands; and providing a minimum of two years rest from livestock grazing following prescribed fires and other vegetative treatments would have a minor beneficial effect on fish as they will protect habitats and reduce the risk of harm to one to five percent of the fish-bearing drainages in the planning area.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
An ACEC designation at Welch Ranch on the Tongue River could have an adverse effect on that fishery. Additional human use could occur with ACEC designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and the risk of fire in the riparian forest. These potential issues would be adequately mitigated through education. The designation would have indirect, long-term beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems and would encompass less than one percent of the fish-bearing streams in the planning area; therefore, management actions for ACECs under Alternative B would have negligible beneficial effects on fish resources.

Scenic or Back Country Byways (negligible adverse)
Increased road maintenance and human activity on byways would have adverse impacts to fish habitat from dust, soil erosion, and spread of invasive species, adversely impacting water quality and aquatic plant communities. Approximately 48 miles of proposed byways intersect with habitat important to fish. Management actions in Alternative B for scenic or BCBs will have a negligible adverse effect on fish resources.

Wild and Scenic Rivers (negligible beneficial)
If Congress releases the Middle Fork Powder River from WSR designation, management will continue to retain free-flowing characteristics and outstanding resource values. This would protect habitats and reduce the risk of harm to less than one percent of the fish-bearing streams in the planning area and would have a negligible benefit to fish resources.

Wilderness Study Areas (minor beneficial)
Under Alternative B, if Congress decides not to designate the North Fork and Gardner Mountain WSAs as wilderness, there would be beneficial effects to fish as management would be consistent for lands with wilderness characteristics until a plan amendment has been completed. WSAs will be managed to preserve natural conditions and processes, and restrict motorized activities. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions associated with Alternative B will have minor beneficial effects on fish resources.

4.4.5.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to fish resources due to its implementation.

Fish and Wildlife Resources – Fish (moderate adverse)
Managing reservoirs and riparian areas to improve or enhance other resource values first and potential fisheries second, as well as managing for PFC would have an adverse impact to fisheries. Allowing surface disturbance within 0.25 miles of naturally occurring water bodies consistent with other resource values could have an adverse impact to fisheries if, for example, the mineral resource is determined to be of higher value and development increased sedimentation. The protections in Alternative C will only protect five to ten percent of the entirety of fish-bearing drainages in the planning area; therefore, moderate adverse effects are expected.

Physical Resources

Soil (major adverse)
Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, on slopes equal to or greater than 25%, on soils with poor reclamation suitability, in badlands, on rock outcrops and on slopes susceptible to mass movement would increase sedimentation and adversely affect fish if those activities took place in drainages that support fish-bearing waters. Allowing the use of prescribed fire on highly erodible soils and allowing activities in these sensitive soil areas could have adverse effect son fish through increased sedimentation, changed streamflows, and increased water temperatures. Lack of soil restrictions would leave greater than ten percent of the fish-bearing drainages vulnerable to impacts from improper soil management. Management actions for soil under Alternative C would have major adverse effects on fish resources.

Water Resources (major adverse)
Under Alternative C, allowing on-channel stream reservoirs could inhibit fish passage and have an adverse effect on fish. Allowing surface-disturbing activities, or not applying an NSO stipulation to any mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat would increase runoff and sedimentation in fish habitat, resulting in an adverse effect. This alternative would permit activities within greater than ten percent of the fish-bearing drainages in the planning area; therefore, management actions for water under Alternative A would have major adverse effects on fish resources.

Cave and Karst Resources (moderate adverse)
Under Alternative C, there would be no restrictions on activities in or around cave and karst resources. Five to ten percent of the fish-bearing drainages in the planning area also contain cave and karst resources. Lack of conservation of cave and karst resources would have a moderate adverse effect on fish resources as it would increase the potential for increased runoff and sedimentation.

Minerals Resources

Locatable Minerals (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable mineral resources (habitat loss and degradation). Alternative C would open 3,319,535 acres to locatable minerals exploration and development and withdraw 11,373 acres from locatable mineral exploration and development. This would have an adverse effect on fish. Locatable mineral development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for locatable minerals under Alternative C would have major adverse effects on fish resources.

Leasable Minerals – Coal (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for coal resources (habitat loss and degradation). Alternative C would open the entire federal coal estate with development potential to leasing which would make 4,775,136 acres available for coal exploration and leasing. Coal exploration and development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for coal under Alternative C would have major adverse effects on fish resources.

Leasable Minerals – Fluids (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in

the *Impacts Common to All Alternatives* section for fluid mineral resources (habitat loss and degradation). Consistent with other resources values, Alternative C would open 539,499 acres for fluid minerals leasing and exploration subject to standard lease terms and conditions; 2,472,472 acres subject to moderate constraints; and 303,601 acres subject to major constraints. Fluid mineral exploration and development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for fluid minerals under Alternative C would have major adverse effects on fish resources.

Salable Minerals (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable mineral resources (habitat loss and degradation). Opening 3,290,908 acres to salable mineral exploration and development and closing 57,213 acres would cause an adverse impact where those areas open to salable minerals overlap fish-bearing watersheds. Salable mineral exploration and development could be permitted in greater than ten percent of the fish-bearing drainages in the planning area. Management actions for salable minerals under Alternative C would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (moderate adverse)
Under Alternative C, use of full protection strategies and tactics, heavy equipment with few tactical constraints, and rehabilitating only suppression-related damage would increase sedimentation from suppression activities and have a moderate adverse effect on fish. If suppression activities prevent catastrophic fires, this action could be beneficial over the long term.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Under Alternative C, forests and woodlands would be managed to meet forest health objectives using silvicultural treatments and intensive management, and to reduce impacts from disease, insects, and wildfire. Methods such as cutting and thinning could adversely impact fish in the short-term, but would have an overall beneficial effect on fish resulting from improved forest health. Management actions would occur on five to ten percent of habitat important to fish, however, short-term adverse impacts will offset some of the long-term benefits, making effects to fish resources minor.

Vegetation – Grassland and Shrubland Communities (major adverse)
Under Alternative C, allowing non-native plant species, only if native species will not accomplish initial reclamation objectives, would provide another tool for achieving reclamation goals, but also would provide an opportunity for non-native species to cross pollinate with native species, outcompete native species for water and soil nutrients, and move out side the reclamation area and become an invasive species. Helping to achieve reclamation objectives would directly benefit surrounding plant communities. Overall, Alternative C management of grasslands and shrublands would have a major adverse effect on the riparian vegetation within the fish-bearing drainages and therefore, have a major adverse effect on fish resources.

Vegetation – Riparian/Wetland Resources (major adverse)
Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on fish by increasing sedimentation, changing hydrography, and decreasing water quality. Riparian/wetland areas contain greater than ten

percent of the fish-bearing drainages in the planning area; therefore management actions under Alternative C for riparian/wetland resources would have major adverse effects on fish resources.

Invasive Species and Pest Management (minor adverse)
Authorizing aerial application of pesticides in areas where topography, extent of infestation, target species, and timing limit other application methods could have a minor adverse effect on fish if appropriate buffers are not applied or applications drift/flow into waters.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative C, allowing surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges could increase sedimentation and invasive species establishment in the Middle Fork Powder River, Tongue River, and Little Bighorn River, which would have an adverse effect on fish in those drainages.

Protections for identified big game ranges, raptor nests, and elk would have beneficial effects on fish in the drainages that also support these species.

Because protections for some wildlife species remain in place and would conserve fish habitats under this Alternative, overall, Alternative C wildlife management would still have a major beneficial effect on fish.

Special Status Species – Plants (negligible beneficial)
Alternative C impacts to fish resources from special status plant species would be the same negligible beneficial effects as described under Alternative A.

Special Status Species – Fish (moderate beneficial)
Restoring or improving important stream segments for fisheries habitat, only for special status fish species, would have a beneficial impact on other (non-special status) fish that occupy the same drainages. Alternative C incorporates a smaller protective buffer, restricting surface-disturbing activities from within 500 feet of any waters containing special status fish species. This would conserve habitats within five to ten percent of all fish-bearing drainages in the planning area. Management actions for special status fish species would have moderate beneficial effects on fish resources.

Special Status Species – Wildlife (major beneficial)
Under Alternative C, protections for Greater Sage-Grouse, and Threatened and Endangered species would have a beneficial effect on fish. Protections for bald eagle and other raptor nests have the greatest potential for reducing impacts to fish-bearing waters. Allowing surface-disturbing and disruptive activities in habitats for special status amphibian and reptile species, in identified 100-year floodplains, and within 500 feet of perennial waters would have an adverse effect on fish. Alternative C, protections for identified special status species raptor nests, Greater Sage-Grouse and the other special status wildlife would be limited, surface disturbing and disruptive activities would be generally allowed. However, management must comply with ESA and BLM's sensitive species policy which would supply some benefit to specials status wildlife species and indirectly fish. Overall, the protective buffers that exist in this alternative would conserve habitats in greater than ten percent of the fish-bearing drainages in the planning area; therefore, management actions for special status wildlife species would have major beneficial effects on fish resources.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Alternative C impacts to fish from cultural resources would be the same negligible beneficial effects as described under Alternative A.

Paleontological Resources (no effect)
Under Alternative C, areas with high quality paleontological resources do not overlap habitat important to fish species and would therefore have no effect on fish resources.

Visual Resources (negligible beneficial)
Under Alternative C, managing VRM Class II areas as VRM Class III would allow more surface-disturbing activities. This would reduce the beneficial effects of visual resource management on fish habitat by increasing opportunities for soil and water erosion and for invasive species to get established. Active management would now occur on less than one percent of habitats important to fish species; therefore, Alternative C management of visual resources would have a negligible beneficial effect on fish resources.

Land Resources

Forest Products (moderate adverse)
Alternative C would have an adverse impact on fish resources. Management actions focus on maximizing forest product harvest and sales, and on managing forests for economic benefit and would occur on five to ten percent of habitat important to fish. Sediment flow and soil erosion associated with increased disturbance and decreased forest health would have a moderate adverse effect to fish.

Lands and Realty (moderate adverse)
Management actions that dispose of lands with water, do not acquire lands that create large blocks of BLM, or do not pursue easements for access to BLM-administered lands would not increase public access to fish resources. Lands identified for disposal under this alternative contain or could provide access to one to five percent of the fish-bearing waters in the planning area. Management actions for lands and realty under Alternative C would have moderate adverse effects on the fish resources.

Renewable Energy (major adverse)
Allowing renewable-energy development anywhere in the planning area consistent with other resource values could have an adverse effect on fish if sedimentation occurs in fish-bearing drainages. Renewable energy could be permitted under this alternative within greater than ten percent of the fish-bearing drainages in the planning area. Management actions under Alternative C would have major adverse effects on fish resources.

Rights-of-Way and Corridors (major adverse)
Allowing ROW on slopes equal to or greater than 25% and on highly erodible soils would have an adverse effect on fish from sedimentation. ROWs could be permitted, under this alternative, within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for ROWs and corridors under Alternative C would have major adverse effects on fish resources.

Travel and Transportation Management (negligible adverse)
Alternative C would continue to open stock driveways to motorized vehicle use. Stock resting in Bear Trap Meadows and on the Middle Fork Powder River removes riparian vegetation, destabilizes banks, and increases sedimentation and nutrient loads in the respective waters and would cause an adverse effect to fish in those drainages. Allowing travel up to 300 feet off

designated routes for necessary tasks if the travel would not damage resources would increase access and therefore the potential to spread invasive species and have an adverse effect on fish. Allowing motorized vehicle use in areas with saturated soils or on slopes equal to or greater than 25% consistent with travel management designations for those areas, and within habitat of special status species consistent with travel management designations for those areas could increase sedimentation have an adverse effect on fish. Overall, these actions would permit adverse effects within less than one percent of the fish-bearing drainages. Management actions for travel and transportation management would have negligible adverse effects on fish resources.

Recreation (negligible beneficial)
Managing the entire planning area as the Buffalo ERMA and designating six SRMAs (totaling 30,570 acres) would have an adverse effect on fish through an increase in OHV use and resulting sedimentation. The six proposed SRMAs contain less than one percent of the fish-bearing drainages in the planning area. The management within these areas would conserve habitats surrounding the fish-bearing waters. Management actions for recreation under Alternative C, through designation of the six SRMAs, would have negligible beneficial effects on fish resources.

Lands with Wilderness Characteristics (negligible adverse)
Under Alternative C, lands with wilderness characteristics would not have any special restriction applied and would be managed in accordance with surrounding areas. Adverse impacts to fish resources would result from increased development; however, these impacts are likely to be negligible based on low potential for mineral development, commercial timber, and renewable energy projects to be proposed in remote, road less areas.

Livestock Grazing Management (major adverse)
Not including actions to reduce or eliminate potential impacts from livestock grazing to meet regeneration objectives following timber harvests would increase sedimentation in the Billy Creek, North Fork Powder River, and Middle Fork Powder River drainages. This would have an adverse effect on fish. Basing AMP goals and objectives on livestock management only in Category I allotments, authorizing permanent increases in forage allocations to livestock grazing as the first priority, allowing increases in livestock stocking rates as a result of vegetative treatments would increase grazing use in riparian areas. This would have an adverse effect on fish by exposing all Category C and M allotments to heavier grazing pressure. Limiting or prohibiting livestock grazing only in areas where it is currently prohibited and locating livestock salt or mineral supplements a minimum of 500 feet from water sources, riparian areas, and aspen stands and providing a minimum of two growing seasons rest from livestock grazing after prescribed fire and vegetative treatments would have an adverse effect on fish due to increased sedimentation, reduced water quality, removal of riparian habitat, and transport of invasive plant species. Grazing allotments encompass greater than ten percent of the fish-bearing drainages in the planning area. All of the management actions under Alternative C for livestock grazing management would have major adverse effects on fish resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
No ACECs are proposed under Alternative C, therefore, there would be no effect to fish resources.

Scenic or Back Country Byways (no effect)
Under Alternative C, no roads would be evaluated for inclusion as scenic or BCBs.

Wild and Scenic Rivers (negligible adverse)
If Congress releases the Middle Fork Powder River from WSR designation, management will follow the management within surrounding areas. The Middle Fork Powder River drainage contains less than one percent of the fish-bearing drainages in the planning area. This would be a negligible adverse impact to fish should surrounding management allow for increased sedimentation.

Wilderness Study Areas (minor beneficial)
Under Alternative C, if Congress decides not to designate the North Fork and Gardner Mountain WSAs as wilderness, there would be beneficial effects to fish as management would be consistent for lands with wilderness characteristics until a plan amendment has been completed. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions associated with Alternative C will have minor beneficial effects on fish resources.

4.4.5.6. Alternative D

This section describes management actions under Alternative D, the preferred alternative.

Fish and Wildlife Resources – Fish (major beneficial)
Management actions for fish under Alternative D will benefit fish. Improving habitat at reservoirs and riparian areas, managing toward Desired Functioning Potential where possible, properly designing stream crossings, managing vegetation to restore perennial flows, and prohibiting surface disturbance near fish-bearing waters would improve habitats, prevent disturbance and sedimentation, maintain water quality and increase overall stream health. These actions would occur in all of the fish-bearing drainages, therefore, management actions for fish under Alternative D would have major beneficial effects on fish resources.

Physical Resources

Soil (major adverse)
Allowing surface-disturbing activities on soils without a severe erosion hazard, on slopes equal to or greater than 25%, and with reclamation potential and evaluating exceptions for areas with highly erosive soils, on slopes equal to or greater than 25%, and soils with poor reclamation potential has the potential for major adverse effects on fish from sedimentation. Waivers allow for activities to occur when mitigated appropriately for the fisheries resource. Surface disturbance associated with development of federal minerals on soils with poor reclamation potential could affect 1,514,445 acres in the planning area. Disturbances would require a reclamation plan. The intent of these plans is to avoid sedimentation. Disturbances could be permitted under this alternative within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for soil, under Alternative D would have major adverse effects on fish resources.

Water Resources (major adverse)
Under Alternative D, authorizing activities associated with the surface discharge of water produced during federal activities if erosive conditions, channel stability, soil characteristics, and other resource values would be adverse as it may still alter water quality. Allowing for on-channel stream reservoirs and surface-disturbing activities or not applying an NSO stipulation to any mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat only by exception and in consideration of other resource

values would have adverse effects on fish. For the impacts to be beneficial, the exceptions must be evaluated for site-specific impacts to wildlife and must not be granted where there would be conflicts. Disturbance, under this alternative, could be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for water, under Alternative D would have major adverse effects on fish resources.

Cave and Karst Resources (no effect)
The cave and karst resource areas identified in Alternative D do not encompass any fish-bearing drainages, therefore, management actions for cave and karst resources under Alternative D would have no effect on fish resources.

Mineral Resources

The amount of minerals extraction under this alternative would create a substantial increase in land use intensity, and would result in a greater potential for increased sedimentation, produced water discharge, spills, and changes instream morphology.

Locatable Minerals (major adverse)
Alternative D locatable minerals management would have effects on fish similar to management under Alternative B, although Alternative D would open more area (3,232,508 acres) to locatable minerals entry. Locatable minerals entry would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for locatable minerals, under Alternative D would have major adverse effects on fish resources.

Leasable Minerals – Coal (major adverse)
Alternative D impacts associated with leasable coal minerals management would be the same as under Alternative C, with 4,775,136 acres open to coal exploration. Coal exploration and development would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for coal minerals, under Alternative D would have major adverse effects on fish resources.

Leasable Minerals – Fluids (major adverse)
Alternative D impacts associated with leasable fluid minerals management would be the same as under Alternative C, with 138,558 acres open to oil and gas leasing. Fluid mineral exploration and development would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for fluid minerals, under Alternative D would have major adverse effects on fish resources.

Salable Minerals (major adverse)
Alternative D impacts associated with salable minerals management would be the same as under Alternative C, with 2,957,960 acres open to salable minerals leasing. Salable mineral exploration and development would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for salable minerals, under Alternative D would have major adverse effects on fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (moderate beneficial)
Under Alternative D, impacts to wildlife would be similar to effects under Alternative B. However, Alternative D would decrease adverse impacts through rehabilitation after fires on

an as-needed basis only; this could result in an increase in natural regeneration of riparian communities along fish-bearing waters.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Under Alternative D, forests and woodlands would be managed to meet forest health objectives using silvicultural treatments and intensive management and to reduce impacts from disease, insects, and wildfire. Methods such as cutting and thinning could adversely impact fish in the short-term, but would have an overall beneficial effect on fish resulting from improved forest health. Management actions would occur on five to ten percent of habitat important to fish, however, short-term adverse impacts will offset some of the long-term benefits, making effects to fish resources minor.

Vegetation – Grassland and Shrubland Communities (major adverse)
Alternative D effects on fish resources from management of grassland and shrubland communities would be similar to effects under Alternative C, although Alternative D would place slightly more emphasis on multiple resource values than Alternative C. Alternative D would allow desirable non-native plant species for short-term reclamation activities, which would result in effects similar to Alternative B. Desirable non-native plant persistence could increase adverse impacts to fish resources if non-native proliferation causes loss of suitable riparian habitats along fish-bearing streams.

Vegetation – Riparian/Wetland Resources (major adverse)
Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on fish by increasing sedimentation, changing hydrography, and decreasing water quality. Not identifying and managing systems capable of achieving DFC could also have an adverse effect on fish by allowing activities that impact riparian vegetation, resulting in increased water temperature and sedimentation. Impacts from the management of riparian/wetland resources will influence all of the fish-bearing streams in the planning area. Management actions for riparian/wetland resources under Alternative D would have major adverse effects on fish resources.

Invasive Species and Pest Management (minor adverse)
Allowing aerial application of pesticides could impair water quality and have a moderate adverse effect on fish populations in those waters if the chemical is inappropriately applied or it drifts into fish-bearing water. Strict adherence to pesticide labels, which is anticipated, would minimize this to minor.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative D, prohibiting surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges could decrease sedimentation and invasive species establishment in the Middle Fork Powder River, Tongue River, and Little Bighorn River, which would have a beneficial effect on fish. Protections for elk would have a beneficial effect on fish resources in the Upper Fork Powder River. Protections for identified big game ranges and raptor nests would have a beneficial effect on fish. Overall, the protective buffers for wildlife would conserve riparian vegetation within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for wildlife under Alternative D would have major beneficial effects on fish resources.

Special Status Species – Plants (negligible beneficial)
Allowing the placement of water developments and salt or mineral supplements in habitat for special status plant species would decrease water quality and increase sedimentation where these resources overlap (in Ute ladies'-tresses orchid habitat). Managing to comply with the ESA and BLM policy associated with special status plant species would have a negligible benefit to fisheries management as their occupied habitat is limited to less than one percent of the fish-bearing drainages in the planning area.

Special Status Species – Fish (moderate beneficial)
Alternative D impacts on fish from special status fish management would be similar to those under Alternative B, except that Alternative D could allow activities by exception within a 0.25-mile CSU area around naturally occurring water bodies containing native and desirable non-native fish species. For the impacts to be the same as those under Alternative B, those exceptions would have to be evaluated for the presence of special status fish species or habitat suitability and would not be granted where there would be conflicts. Special status fish-bearing streams represent five to ten percent of all of the fish-bearing streams in the planning area. Management actions for special status fish species would have moderate beneficial effects on fish resources.

Special Status Species – Wildlife (major beneficial)
Under Alternative D, protections for raptor nests, Greater Sage-Grouse, and Threatened and Endangered species would have a beneficial effect on fish. Establishing a year-round disturbance-free zone of at least 0.5 mile for riparian corridors (Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River) consistently used by bald eagles would have a beneficial effect on fish. Protections for elk would have a minor beneficial effect on fish resources in the Upper Fork Powder River. Prohibiting surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats in identified 100-year floodplains and within 500 feet of perennial waters would have a beneficial effect on fish. Protections for bald eagle and other raptor nests (1.5-miles buffer) would have the greatest potential for reducing impacts to fish-bearing waters. Overall, protections for special status wildlife species would conserve vegetation within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for special status wildlife species would have major beneficial effects on fish resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Alternative D impact types associated with cultural resources management would be the same as those under Alternative B, except Alternative D would protect 15,382 acres through cultural resources NSO restrictions and 613,601 acres through cultural resources CSU restrictions. These areas of prohibitions or restrictions would also conserve vegetation within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for cultural resources would have major beneficial effects on fish resources.

Paleontological Resources (no effect)
Under Alternative D, areas with high quality paleontological resources do not overlap habitat important to fish species and would therefore have no effect on fish resources.

Visual Resources (moderate beneficial)
Under Alternative D, effects to fish resources from management actions associated with visual resource management would be the similar to those described under Alternative B; however,

management actions would impact five to ten percent of habitat important to fish making the effects moderate.

Land Resources

Forest Products (minor adverse)
Under Alternative D, forest product harvest would be maximized within the bounds of maintaining forest health. Harvested areas would be managed for regeneration, utilizing protection techniques where needed. Although some beneficial impacts to fish from improved water quality over the long-term may result, the focus of economic return and sales will result in increased disturbance. Management actions will occur on five to ten percent of habitat important to fish; however, beneficial effects to forest health would lessen the adverse effects to some of the habitat. Overall, a minor adverse effect to fish would result.

Lands and Realty (negligible beneficial)
Under Alternative D, acquisitions and disposals could have beneficial or adverse effects on fish, depending on which lands are acquired or disposed of. Land acquisitions that block up existing BLM-administered lands would have a negligible effect on fish because most existing blocks of BLM-administered lands are not along drainages. All other lands identified for acquisition or disposal contain less than one percent of the fish-bearing drainages in the planning area. Management actions for lands and realty under Alternative D would have negligible beneficial effects on fish resources.

Renewable Energy (major adverse)
Under Alternative D, excluding renewable-energy development on 413,001 acres would have a beneficial effect on fish by avoiding sedimentation from construction. This would be particularly true in the southern Big Horn Mountains. Renewable energy would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for renewable energy under Alternative D would have major adverse effects on fish resources.

Rights-of-Way and Corridors (major adverse)
Avoiding ROW on slopes equal to or greater than 25% and on highly erodible soils would have a beneficial effect on fish. ROWs would be permitted within greater than ten percent of the fish-bearing drainages in the planning area. Management actions for ROWs and corridors under Alternative D would have major adverse effects on fish resources.

Travel and Transportation Management (negligible adverse)
Alternative D impact to fish from management of travel and transportation would be similar to those under Alternative C, except that less than one percent of the fish-bearing drainages would be closed to motorized vehicle use. Allowing travel for dispersed camping and big-game retrieval up to 300 feet off designated routes if it would not damage resources would have an adverse effect on fisheries. Management actions for travel and transportation management would have negligible adverse effects on fish resources.

Recreation (negligible adverse)
Designating seven SRMAs (totaling 54,160 acres) could have an adverse effect on fish. Allowing additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values could have an adverse effect on fish through increased fishing and the potential for increasing invasive aquatic species. Increased education would reduce these adverse impacts. Limiting motorized vehicle travel to designated roads and

trails (other than within stock driveways) consistent with other resource values would have a beneficial effect on fish. Recreation management would occur within less than one percent of the fish-bearing drainages in the planning area. Management actions for recreation under Alternative D would have negligible adverse effects on fish resources.

Lands with Wilderness Characteristics (negligible beneficial)
Approximately 6,864 acres of BLM-administered land has been identified for management of lands with wilderness characteristics under Alternative D, 2,313 acres of which occur near fish-bearing streams. Management actions include closing the area to mineral development, motorized use, ROWs, renewable energy development, commercial woodcutting, and all other surface disturbing activities not compatible with retaining natural values. Emphasizing ecosystem health and retaining natural values will retain or enhance fish habitat and would have a beneficial effect on fish resources. Management actions would occur in one to five percent of habitats important to fish, but effects would be localized, making the effects negligible.

Livestock Grazing Management (moderate beneficial)
Under Alternative D, including actions to reduce or eliminate potential impacts from livestock grazing to meet regeneration objectives following timber harvests would decrease sedimentation in the Billy Creek, North Fork and Middle Fork Powder River drainages. This would have a beneficial effect on fish. Performing baseline inventories; developing, implementing, and monitoring AMPs; and basing AMP goals and objectives in Category I and M allotments on resource protection and watershed health; considering any permanent increases in forage allocations for watershed protection, livestock grazing, wildlife habitat, and other resource values; locating livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands; designating and managing future resource reserve allotments as needed; providing rest and deferment from livestock grazing following wildfires, prescribed fires, and other vegetative treatments until resource objectives are met; and allowing increases in livestock stocking rates as a result of vegetative treatments when resource objectives are met would also have a beneficial effect on fish. Allowing livestock grazing on all public lands in the planning area, except where an evaluation has determined grazing would be incompatible with other resource uses or values, could have an adverse effect on fish due to increased sedimentation, reduced shading and bank stability, changes in water chemistry, and increased invasive plant species. Management of livestock grazing would occur in five to ten percent of the fish-bearing drainages in the planning area. Management actions for livestock grazing management under Alternative D would have moderate beneficial effects on fish resources.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
An ACEC designation at Welch Ranch on the Tongue River could have an adverse effect on that fishery. Additional human use could occur with designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and increase the risk of fire in the riparian forest. These potential issues would be mitigated through education. Designation would have beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems. The proposed ACECs would encompass less than one percent of the fish-bearing drainages in the planning area. Management actions for ACECs would have negligible beneficial effects on fish resources.

Scenic or Back Country Byways (negligible adverse)
Effects to fish resources resulting from management actions in Alternative D, will be the same as those described in Alternative B.

Wild and Scenic Rivers (negligible beneficial)
If Congress releases the Middle Fork Powder River from WSR consideration, management will continue to retain free-flowing characteristics and outstanding resource values. The Middle Fork Powder River drainage contains less than one percent of the fish-bearing drainages in the planning area. This would have a negligible beneficial effect to fish resources.

Wilderness Study Areas (minor beneficial)
Under Alternative D, if Congress decides not to designate the North Fork and Gardner Mountain WSAs as wilderness, there would be beneficial effects to fish as management would be consistent for lands with wilderness characteristics until a plan amendment has been completed. WSAs will be managed to preserve natural conditions and processes, and restrict motorized activities. These actions would occur on over ten percent of habitat important to fish species; however, WSAs are localized and few stream segments would be impacted. Management actions associated with Alternative D will have minor beneficial effects on fish resources.

4.4.5.7. Cumulative Impacts

Cumulative impacts to fish in the planning area would come from non-federal minerals development, non-BLM fire programs, and non-BLM-regulated recreation. In general, these actions can be grouped into actions that are apart from either BLM surface estate or BLM mineral estate. Most of the cold-water fisheries are on BLM or USFS lands, and actions on USFS lands would be similar to BLM actions regarding protective measures. In forested habitats of the cold-water fisheries, the greatest threat to fish is catastrophic fire and the resulting sedimentation and water temperature and chemistry changes. The Bighorn National Forest Plan addresses this threat with suppression efforts and forest health projects; however, the extent of diseased timber that could burn does represent a potential major adverse effect on fish.

Most fee minerals development has already occurred in the planning area. The potential for wind-energy projects on private lands that could affect fisheries is limited to the southern Big Horn Mountains and represents a moderate adverse effect.

Recreation off BLM surface would likely result in the transport and introduction of diseases and invasive species, which could have a major adverse effect on fish.

4.4.5.8. Conclusion

Table 4.43, “Summary of Impacts to Fish Resources” (p. 974) summarizes impacts to fish resources by alternative.

Table 4.43. Summary of Impacts to Fish Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Major beneficial	Major beneficial	Major adverse	Major adverse
Water Resources	Minor beneficial	Major beneficial	Major adverse	Major adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Cave and Karst Resources	No effect	Moderate beneficial	Moderate adverse	No effect
Mineral Resources				
Locatable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Leasable Minerals – Coal	Major adverse	Moderate adverse	Major adverse	Major adverse
Leasable Minerals – Fluids	Major adverse	Major adverse	Major adverse	Major adverse
Salable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor adverse	Moderate beneficial	Moderate adverse	Moderate beneficial
Planned Fire (Prescribed Fire)	Minor adverse	Moderate beneficial	Moderate adverse	Moderate beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Major beneficial	Minor adverse	Minor beneficial	Minor beneficial
Vegetation – Grassland and Shrubland Communities	No effect	Major beneficial	Major adverse	Major adverse
Vegetation – Riparian/Wetland Resources	Major beneficial	Major beneficial	Major adverse	Major adverse
Invasive Species and Pest Management	Moderate beneficial	Moderate adverse	Minor adverse	Minor adverse
Fish and Wildlife Resources – Fish	Minor beneficial	Major beneficial	Moderate adverse	Major beneficial
Fish and Wildlife Resources – Wildlife	Major beneficial	Major beneficial	Major beneficial	Minor beneficial
Special Status Species – Plants	No effect	Moderate beneficial	Negligible beneficial	Negligible beneficial
Special Status Species – Fish	No effect	Moderate beneficial	Moderate beneficial	Moderate beneficial
Special Status Species – Wildlife	Major beneficial	Major beneficial	Major beneficial	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	No effect	Negligible beneficial	Major beneficial
Paleontological Resources	Negligible beneficial	No effect	No effect	No effect
Visual Resources	Major beneficial	Major beneficial	Negligible beneficial	Moderate beneficial
Land Resources				
Forest Products	Minor adverse	Moderate adverse	Moderate adverse	Minor adverse
Lands and Realty	Negligible adverse	Negligible beneficial	Moderate adverse	Negligible beneficial
Renewable Energy	No effect	Minor adverse	Major adverse	Major adverse
Rights-of-Way and Corridors	Major adverse	Moderate adverse	Major adverse	Major adverse
Travel and Transportation Management	Minor adverse	Moderate beneficial	Negligible adverse	Negligible adverse
Recreation	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible adverse
Lands with Wilderness Characteristics	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Livestock Grazing Management	Major adverse	Minor beneficial	Major adverse	Moderate beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible beneficial	No effect	Negligible beneficial
Scenic or Back Country Byways	No effect	Negligible adverse	No effect	Negligible adverse
Wild and Scenic Rivers	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Wilderness Study Areas	No effect	Minor beneficial	Minor beneficial	Minor beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.6. Fish and Wildlife Resources – Wildlife

Wildlife populations fluctuate, sometimes widely, in response to natural factors such as cycles in the abundance of prey base or extremes in seasonal weather (e.g., severe winters). It is sometimes difficult to determine whether impacts to wildlife result from any specific management action or from wildlife population changes caused by natural factors. Changes in stressors (e.g., increased human presence and noise) on habitat components such as vegetation, water, soil, or air are likely to cause direct and indirect impacts to wildlife.

Actions that remove, degrade, or fragment wildlife habitat would be adverse. Actions that conserve or improve habitats, such as crucial big game ranges, raptor nest sites, or grouse habitats would be beneficial.

Direct impacts to wildlife could result from the loss of habitats or key habitat features, such as nest sites or lek areas, or from the immediate loss of life. Human activities also can directly disturb wildlife and could cause wildlife to abandon nests, leks, or their home ranges. Disturbance during sensitive periods (e.g., winter and 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 and calving big game.

Habitats can be lost and fragmented by activities such as vegetative treatments; fire and fuels management; minerals exploration and extraction; construction and maintenance of roads and trails; and development of renewable-energy resources. 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 wildlife habitats also could occur when specific actions change habitat in a way that would make it unsuitable for future habitation. Human disturbances from vehicular travel on roads, activities at drill sites or wellheads, or any other activity not associated with the natural environment (including noise from generators and compressors) can indirectly impact wildlife not accustomed to such disturbances.

Disturbance impacts range from short-term displacement and shifts in activities, to long-term abandonment of home ranges. For purposes of this analysis, short-term impacts to wildlife result from activities to which individuals or species respond immediately, but do not affect the population viability of the species. For example, many disturbance impacts are short-term because a species might temporarily abandon an area or nest, but return immediately following the cessation of the disturbance, such as a passing OHV. Short-term construction could cause an animal to abandon an area or nest, but the species is often able to return to the area and reproduce successfully the following season.

Long-term impacts to wildlife are those that would impact the viability of the population. These impacts include alteration of adequate habitats in size or health (direct loss, fragmentation, or degradation) for any or all life requirements (e.g., seasonal habitats), and activities that would affect reproductive success (e.g., activities that cause undue energy expenditure for prolonged periods, and removal of breeding grounds and nests). Human disturbance, whether from harassment or by accident, results in increased energy cost to the disturbed animal, which incurs a physiological cost through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness, survival, and reproductive potential. In addition, physical or psychological barriers lead to habitat fragmentation, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These impacts are especially problematic when they occur within limiting habitat components such as winter ranges and reproductive habitats (WGFD 2004).

4.4.6.1. Methods and Assumptions

This section describes the methods and assumptions used in the analysis of impacts to wildlife. The assumptions and methods include, but are not limited to the following:

- The BLM, in cooperation with state and other federal wildlife agencies, is responsible for managing habitat (e.g., quality, suitability, and usability), whereas state and federal wildlife management agencies (e.g., the WGFD and the USFWS) have primary authority for overseeing management of wildlife populations. Therefore, this analysis relies primarily on vegetation changes and loss of habitat use due to disruptive activities to estimate effects to wildlife habitats.
- High-quality habitats foster healthy and abundant biological communities appropriate to those habitats.
- The quality and quantity of seasonal ranges and migration corridors are generally considered to be the limiting factors on big-game populations in the planning area. The ability of these areas to support wildlife populations is a factor in determining population levels.
- Natural variability in wildlife health, population levels, and habitat conditions will continue. Periods of mild or severe weather and outbreaks of wildlife disease or insects and plant diseases that impact habitat could impact wildlife population levels.
- For each alternative, changes to vegetative types, either in quantity, quality, or increased fragmentation, are compared to baseline conditions. Adverse and beneficial impacts to vegetative types (e.g., wildlife habitats) are assumed to have a corresponding adverse or beneficial impact on wildlife species.

- Disturbance impacts to wildlife are evaluated by comparing them to current management practices in the planning area; increased protections in time or space are beneficial, reduced protections result in adverse impacts.
- Management actions aimed at benefiting specific wildlife species can have adverse or beneficial impacts on other wildlife species.
- Alternatives with more acres of wetlands restored or protected will provide a greater benefit to migratory game birds and other riparian/wetland wildlife species compared to alternatives with fewer acres of wetlands restored or protected.
- Alternatives with more acreage managed toward DPC will exhibit a correspondingly greater benefit to wildlife than alternatives managing fewer acres toward DPC. Management toward DPC is assumed to exceed the requirements of managing toward PFC.
- The more acreage of habitats protected from fragmentation, the greater the benefit to wildlife species.
- Surface disturbance causes adverse impacts to wildlife habitats. Less surface disturbance in wildlife habitats has correspondingly fewer adverse impacts to wildlife compared to more surface disturbance.
- The higher the road density and frequency of use in the planning area, the greater the potential to degrade adjacent wildlife habitat quality in the planning area.
- The exact locations of future surface-disturbing activities cannot be predicted at the RMP level. For purposes of analysis, surface-disturbing activities are assumed to occur in vegetative types in proportion to their availability in the planning area. Impact acreages for vegetative types are not absolute, but provide a means to compare relative impacts among alternatives.
- Human activity that disturbs wildlife during sensitive periods causes adverse impacts.
- "Prohibit" means specified activities or impacts to wildlife during identified periods or in designated habitat areas would not occur unless specific biological exception criteria are met.
- Prohibiting surface disturbance or occupancy is more restrictive and provides more protections for wildlife than avoiding surface disturbance or occupancy.
- All known raptor nests from the geographic information system database maintained by the BLM BFO were used in the analysis. Buffers associated with raptor nests were analyzed in accordance with USFWS recommended spatial buffers to protect nesting raptors.

4.4.6.2. Impacts Common to All Alternatives

Fish and Wildlife Resources – Wildlife (major beneficial)
Management actions common to all alternatives that would impact wildlife include: (1) developing mitigation measures for surface-disturbing and disruptive activities; (2) maintaining and improving wildlife habitats; (3) providing suitable habitat and forage to support population objectives as defined by the WGFD; (4) protecting crucial habitats; and (5) constructing new fences in accordance with BLM Fencing Handbook 1741-1. These management actions would generally have major beneficial impacts to wildlife. Preparing and implementing habitat management plans would have a long-term beneficial impact because they would maintain or improve wildlife habitat through on-the-ground improvements or control of other activities.

Human disturbance near raptor nesting sites could result in the abandonment of the nest; high nestling mortality from overheating, chilling, or desiccation when young are left unattended; premature fledging; and ejection of eggs or young from the nest. Raptors that successfully nest during a disturbance might abandon the nesting territory the following year. Responses of nesting raptors to human disturbance typically are determined by the type, duration, magnitude, noise level, and timing recurrence and frequency of activity in relation to nesting phenology.

Although some level of habituation to disturbance could occur, repeated flushing of adult raptors increases energy expenditure during foraging and decreases energy ingestion, depleting energy reserves and resulting in premature mortality during harsh conditions. Evidence suggests that some falcons, ospreys, and owls are generally more tolerant of human-induced disturbance and human environments. Golden eagles, turkey vultures, northern harriers, Cooper's hawks, and sharp-shinned hawks appear to be much less tolerant, while buteos exhibit a wide range of acceptance levels. Raptors are less tolerant of disturbance when populations of prey species are at low levels (Romin and Muck 2002).

Under each alternative, wildlife in the planning area could be disturbed by activities proposed across a variety of resource programs. Appendix G (p. 1671) lists projected surface disturbance by alternative over the life of this plan.

Physical Resources

Management actions common to all alternatives for physical resources (e.g., complying with rules and regulations and filing for water rights) that are administrative processes will have no impact on wildlife.

Air Quality (major beneficial)
Reducing dust emissions, if they are reduced throughout the entire planning area, would have minor beneficial impacts to wildlife. Dust that covers vegetation reduces the photosynthesis process, and blocks light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with gravel or scoria, if untreated, would cause large amounts of dust to be forced into the air. This dust could settle on vegetation, thereby degrading the quality of wildlife habitat. Reducing dust emissions would help maintain suitable habitat for all wildlife species. The beneficial effects would be major as this would improve habitat mostly along roads, covering greater than ten percent of habitats important to big game, trophy game, small game birds, and non-game migratory birds (five to ten percent of habitats important to small game mammals, furbearers, and non-game mammals, one to five percent of habitats important to migratory game birds and less than one percent of habitats important to raptors), therefore the management actions common to all alternatives for air quality would have major beneficial effects on wildlife in the planning area.

Soil (major beneficial)
Evaluating proposed surface-disturbing activities for effects on soil resources would have major beneficial impacts to wildlife. Inclusion of reclamation plans in any authorized surface-disturbing activity would have long-term, major, beneficial impacts to wildlife if implemented on every project as greater than ten percent of habitats important to any wildlife species will be impacted by surface-disturbing activities of some kind. The more surface disturbance on steep slopes or on highly erosive soils, the greater the potential for adverse impacts to wildlife habitats. Implementing mitigation measures to protect soils, and therefore avoid impacts to vegetation, throughout the planning area would reduce disturbance to wildlife habitats and aid in the recovery of habitat from permitted uses. Once surface disturbance occurs, the goal of interim reclamation is to avoid or minimize soils erosion. The longer the reclamation takes, the greater the adverse impacts to wildlife habitats and wildlife species.

Water Resources (major beneficial)
Management actions and allowable uses that protect surface water from impacts associated with soil erosion and pollutants are anticipated to benefit wildlife habitats. Wildlife species that use

water sources and riparian habitats benefit from management actions common to all alternatives that promote protecting, developing, restoring, and improving water sources. However, livestock use around water sources also could alter vegetative diversity in these mesic areas, potentially reducing habitat quality for a wide variety of wildlife species.

There are approximately 237 miles of riparian corridors in the planning area, all of which could support greater than ten percent of habitats important to small game birds (five to ten percent of habitats important to big game, trophy game, and raptors and one to five percent of habitats important to small game mammals, migratory game birds, predator species, furbearers, non-game mammals, and non-game migratory birds), therefore, the beneficial effects of the management actions common to all alternatives would be major.

Cave and Karst Resources (major beneficial)
Cave inventories, if performed in conformance with Washington Office Instruction Memorandum 2010-181 and in a manner that prevents the spread of bat disease and infection (such as White-nose Syndrome [WNS]), could benefit wildlife. Cave inventories include surveys for cave-inhabiting wildlife species. New information on populations could be acquired through these inventories. However, the geologic formations likely to contain caves are limited to the western edge of the planning area in the Big Horn Mountains and will provide only limited amounts of wildlife inventory information. The management actions common to all alternatives for cave and karst resources would beneficially affect greater than ten percent of habitats important to big game and trophy game, (less than one percent of habitats important to all other general wildlife species), therefore, cave inventories would have a major beneficial impact on wildlife.

Mineral Resources

Although 43 CFR 3161.2 directs the BLM to ensure that "all operations are conducted in a manner which protects other natural resources and the environmental quality," it also contains scenarios in which operators may continue to conduct activities without requesting exceptions. Many studies have shown that actions involving increased human presence adversely impact wildlife populations such as big game, raptors, and grouse.

The primary impacts to wildlife species from minerals development in the planning area are the reduction in usable wildlife habitat and disruption of migration corridors. Reductions would be particularly severe in areas with continuous surface disturbance. Subsequent crowding into non-affected areas from affected areas could have the density-dependent impact of reducing animal survival and damaging resources.

The impacts of human activity, including those related to minerals development, on wildlife include loss of habitat and forage occurring from surface-disturbing activities at any time of the year, and displacement and physiological stress as a result of human presence and activity. As reclamation and habitat succession change the habitat type, the species with more specific micro-habitat requirements could re-inhabit these areas.

Large seismic projects, particularly the use of thumper trucks, adversely impact sagebrush habitats because they provide trails for increased predator access; fragment sagebrush habitats; crush live sagebrush and understory grass and forb species; and could disrupt breeding and nesting activities of sagebrush-obligate and other wildlife species.

Energy development is anticipated to be the greatest single contributor to disturbance of wildlife habitat in the planning area. Beyond initial exploration, land clearing, and construction of

permanent aboveground structures and facilities, continued human disturbance to wildlife can occur from activities such as equipment maintenance, which is especially disruptive to wildlife during crucial periods (wintering, breeding, and nesting). Increases in wildlife mortalities are also likely to occur as a result of collisions with haul trucks.

All of the impacts associated with minerals development would be adverse to wildlife over the long term.

Locatable Minerals (moderate adverse)
Mineral development fragments vegetative communities, alters plant community structure and diversity, and alters landscapes. Potential impacts to wildlife include temporary disturbance in localized areas, temporary loss of habitat, long-term degradation of habitat, and possible direct mortality of small rodents or nesting birds. Long-term impacts would result from habitat fragmentation associated with roads, utility corridors, and construction, and wildlife avoidance of development sites and facility locations. Locatable mineral development is likely to occur in five to ten percent of habitats important to migratory game birds (one to five percent of habitats important to all other general wildlife species), therefore, the management actions common to all alternatives will have a moderate adverse effect on wildlife.

Leasable Minerals – Coal (major adverse)
Coal development occurs primarily in areas with high development potential, namely northern Sheridan and Campbell counties, and consideration may be given to areas outside this designation. These high coal development potential areas occur in over ten percent of the entire planning area and would have a major adverse impact on wildlife through habitat loss if leased and developed.

Leasable Minerals – Fluids (major adverse)
Depending on the economic feasibility of development and fluctuations in market price, and because of the extensive oil and gas reserves and existing leases in the planning area, important habitat could be lost throughout the planning area. As densities of wells, roads, and facilities increase, habitats in and near well fields become progressively less effective until most animals no longer use these areas. Although vegetation and other natural features might remain physically unaltered, many wildlife species make proportionately less use of the areas near oil and gas facilities. Animals that remain within the affected zones are subjected to increased physiological stress. This avoidance and stress response impairs habitat function by reducing the capability of wildlife to use the habitat effectively.

Elk herds in the Big Horn Mountains and in the Fortification Creek area have not yet experienced a high level of drilling activity in their crucial winter or calving ranges. Research has shown that elk are displaced out of the high-quality winter ranges during drilling and construction activities and do not return until those activities were completed. Continued development in these areas could lead not only to native winter and calving range abandonment, but also to loss of high-quality forage until habitats recover. These impacts are expected to be more severe for the Fortification Creek elk herd where mineral exploration has recently begun and is expected to continue. Impacts would be far less for elk in the Big Horn Mountains, where mineral development potential is low.

Mule deer exhibit a stress response to disturbances associated with noise and activity up to 4.65 miles from the source (Sawyer et al. 2009). The greater mobility and adaptability of these species to human activity and disturbed areas likely would prevent long-term impacts to populations; however, it is feasible that mule deer and pronghorn behavior or populations in the planning area could be altered at some level of development.

Evaporation ponds built for produced water from natural gas wells contain waters that could be highly alkaline and contain very high concentrations of salt. Waterfowl and shorebirds become attracted to these ponds and, over time, become encrusted. This can cause death from excess salts in the body from preening. Birds can drown from excess weight, or they can suffer from cold stress resulting from the loss of insulation from their feathers (USFWS 2006; Ramirez 2005).

Fluid mineral development is likely to occur in greater than ten percent of habitats important to all wildlife species, except trophy game (less than one percent), therefore management action common to all alternatives will have major adverse effects on wildlife resources.

Salable Minerals (major adverse)
Salable minerals extraction would result in direct, long-term, impacts on wildlife and associated habitat. Impacts would include displacement and disturbance of animals, removal of vegetation, and loss of habitat. The level of impacts would depend on the size of the salable minerals area and the importance of the altered habitat to wildlife. Many sand and gravel areas are associated with riverine and alluvial plains. The vegetative communities normally associated with these areas would be impacted by the extraction of salable minerals.

Cottonwood communities normally associated with these minerals would be impacted by potentially lowering the water table, resulting in loss of these communities. Eyries for nesting birds, such as great blue herons, eagles, several raptor species, and habitat for numerous waterfowl and neotropical migrants that rely on many of these communities would be lost. Many other species (e.g., big game and small mammals) also rely on these areas during winter to provide cover from the elements.

Potential salable mineral development may occur in greater than ten percent of habitats important to small game mammals, predator species, furbearers, non-game mammals, non-game migratory birds and raptors (five to ten percent of habitats important to small game birds and migratory game birds; one to five percent of habitats important to big game; and less than one percent of habitats important to trophy game), therefore, the management actions common to all alternatives will have major adverse effects on wildlife in the planning area.

Fire and Fuels Management

Fire has both direct and indirect impacts and may have either beneficial and adverse impacts on wildlife and their habitats. Generally, the impacts on habitat are much greater than the impacts on resident animals. Short-term adverse impacts from fire on resident wildlife include displacement, disruption of reproductive activities, habitat modifications and occasional mortalities. However, populations of certain species can recover quickly if suitable habitat is available. Adverse impacts to individuals are generally offset by the benefits of habitat changes for future generations.

Unplanned Fire (Wildfire) (minor adverse)
Wildlife species have adapted to survive the pattern of fire frequency, season, size, severity, and uniformity that characterized their habitat in pre-settlement times. Historically, low-intensity fires created mosaics resulting in more variability in vegetation seral stage, species composition, vertical stratification, and improved herbaceous understory. If fire frequency or severity increases or decreases from pre-settlement patterns, habitat for many species would decline. Studies have shown a reorganization of animal communities in response to fire, with increases in some species and decreases in others. In areas where fire exclusion has changed species composition and fuel arrays over large areas, subsequent fires without prior fuel modification are unlikely to restore

pre-settlement vegetation and habitat. In the last 10,000 years, fire in North American ecosystems has not operated in isolation from other disturbances or has occurred independent of human influence. Due to likely scattered nature of effects to all wildlife species in the planning area, the adverse effects of habitat removal from unplanned fire are likely to be minor.

Planned Fire (Prescribed Fire) (minor beneficial)
Prescribed fire where historical fire regimes occurred 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. Prescribed fire, hazardous fuels reduction, and WUI projects that include fire would be considered beneficial practices. Preparing plans and coordinating with adjacent land owners before prescribed or wildland fires can provide important opportunities for taking advantage of the benefits wildland fire can provide to certain desirable wildlife habitats. These three efforts, usually planned on a project-specific basis, are generally applied in the cooler seasons (spring, fall, and winter), and often involve adjacent land owners. These fires would generally be cooler than summer wildland fires and typically would not severely sterilize soils or the nutrients found in the ash of fire.

Rehabilitation and reclamation of wildfires, prescribed fires, and surface disturbance associated with fire suppression activities are integral to protect vegetative communities and watersheds from erosion and reduce the opportunity for invasive plant species to establish or expand. Management actions associated with fire will have short-term, localized, impacts to wildlife, and long-term minor beneficial impacts on wildlife across the planning area.

Biological Resources

Management actions common to all alternatives that are administrative processes (e.g., development and prioritization of plans; providing outreach and education; updating plans; and compliance with rules, regulations, and agreements such as MOUs) would have negligible to no impact on wildlife.

Management actions common to all alternatives that promote balanced management of biological resources in the planning area would promote a natural landscape, thereby promoting healthy wildlife habitats. These management actions include managing for forage enhancement and implementing cooperative IPM programs, which would have beneficial impacts to wildlife.

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities (major beneficial)
Management actions common to all alternatives that would reduce impacts to vegetative resources, by nature, would reduce impacts to wildlife habitats and would have beneficial impacts on wildlife. Vegetation inventories on all lands (grasslands and shrublands and lotic and lentic riparian/wetland systems, and evaluation of CBNG-created riparian and wetland systems for retention or reclamation) would have beneficial impacts on wildlife. Forest, woodlands, grassland, and shrubland communities contain greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to trophy game and less than one percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals), therefore, the management actions common to all alternatives will have major beneficial effects on wildlife in the planning area.

Vegetation – Riparian/Wetland Resources (major beneficial)
Restoration of disturbed sites, including split estate lands, would promote recovery of habitat function. This would have a localized, beneficial impact to wildlife. Expansion and enhancement of riparian/wetland systems and habitat would equally provide these same long-term, beneficial impacts to wildlife that inhabit riparian/wetland ecosystems. There are 296,359 acres of suitable riparian wildlife habitat on split estate (federal fluid mineral) lands and 23,831 acres of suitable riparian wildlife habitat on BLM surface. Riparian/wetland resource areas provide greater than ten percent of habitats important to big game, trophy game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to all other wildlife species), therefore the management actions common to all alternatives would have major beneficial effects on wildlife over the entire planning area.

Invasive Species and Pest Management (major beneficial)
The spread of invasive plant species contributes to loss of certain desirable wildlife habitats, increases soil erosion, reduces water quality and quantity, and reduces structural and species diversity. Controlling the spread of invasive species is necessary to maintain the carrying capacity of wildlife habitats. Comprehensive management plans, including controlling and monitoring the spread of invasive species, are anticipated to be effective in reducing the adverse impacts of invasive species. Targeting and eradicating invasive species particularly detrimental to certain wildlife habitats are anticipated to benefit wildlife. For example, salt cedar is an invasive species often found adjacent to or within water courses, wetlands, and riparian areas – habitats that are important to numerous wildlife species. If the spread of invasive species in the planning area continues, adverse impacts to wildlife habitats are anticipated to be commensurate with the amount of wildlife habitat affected.

Controlling grasshoppers and Mormon crickets on public lands would have an adverse impact to wildlife over the short term because these insects provide a food source for many wildlife species. However, controlling these pests could be beneficial to wildlife over the long term by improving vegetation health. These long-term beneficial impacts typically are localized, but occur over the entire planning area, making them major.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (major beneficial)
Impacts to wildlife from the management of activities potentially affecting native and desirable non-native fish species are not known at this time. It is difficult to predict the impacts to wildlife from these as-yet defined activities.

Managing public access to fish bearing waters and to protect crucial habitats could have adverse impacts on wildlife. Future access routes have the potential to adversely impact wildlife resources by stripping away vegetation as part of the access route creation, trampling or eliminating vegetation, compacting soils throughout the footprint of the access route, and increasing human presence. New access routes could fragment wildlife habitat. There are 30,280 acres of wildlife habitat on BLM-administered land close (165 feet) to fish-bearing waters. Constructing new fences, even in accordance with the BLM Fencing Handbook, would have the same potential adverse impacts to wildlife for the same reasons. These impacts are typically localized, but would occur on one to five percent of BLM-administered lands.

Through the NEPA and permitting processes, protecting fish habitat and special status fish species habitats, and mitigating impacts to fish and special status fish species would have beneficial impacts to wildlife. Special status fish species and non-special status fish species management actions common to all alternatives support efforts to protect and improve riparian ecosystems.

These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species; this would have beneficial impacts to other wildlife species inhabiting these riparian areas. Actions that include managing vegetation diversity and minimizing disturbances to springs and riparian zones help maintain natural landscapes. Fish and special status fish species resource areas contain greater than ten percent of habitats important to all wildlife, except trophy game and small game birds (five to ten percent), therefore, management actions common to all alternatives would have major beneficial impacts to all wildlife.

Special Status Species – Plants (major beneficial)
Implementation of actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate and reasonable and prudent measures within biological opinions for Threatened and Endangered species at this point in time, includes surface-disturbing restrictions for Ute ladies'-tresses orchids and their habitats, along with guidelines to prevent alteration of stream flow near known populations. Management actions common to all alternatives also include allowing treatments within habitat for special status plant species and within known populations that are proven to benefit the species. These actions, including the prohibitions/restrictions encompass and therefore improve or conserve greater than ten percent of habitats important to big game and trophy game (one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, the management actions common to all alternatives would have major beneficial effects on wildlife resources.

Special Status Species – Wildlife (negligible beneficial)
Avoidance areas, whether for application of broad-spectrum insecticides or for the protection of nesting bald eagles, would have a beneficial impact to general wildlife where these resources overlap. Avoidance areas for other species would, by nature, be avoidance areas for general wildlife. Avoidance areas for broad-spectrum insecticide application are unknown at this time. There are 7,710 acres of suitable wildlife habitat within 0.5 mile of bald eagle nests (federal fluid mineral estate). These impacts are typically localized impacts, but would occur on less than one percent of BLM-administered lands in the planning area, making them negligible.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (major beneficial)
Maintaining and developing relationships with Native American tribes and maintaining federal ownership of areas important to Native Americans or with significant paleontological values are administrative processes and will not impact wildlife. Other cultural resources management actions common to all alternatives, such as the stabilizing and protecting of sites, are actions that would create avoidance areas to protect cultural resources and would, by nature, be avoidance areas for wildlife habitats. Avoidance areas for cultural and paleontological resources would conserve greater than ten percent of habitats important to all wildlife species in the planning area, except raptors (five to ten percent) and migratory game birds (less than one percent), therefore, management actions common to all alternatives for cultural and paleontological resources would have major beneficial effects on wildlife in the planning area.

Visual Resources (major beneficial)
Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect grassland and shrubland communities and other wildlife habitats. VRM Class III and IV areas have minor limitations. Managing visual resources would indirectly affect wildlife habitats, depending on the locations, types, and durations of approved projects.

Beneficial effects under the management actions common to all alternatives would occur on greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species), and would therefore, be major effects.

Land Resources

Forest Products (minor adverse)
Vegetative treatments, such as silviculture, are used to manage forests. This management can impact wildlife habitats. Forest clear cuts alter wildlife habitats more than any other silviculture treatments because they set plant succession back to an early stage, disturbing soil, altering microclimate conditions, and completely removing forest habitats. In all timber management activities, the practice of leaving dead and dying trees, trees with heart rot, and other standing unmerchantable timber would meet the ecological needs of numerous species, including woodpeckers, owls, and neotropical bird migrants. Forest management actions that replicate natural historical disturbance regimes instead of or in addition to managing forest products are anticipated to benefit wildlife habitats.

Potential short-term impacts on elk from forest management include loss of security habitat and calving cover and displacement of elk to other portions of the habitat. Displacement of elk has been detected as far as four miles from areas of summer logging activity. Timber harvest also would have long-term impacts on security cover. Timber harvest practices could lead to increased human presence, wildlife harassment, and increased hunting vulnerability in elk habitats.

Personal use of forest products by the public could have major adverse impacts on wildlife. Access routes to retrieve the forest products have the potential to adversely impact wildlife habitat by stripping away vegetation as part of the access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access route. There are 16,234 acres of suitable wildlife habitat on BLM-administered lands that also containing forest products. The impacts identified above are typically localized, but due to the lack of overlap (one to five percent of BLM-administered lands in the planning area), when projected over the entire planning area, adverse impacts would be minor.

Prohibiting timber harvest and recreational camping within 200 feet of surface water sources would create avoidance areas to protect surface water resources; these also would be avoidance areas for wildlife. There are approximately 5,584 acres of suitable wildlife habitat on BLM surface within 200 feet of surface water resources. These beneficial impacts are typically localized, but would occur on more than ten percent of BLM-administered lands in the planning area.

Lands and Realty (major beneficial)
Lands acquisitions, pursuit of easements, and tenure adjustments would improve management of public lands overall. Impacts to the vegetation would vary depending on the type of action and would be project specific. Lands and realty actions would have indirect beneficial impacts on wildlife. Effects would be minor for individual projects but could be moderate to major if a large acquisition was pursued and completed. Vegetation on land proposed for disposal, exchange, or acquisition would be directly impacted by this action due to a change in ownership and management. Land exchanges and acquisitions could provide opportunities for the BLM to manage more land in a manageable land pattern to promote healthy habitats for those species, thus providing greater benefits to those species. Lands available for tenure adjustments contain greater ten percent of habitats important to small game mammals, predator species, furbearers,

and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to big game, trophy game and migratory game birds), therefore, the beneficial effects from management action common to all alternatives on wildlife would be major.

Renewable Energy (negligible adverse)
Potential renewable-energy development would include site development, utility corridors, and access routes that would have direct and adverse impacts to wildlife habitats. If renewable-energy sources such as wind are developed in the planning area, there would be direct and indirect impacts on wildlife. Direct impacts would include disturbance during construction and maintenance activities, mortality due to bird strikes on wind towers, and mortality of small, less mobile animals such as small mammals or nestling birds during construction. On the basis of mortality estimates at existing wind-energy projects in the western United States, the mid-range expected for passerine mortality would be approximately 1.2 to 1.8 birds per turbine per year (BLM 2005c). Wind-energy facilities would be sited to minimize bird strikes. Indirect impacts would include minor loss of habitat due to facility construction. Little renewable-energy development is anticipated on BLM-administered lands in the planning area, so actual impacts would be minimal and would not impact wildlife populations. Because the potential for renewable-energy projects in the planning area is low, adverse impacts on wildlife would be negligible.

Rights-of-Way and Corridors (major adverse)
ROW and corridors in the planning area would impact wildlife in various ways. For example, utility poles benefit raptors and other birds by providing perching or nesting structures; however, these same utility structures can cause raptor mortality through electrocution and collisions (Romin and Muck 2002). In addition to raptors, other species, such as ravens, crows, magpies, small flocking birds, and wading birds, are subject to electrocution by utility structures (Romin and Muck 2002). Erecting artificial nest platforms on utility structures could benefit birds such as osprey, eagles, and hawks, and nest boxes constructed on utility structures could benefit cavity-nesting birds (e.g., bluebirds) and bats (Romin and Muck 2002).

There would be habitat loss, degradation, fragmentation, and species displacement from approved linear features (e.g., powerlines, roads, and pipelines) and other permitted facilities. Linear ROW features could fragment habitat and disturb vegetation; increase erosion; and degrade the quality of riparian areas, watersheds, and habitats if features cannot be avoided or impacts mitigated. Impacts from buried pipeline construction could last from 30 to 40 years or more, depending on the time required for full reclamation of predisturbance vegetation, including sagebrush. The length of time of wildlife displacement would depend on the timeliness and effectiveness of reclamation efforts. Impacts from ROW-approved actions such as powerlines and communications sites would include increased injury to and death of bats, raptors, and other migratory birds as a result of collisions.

The designation of corridors for utility ROW, the construction of new ROW projects adjacent to existing projects, a developmental plan to concentrate communications sites, approval of ROW to access private lands, and a transportation management system would reduce the number of acres disturbed for these types of management actions. Acres disturbed would be directly and adversely impacted over the long-term (life of the projects). Concentrating these disturbances would reduce these adverse impacts to wildlife by reducing the potential for fragmentation.

Potential ROW and corridor development could be permitted within greater than ten percent of habitats important to all wildlife species in the planning area, except migratory game birds

(one to five percent), therefore management actions common to all alternatives would have major adverse effects on wildlife resources.

Travel and Transportation Management (major adverse)
Roads and associated traffic have the greatest impact to wildlife and wildlife habitats. Roads remove vegetation and disturb soil when they are constructed and thereafter. Impacts to wildlife include mortality, habitat loss, and reduced habitat connectivity. Wildlife mortality and loss of habitats due to road construction are direct impacts; vehicle speeds and traffic volumes generally increase the mortality of wildlife due to wildlife collisions with vehicles. Road construction also causes habitat loss by converting wildlife habitats to permanent road surfaces and ROW. In addition, because roads typically are void of vegetation and exhibit impervious surfaces 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. Roads also contribute to habitat fragmentation and can be barriers to some wildlife species. There are typically two wildlife responses to roads and their associated disturbances - avoidance of roads and numerical reductions in wildlife populations.

Inventory and evaluation of all existing roads and trails into one transportation plan would designate those to be upgraded, maintained, or abandoned. These actions would reduce erosion, protect and stabilize soils and vegetation, and reduce opportunities for invasive plants and weeds to establish. Restricting motorized vehicles and implementing temporary closures would contribute to stabilizing soils and reducing erosion. All new roads would be designed to minimize surface disturbance and surface runoff and erosion potential. Constructing new roads and trails have a direct, long-term adverse impact on wildlife. Roads and trails for motorized vehicles result in localized direct and adverse impacts on wildlife habitats, such as reducing vegetation cover and density and changing community compositions. Reclaiming abandoned roads and trails with appropriate herbaceous and shrubby vegetation and upgrades on utilized roads would promote soil stabilization and reduce opportunities for erosion and for invasive plant and weed species to establish; this would have a direct beneficial impact on wildlife over the long term.

Overall, travel and transportation actions would be conducted within greater than ten percent of habitats important to big game, trophy game, small game birds, and non-game migratory birds (five to ten percent of habitats important to small game mammals, predator species, furbearers and non-game mammals, one to five percent of habitats important to migratory game birds, and less than one percent of habitats important to raptors), therefore having major adverse effects to wildlife over the long term.

Recreation (minor adverse)
Although many recreational activities are nonconsumptive, they can impact wildlife and their habitats. Increased human presence could result in habitat or water quality degradation or wildlife disturbance (e.g., dispersal or avoidance). If recreation activities took place in non-crucial habitats or during seasons when sensitive wildlife species are not present and in compliance with recreation management actions, impacts likely would be minimal. During seasonally sensitive periods (e.g., winter, calving, breeding, nesting, and early brood rearing), recreation activities could significantly alter animal behavior and result in increased winter mortality or lowered reproductive success. In areas that are repeatedly used for camping sites, there could be minor, site-specific degradation of habitats.

The installation of recreation facilities, particularly in new areas, could disturb habitat during construction, permanently alter habitat, or lead to increased human presence that could disturb

wildlife. Animal avoidance of developed areas would be similar to that for any other types of development in wildlife habitat.

In addition to the stressors from BLM-permitted activities, game animals (big game, small game, furbearers, and game birds) are hunted seasonally. Pursuit of game animals during hunting seasons could present additional short-term stressors. Hunting seasons vary from weeks to months, depending on the game species, and are designed to harvest animals to maintain established population objectives or maintain populations at or below sustainable habitat thresholds (carrying capacity). Though the BLM has no jurisdiction over hunting as a whole, use of BLM-administered lands for the purpose of hunting is promoted.

In general, OHV management decisions that result in increased human presence would have a localized impact on wildlife. Impacts would include increased displacement of wildlife, increased stress during critical periods, and degradation of habitats. The greater area and the higher the density of OHV use, the more adverse impacts to wildlife habitats. OHV use can alter the seasonal use patterns of many wildlife species. The use of over-snow vehicles on winter range could lead to excessive wildlife disturbance and cause additional stress, more rapid depletion of fat (energy) reserves, and in extreme cases, death. New roads created from the extensive use of OHVs could provide access to areas that normally do not experience human presence; degrade habitat through vegetation loss; provide access for predator species and create competition for species; and compact soil, which would cause accelerated erosion or prevent water infiltration.

Development of recreation opportunities, trails, maintenance of established sites, facility construction, and designating trails to caves all have the potential to adversely impact wildlife habitats. Recreational use of caves containing suitable bat habitat and development of cave management plans would consider the strategy described in Washington Office Instruction Memorandum 2010-181, reducing the threat of WNS spread.

Recreation management actions would occur within one to five percent of habitats important to big game, trophy game, small game mammals, predator species, furbearers and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, management actions common to all alternatives for recreation would have minor adverse effects on wildlife.

Lands with Wilderness Characteristics (minor beneficial)
Identified and designated areas would be managed to maintain suitability for preservation as wilderness. This management would help maintain or improve wildlife habitat by limiting surface disturbance. Closing or limiting motorized vehicles to designated roads and trails would have a beneficial effect on wildlife. Avoidance areas for other resource concerns would also be avoidance areas for wildlife. Lands with wilderness characteristics could potentially occur in one to five percent of habits important to small game mammals, predator species, furbearers and non-game migratory birds, (less than one percent for all other wildlife species) therefore, management actions common to all alternatives for lands with wilderness characteristics would have minor beneficial effects on wildlife in the planning area.

Livestock Grazing Management (minor adverse)
Impacts to wildlife habitat from livestock grazing include competition for forage and water and habitat use and alteration. Livestock driveways impact wildlife habitats because they reduce vegetation and compact soils. Stock driveways tend to concentrate high levels of livestock use that can cause significant degradation (e.g., near-complete removal of vegetation and soil compaction). These areas no longer provide forage or shelter, but could be used as wildlife

movement corridors. Late-season grazing can remove residual vegetation that would be necessary on big game winter ranges. Livestock grazing also can enhance forage and brood-rearing conditions for wildlife species. Wildlife could favor regrowth areas previously used by cattle because of the resultant increase in forage palatability. Historic and current trailing of livestock on the established stock driveways can contribute to soil disturbance, trampled vegetation, deposited manure, loss of plant cover, and localized areas dominated by annual, invasive, and other weed species. The major stock driveways (The Slip, Trabing Road, and Hazelton Road) are designated county roads; therefore, trailing contributes only a small portion of adverse impacts. Trailing is also short term, occurring only 2 to 3 weeks in spring and fall.

Improper livestock grazing management could adversely impact stabilization of riparian vegetation, which can lead to stream instability and an associated loss of habitat complexity, and the loss of shading vegetation, which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris. The degree of adverse impact, if any, would depend on livestock grazing timing and intensity, site characteristics, and species habitat requirements. Early spring and late summer are periods when livestock are most likely to utilize shrubs, thereby reducing their availability to wildlife species. Browsing of shrubs could reduce their competitive ability against grasses, which could increase abundance and vigor of the herbaceous understory.

Livestock grazing in fall or early spring would remove the residual herbaceous understory and reduce its vertical structure, which reduces the visual security for upland nesting birds. This could lead to increased predation and lower nesting success. Removing residual cover could also hasten spring green-up of the herbaceous understory, providing quality forage for wildlife coming out of stressful winter conditions.

Livestock range improvements designed to alter grazing distribution and use of pastures, such as fences and water developments, would affect wildlife. Big game species use mineral supplements placed for livestock use. However, livestock fences create travel barriers, create stress, and could lead to decreased reproductive success (especially when constructed in big game migration corridors) and death from entanglement. Well planned, appropriate, range improvements may benefit wildlife by improving livestock management and distribution.

Placing water development projects for livestock in certain areas could lead to a redistribution of livestock on crucial winter ranges not previously used by livestock. This could lead to increased competition between livestock and big game for forage on crucial winter ranges. Water developments maintained throughout the year can be beneficial to wildlife where other water sources are limited. Properly distributed water developments can be used to facilitate rotational or other livestock grazing systems to improve rangeland health and provide better forage for wildlife. Well-designed water developments (reservoirs) and associated riparian vegetation create nesting, feeding, and brood-rearing habitat for waterfowl and other migratory birds. The development of water sources in dry regions would allow wildlife use to expand into habitats that previously were used only seasonally. Dispersion of wildlife to access water sources reduces potential impacts from predators; however, livestock use around water sources also could alter vegetative diversity in these mesic areas, potentially reducing habitat quality for a wide variety of wildlife species.

Beneficial impacts of proper grazing include reducing competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removing wildfire fuels; and controlling invasive plant and weed species with properly timed grazing rotations and species

(e.g. goats). Rangelands provide open space and habitat for many wildlife species. Prolonged grazing during the growing season or summer months could reduce the vigor of desired species, change species richness, and increase the potential for invasion by annual grasses and invasive plant and weed species. Although there are BLM surface lands in the grazing allotments, most parcels are small and cannot be meaningfully managed for wildlife habitats. There are 779,034 acres of BLM surface in grazing allotments in the planning area, all of which are likely to support various wildlife species.

Overall, livestock grazing management would have minor adverse impacts on wildlife.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Prohibiting surface-disturbing activities and implementing land use restrictions in ACECs would limit the extent of surface disturbance. This would have a direct beneficial impact on wildlife over the long term because it would minimize the potential for adverse impacts on habitat. ACECs could encompass as much as one to five percent of habitats important to big game, trophy game, small game mammals, predator species, furbearers, and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, management actions common to all alternatives for ACECs would have minor beneficial effects on wildlife species in the planning area.

Scenic or Back Country Byways and Wild and Scenic Rivers (negligible adverse)
Scenic or BCBs and WSRs would be managed to maintain or enhance their natural characteristics. These management actions would directly benefit wildlife over the long term. Although such areas could increase in popularity and increase impacts from human presence, impacts would be minimal. These actions would have a negligible effect on vegetative resources. Due to the large amounts of suitable wildlife habitat in the planning area and the localized impacts of Scenic or BCBs and WSRs, impacts to wildlife would be negligible.

Wilderness Study Areas (moderate beneficial)
Management actions for WSAs would have beneficial impacts on wildlife habitat. WSAs would be managed to emphasize primitive, nonmotorized activities to maintain existing natural values. Management of WSAs would prohibit surface-disturbing activities and implement land use restrictions, which would limit the extent of surface disturbances. WSAs could encompass as much as five to ten percent of habitats important to big game (one to five percent of habitats important to trophy game and small game birds and less than one percent of habitats important to all other wildlife species), therefore, management actions common to all alternatives for WSAs would have moderate beneficial effects on wildlife species in the planning area.

Socioeconomic Resources

Social and Economic Conditions (no effect)
Management actions common to all alternatives are administrative processes and will have no effect on wildlife resources. Impacts to social and economic resources will be quantified on a project specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section

Health and Safety (major beneficial)
Management actions common to all alternatives are designed to control and mitigate threats

to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials would have beneficial impacts to wildlife habitat by protecting riparian and upland areas. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or upland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts. Reclaiming abandoned mines would have indirect beneficial impacts on wildlife habitat on affected sites over the long term, although there would be short-term displacement of wildlife occupying those mines.

Only management actions in Common to All Alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.6.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes management actions and potential impacts to wildlife from implementing Alternative A.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative A, only habitats currently designated as crucial seasonal wildlife habitat (75,175 acres of crucial elk habitats, 27,222 acres of big-game priority migration corridors, and 1,195,815 acres within biologic buffers for raptor nests) would be protected. There is a moderate probability that habitat loss, increased physiological stress, and lower reproduction and survival would occur in priority wildlife populations because of the extensive land use now occurring in the planning area.

Seasonal restrictions on land uses would benefit wildlife by preventing disturbance during critical winter and calving periods. These seasonal restrictions would not prevent activities, but merely delay them. Seasonal restrictions alone are not sufficient to reduce impacts to many wildlife species; therefore, Alternative A couples additional disturbance-free buffer zones with these restrictions. This would have a long-term beneficial impact on wildlife. Other long-term beneficial impacts would result from restrictions on access roads, pipelines, and powerlines to corridors and from piping oil and gas products out of crucial winter range for elk.

Wildlife also would benefit from prohibiting surface occupancy for oil and gas activities, restricting off-road vehicle activities in big-game winter ranges and elk calving areas, retaining sufficient escape and foraging habitat adjacent to timber cutting units, and exchanging or selling scattered parcels of public land areas could be blocked up into manageable units. From past experience, it is estimated that restrictions on oil and gas exploration, ROW, and other surface-disturbing activities through wildlife seasonal or NSO stipulations are inconsistently applied. Futhermore, under Alternative A, the authorized officer may waive prohibitions and restrictions without defined criteria; this has resulted in inconsistent application of management and has not been effective in protecting wildlife.

Management actions under Alternative A are generally expected to maintain existing conditions for big game in the planning area. Black bears are impacted by management actions in forest and woodland habitats; these management actions generally are not focused on providing habitats for black bears or mountain lions. Although there are no specific management actions for

mountain lions under the alternatives, mountain lions benefit from management actions for mule deer and big-game habitats.

Under Alternative A, there are no specific management actions for furbearing animals, predators, small game, or nongame mammals, but these species are impacted by other management actions. Badger and bobcat are habitat generalists and are therefore, are impacted by actions in a variety of habitats. The BLM does not perform any specific habitat management activities for predatory animals. Regardless, BLM management actions for wildlife habitats would affect predatory animals. All of these animals are largely habitat generalists and would be impacted by actions for a variety of habitat types.

Under Alternative A, the BLM preserves, protects, and restores natural function in riparian areas. Alternative A does not allow surface disturbance within 500 feet of riparian and wetland areas, which benefits beaver, muskrat, and mink. Although there are no specific management actions for migratory game birds, these species are impacted by other biological resource management actions, particularly those pertaining to water and riparian and wetland habitats for waterfowl. Under Alternative A, the BLM manages riparian and wetland areas to preserve natural functions and implements buffers in these areas and within 100-year floodplains and perennial streams where surface disturbance should be avoided; this benefits migratory game birds.

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

Physical Resources

Air Quality (negligible beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (habitat conservation). Under Alternative A, though, modeling and monitoring would be conducted only on a project-specific basis. The lack of direct management under Alternative A would make the beneficial effects to wildlife resources negligible.

Soil (minor beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for soil (habitat conservation). Surface-disturbing prohibitions and restrictions apply to areas of severe erosion hazards and areas having poor reclamation suitability. Under Alternative A, though, these prohibitions and/or restriction can be waived by the authorizing officer without specifying criteria that must be met for the waiver. In addition, these prohibitions/restrictions are considered only on a project-specific basis. Soil resource conservation under Alternative A would occur in greater than ten percent of habitats important to all wildlife species, except migratory game birds, therefore, soil management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Water Resources (minor beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for water (habitat conservation and improvement). Prohibition of surface disturbance within 500 feet of most water sources can be waived by the authorizing officer under Alternative A, and all other management is considered on a project specific basis only. Water resource management under Alternative A would occur in greater than ten percent of habitats important to small game birds, (five to ten percent of habitats important to big game, trophy game, and raptors and one to five percent of habitats important to all other wildlife species) therefore, water management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Cave and Karst Resources (minor beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cave and karst resources (habitat conservation). Management of cave and karst resources is considered on a project-specific basis only. Cave and karst resource conservation under Alternative A would occur in greater than ten percent of habitats important to big game and trophy game, (less than one percent of habitats important to all other wildlife species) therefore, cave and karst management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Mineral Resources

Locatable Minerals (major adverse)
The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable minerals (habitat loss, fragmentation, and degradation). Locatable mineral development under Alternative A would be restricted (game ranges only) in one of habitats important to all wildlife species, except non-migratory birds and raptors (less than one percent). This means that locatable mineral development would be permitted in greater than ten percent of habitats important to all wildlife species in the planning area. The adverse effects would be major.

Leasable Minerals – Coal (major adverse)
If coal lease applications were approved, appropriate mitigation measures would be developed. Depending on the scale and location of the disturbance to crucial wildlife habitats, effects could be more immediate. The development area for coal has been predicted to remain around current proposals and active mines. Coal development under Alternative A would occur in greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (less than one percent of habitats important to all other wildlife species); therefore, coal resources management actions under Alternative A would have major adverse impacts on wildlife resources.

Leasable Minerals – Fluids (major adverse)
The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid minerals (habitat loss, degradation and fragmentation). Fluid mineral development under Alternative A would be permitted in greater than ten percent of habitats important to big game, small game birds, migratory game birds,

non-game migratory birds, and raptors, (less than five percent of habitats important to all other wildlife species) therefore, fluid mineral management actions under Alternative A would have major adverse effects on wildlife resources.

Salable Minerals (major adverse)
The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable minerals (habitat loss, degradation and fragmentation). Salable mineral development under Alternative A would be permitted in greater than ten percent of habitats important to non-game migratory birds and raptors, (five to ten percent of habitats important to small game birds and migratory game birds, one to five percent of habitats important to big game, and less than one percent of habitats important to all other wildlife species) therefore, salable mineral management actions under Alternative A would have major adverse impacts on wildlife species.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse)
Fire suppression removes vegetation and disturbs soil, and can have both short-term and long-term impacts to wildlife habitats. For example, using heavy equipment to construct fire lines can cause habitat loss, degradation, and fragmentation over the short term. Moreover, if not rehabilitated, these fire lines can cause erosion and provide opportunities for the spread of invasive species, thereby resulting in long-term adverse impacts to wildlife habitat. Therefore, timely rehabilitation following fire is important to maintaining the quality of wildlife habitats. Fire suppression agents contain chemicals that can be detrimental and poisonous to macroinvertebrates, which are a necessary food source for numerous wildlife species. Some of these fire suppression chemicals also are directly poisonous to some wildlife species. Due to the likely scattered nature of effects to all wildlife species in the planning area, the adverse effects of habitat removal from unplanned fire are likely to be minor.

Planned Fire (Prescribed Fire) (major adverse)
Long term, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 14,000 acres from BLM actions. All acres are expected to be successfully reclaimed. All fires are suppressed; priority is given to areas with high value resources or where fires may spread to other land ownerships. Some types of suppression equipment is restricted in some areas, though not specified in this alternative. All fire and suppression damage is rehabilitated under Alternative A and vegetation treatments are used to support vegetation and wildlife habitat objectives. Prescribed fire under Alternative A is planned within greater than ten percent of habitats important to big game, trophy game, small game birds, and non-game migratory birds (five to ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals, one to five percent of habitats important to migratory game birds, and less than one percent of habitats important to raptors), therefore, prescribed fire management actions under Alternative A would have major adverse effects on wildlife resources.

Biological Resources

Alternative A actions that promote balanced management of biological resources in the planning area would promote a natural landscape, thereby promoting healthy wildlife habitats. These management actions include such things as managing vegetative resources for special status

wildlife species, and controlling invasive species, which would have major beneficial impacts to wildlife habitat. There are 782,102 acres of BLM surface in the project area, all of which are assumed to provide suitable wildlife habitat for various wildlife species. Under Alternative A, the authorized officer may waive management actions without defined criteria, which has resulted in inconsistent application of management and has not been effective for protecting wildlife. Any beneficial effects that may be encountered through the use of habitat conservation measures are likely to manifest on half the anticipated scale as a consequence of their inconsistent application.

Vegetation – Forests and Woodlands (moderate beneficial)
Forest management practices, which convert late-seral stage stands to early and mid-seral, would adversely affect wildlife adapted to late-seral forest types. Under Alternative A, vegetation treatment would be designed to meet overall resource management objectives and diseased old growth and overstocked forests would be managed in accordance with the Healthy Forest Restoration Act (HFRA). These actions would both promote the natural health of the forest and woodlands communities and would be beneficial to wildlife resources depending on them. Forest and woodlands contain five to ten percent of habitats important to big game and migratory game birds, (one to five percent of habitats important to trophy game and small game birds and less than one percent for all other wildlife species) therefore; management actions under Alternative A would have moderate beneficial effects on wildlife resources.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat conservation and improvement). Under Alternative A, grassland and shrubland community conservation and improvements would occur in five to ten percent of habitats important to big game and migratory game birds (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species) therefore, grassland and shrubland management actions under Alternative A would have moderate beneficial impacts on wildlife resources.

Vegetation – Riparian/Wetland Resources (minor beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for riparian/wetland resources (habitat conservation and improvements). Prohibition of surface disturbance within 500 feet of most water sources can be waived by the authorizing officer under Alternative A, and all other management is considered on a project-specific basis only. Under Alternative A, riparian/wetland conservation and improvements would occur in greater than ten percent of habitats important to small game mammals and birds, predator species, furbearers, non-game migratory birds, and raptors. (five to ten percent of habitats important to all other wildlife species) therefore, riparian/wetland management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level and specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Invasive Species and Pest Management (moderate adverse)
The types of effects from Alternative A would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for invasive species and pest management (habitat loss and degradation). Noxious weeds would be controlled only on public lands and in cooperation with county weed and pest districts. Under Alternative A, invasive species and pest management would occur in five to ten percent of habitats important to small game birds and

migratory game birds, (one to five percent of habitats important to big game and non-game migratory birds and less than one percent of habitats important to all other wildlife species) therefore, invasive species and pest management actions under Alternative A would have moderate adverse effects on wildlife resources.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (major adverse)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for fish (habitat improvements). Alternative A management dictates that reservoirs and riparian areas are sometimes maintained to improve or enhance fisheries. Fish habitat improvements would occur in greater than ten percent of habitats important to big game and migratory game birds (five to ten percent of habitats important to trophy game and small game birds, one to five percent of habitats important to non-game migratory birds and less than one percent of habitats important to all other wildlife species) therefore, fish and special status species fish management actions under Alternative A would have major adverse effects on wildlife resources.

Special Status Species – Plants (minor beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status plant species (habitat conservation and improvement). Management of special status plant species is considered on a project-specific basis only. Under Alternative A, special status plant conservation would occur in greater than ten percent of habitats important to big game and trophy game (one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, special status plant species management actions under Alternative A would have major beneficial impacts on wildlife resources. Without oversight on a programmatic level, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Special Status Species – Wildlife (major adverse)
Under Alternative A, special status wildlife species habitat management complies with ESA and BLM policy. Greater Sage-Grouse management includes requiring anti-perching devices on new powerlines within 0.5 mile of occupied Greater Sage-Grouse leks and nesting habitat; surface disturbing and occupancy restrictions within 0.25 mile of Greater Sage-Grouse leks and a 1.75 mile TLS outside of that. Bald eagle management allows for a 0.5 mile year-round disturbance-free buffer zone around nest sites and a TLS up to a mile from the nest. Raptor nest protection involves a biologic buffer disturbance or occupancy zone around active nests. Under Alternative A, though, these prohibitions and/or restriction can be waived by the authorizing officer without specifying criteria that must be met for the waiver. Special status wildlife prohibitions/restrictions would also conserve greater than ten percent of habitats important to all general wildlife, except big game and trophy game (five to ten percent), therefore, special status wildlife species management actions under Alternative A would have major beneficial impacts on wildlife resources. Without specified criteria for waiving these restrictions, though, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Heritage and Visual Resources

Cultural Resources (major beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cultural resources (habitat conservation). NSOs

are currently applied to the Bozeman Trail and Crazy Woman Battle Site only. These restrictions would be beneficial to any wildlife habitats they encompass. All other management of cultural resources is considered on a project specific basis. Under Alternative A, cultural resource protection would occur in greater than ten percent of habitats important to big game and trophy game (one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, cultural resource management actions under Alternative A would have major beneficial impacts on wildlife resources.

Paleontological Resources (negligible beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for paleontological resources (habitat conservation). Management of paleontological resources is considered on a project specific basis. Under Alternative A, paleontological resource protection would occur in less than one percent of habitats important to all wildlife species; therefore, cultural resource management actions under Alternative A would have negligible beneficial impacts on wildlife resources.

Visual Resources (no effect)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for visual resources (habitat conservation). There are no additional impacts anticipated from Alternative A management actions for visual resources for any specific wildlife species in the planning area.

Land Resources

Forest Products (minor beneficial)
The layout and timing of timber sales would largely determine the degree of impacts to wildlife. Forest management actions could impact feeding, breeding, and sheltering of raptors and other forest-dependent species. Habitat fragmentation and degradation, increased human presence, and habitat access by competitor species that normally cannot use these areas all could have an effect on these species, depending on whether the action is a harvest or thinning, where the access roads are constructed, the type of equipment used, and the rate of habitat rehabilitation. Projected over the entire planning area, the estimated occurrence of overlap would occur within one to five percent of habitats important to big game, trophy game, and migratory game birds (less than one percent for all other wildlife species); therefore, forest products management actions under Alternative A would have minor beneficial impacts on wildlife resources. Fencing of these regeneration areas would help allow the natural succession to return to each of the seral stages and promote the growth of suitable wildlife habitat.

Lands and Realty (major adverse)
Land tenure adjustments could impact wildlife, depending on the future use of the habitat. Even uses that maintain open spaces could have an impact if the habitat is altered. Approximately 117,427 acres have been identified as suitable for future consideration for disposal.

Disposing of all acres that meet the FLPMA disposal criteria could fragment sensitive habitats. Exchanging parcels rather than using other disposal methods could ensure that sensitive habitats remain secure, prevent further fragmentation, and address management gaps caused by isolated private landholdings. Disposing of or exchanging parcels with riparian/wetland and aquatic resources could reduce available habitat for various species. An exchange could be beneficial if the acquired habitat is high quality and has a diversity of wildlife.

Land acquisitions could increase the overall quantity or quality of wildlife habitat in the planning area. Land exchanges to acquire state and private lands in crucial habitats in important and predominantly federal management areas likely would result in long-term habitat sustainability. Lands available for tenure adjustments under Alternative A contain greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore management actions for lands and realty under Alternative A would have major adverse effects on wildlife resources.

Renewable Energy (negligible adverse)
Alternative A allows wind-energy development throughout the planning area, which would create collision hazards for bats and numerous avian species. Large wind-energy fields also involve surface disturbance, which could permanently change the habitat structure of the wildlife inhabitants. Management without defined criteria and evaluating renewable-energy projects on project-specific basis has resulted in inconsistent application management and mitigation and has not been effective.

At this point in time, renewable energy development potential in the planning area is low. Given this overall rating, it is not likely that if it were to occur, it would occur on a large scale. Renewable energy, where it might conflict with wildlife habitat or travel corridors would have adverse effects on wildlife.

Rights-of-Way and Corridors (major adverse)
Under Alternative A, routing linear ROW (e.g., pipelines, powerlines, and roads) where impacts would be least disturbing would help to minimize fragmentation of sensitive habitats. However, habitat fragmentation would still occur as more ROW are located and developed or as an existing ROW corridor is expanded. Restricting locations and heights of communications towers would reduce impacts on migratory birds, including collisions during periods of low visibility. Though these mitigations are implemented, ROW occur in conflict with wildlife and habitat throughout the planning area. Currently, ROWs are permitted within greater than ten percent of habitats important to all wildlife species, except migratory game birds (one to five percent). Due to the scale of habitat fragmentation projected over the entire planning area, these adverse impacts would be major.

Travel and Transportation Management (major adverse)
Under Alternative A, there would be direct and indirect impacts on wildlife from travel management and OHV use. OHV use removes vegetation, disturbs soil, and transports invasive species, all of which degrade wildlife habitats. Higher, rockier terrain and remote areas are becoming more accessible over time as OHVs become more sophisticated and powerful, and as the human population in the planning area increases. In addition to the direct effects of vegetation removal and soil disturbance, disturbance to wildlife associated with OHV use includes movement and noise from vehicles and riders. This activity can cause noise that adversely impacts wildlife by increasing stress, can increase poaching, and can result in direct wildlife mortality from collisions with OHVs. By designating areas where OHV use is limited to designated roads and trails, these impacts can be reduced. In areas where motorized vehicle use is closed for only portions of the year, the closures would not have as great a benefit to wildlife as would a year-round closure. Allowing surface occupancy during any time of year would have an adverse impact to wildlife habitat. Current management protects resources in some areas (Middle Fork Canyon, Cantonment Reno, and Dry Creek Petrified Tree EEA). Transportation and access impacts would be allowed in

greater than ten percent of habitats important to small game mammals, migratory game birds, furbearers, non-game mammals, and raptors (less than one percent of habitats important to all other wildlife species); therefore management actions for transportation and access management under Alternative A would have major adverse effects on wildlife resources.

Recreation (minor adverse)
Recreational activities that result in increased human presence would have localized impacts on wildlife. These activities would include hiking, biking, camping, boating, fishing, hunting, and sightseeing. Although many recreational activities are nonconsumptive, they can affect wildlife and their habitats. Increased human presence could result in habitat or wildlife disturbance (e.g., dispersal or avoidance). If recreational activities occurred in non-crucial habitats or during seasons when sensitive wildlife species were not present and in compliance with recreation management actions, impacts likely would be negligible. During seasonally sensitive periods (e.g., winter, calving, breeding, nesting, and early brood rearing), recreational activities could significantly alter animal behavior and result in increased winter mortality or lowered reproductive success. Over the long term and where the two resources overlap, recreational activities would have major adverse impacts on wildlife. Surface-disturbing restrictions/prohibitions are applied to Dry Creek Petrified Tree EEA and Mosier Gulch Recreation Area. The prohibitions/restriction for recreation under Alternative A conserves one to five percent of habitats important to big game, trophy game, small game mammals, predator species, furbearers, and non-game migratory birds (less than one percent for all other wildlife species); therefore, the adverse effects, over the entire planning area, would be minor.

Lands with Wilderness Characteristics (no effect)
Alternative A does not include decisions for and therefore does not manage for areas with wilderness characteristics. BLM's 1979 wilderness inventory (BLM 1979) concluded that there were no lands within the planning area except for the three WSAs that contained wilderness characteristics. There would be no effect on wildlife.

Livestock Grazing Management (major adverse)
Maintaining livestock grazing AUMs in areas of intense industrial activity could increase big-game forage competition. Many of these industrialized areas correspond to sensitive wildlife habitats. Where wildlife are being displaced from important habitats by human activity and industrial development, it increases the competition with livestock for forage and could be detrimental to the local wildlife population. This would cause degradation of the range for both livestock and wildlife.

Water projects developed on crucial winter ranges could lead to a redistribution of livestock on those ranges, which could result in the loss of sufficient forage to maintain wildlife during winter. Loss of forage could cause wildlife redistribution, particularly big game, to areas that might be occupied by other big-game herds, to areas with a lower quality habitat, or to private lands. Because native winter habitats can only support a limited wildlife population, this could result in increased winter mortality and reduced species viability. Restricting placement of mineral supplements within 500 feet of fish-bearing water or riparian/wetland areas would minimize soil compaction and subsequent runoff near surface waters.

Allocating forage increases realized from management prescriptions and range improvement practices to wildlife and livestock could benefit wildlife species. Forage increases achieved through vegetative treatment practices would be temporary if the vegetative community is successional. Active management of vegetative treatments would improve grazing conditions,

potentially decreasing competition for forage between big game and livestock. Any increases in AUMs allocated to livestock (increasing permitted use) would have the potential to increase forage competition with wildlife. Under this Alternative A, the degree of impact would depend upon the number of animals involved, and seasonal frequency of presence in wildlife habitat.

Under Alternative A, livestock grazing is not authorized on approximately 10,000 acres of public land where grazing has been determined to be incompatible with other resource values, specifically 4,000 acres in the canyons and slopes of the southern Big Horn Mountains. Management of livestock grazing, under Alternative A, occurs in greater than ten percent of habitats important to big game, trophy game, small game birds, migratory game birds, and raptors (five to ten percent of habitats important to non-game migratory birds and less than one percent for all other wildlife species); therefore, the adverse effects, over the entire planning area, would be major.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, and Wild and Scenic Rivers (no effect)
Management actions for ACECs, scenic or BCBs and for Wild and Scenic Rivers would have no effect on wildlife resources.

Wilderness Study Areas (minor beneficial)
Under Alternative A, the types of impacts to wildlife species from management actions for special designations would be the same as described under *Impacts Common to All Alternatives*, except that the additional 28,931 acres within the three WSAs would be open to oil and gas development. Impacts Common to All Alternatives describes impacts to wildlife and wildlife habitat form oil and gas development. Table 4.44, "Important Wildlife Habitats in Wilderness Study Areas" (p. 1001) lists the three WSAs and their important wildlife habitats.

Table 4.44. Important Wildlife Habitats in Wilderness Study Areas

Wilderness Study Area	Important Wildlife Habitat				
	Big-game ranges	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest buffers	Amphibian and reptile habitats
Gardner Mountain	1,034 / 0.2%	0	0	0	3,484 / 0.1%
North Fork	2,150 / 0.5%	0	0	0	4,783 / 0.1%
Fortification Creek	12, 184 / 3%	73 / 2%	1,318 / 1%	530 / 0.02%	477 / 0.01%

Source: BLM 2012f

Note: Percentages in table represent the percent of important wildlife habitat (columns) that overlaps wilderness study areas (rows).

4.4.6.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to wildlife resources due to their implementation. Prohibiting surface-disturbing activities for the protection of any other resource would have a major beneficial impact to wildlife where these resources overlap. (See Chapter 4 introduction for the definition of surface disturbance.) Avoidance areas for other resources would, by nature, be NSO areas for wildlife. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative B management actions for wildlife include modifying existing fences that prevent wildlife movement; applying restrictions on surface-disturbing and disruptive activities within various wildlife habitats (elk crucial winter range, biologic buffers for raptor nests, amphibian and reptile habitats); requiring burial of all new low-voltage powerlines and installation of perch-inhibiting devices on aboveground powerlines; limiting loss of elk security habitat; designating the Fortification Creek elk herd unit as a WHMA; and maintaining or enhancing various wildlife habitats throughout the planning area. This approach is the most conservative because it allows for the greatest protective measures for wildlife and wildlife habitats. This level of protection greatly increases the potential for future management decisions to expand the proliferation of these species through active management. Table 4.45, "Acres of Habitats Important to Wildlife in the Planning Area on BLM and Split Estate Lands" (p. 1002) lists the amount of habitats important to wildlife in the planning area on both BLM and split estate lands.

Table 4.45. Acres of Habitats Important to Wildlife in the Planning Area on BLM and Split Estate Lands

Surface	Big-game ranges	Big-game migration corridors with 0.5 mile buffer	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest biologic buffers	Within 1.5 mile of raptor nests	Amphibian and reptile habitats
BLM	4,583	15,559	132,148	54,300	323	7,607	255,129	429,328	176,636
Federal Minerals									
Coal	14,216	85,277	309,300	114,649	2,200	43,201	1,756,070	3,076,3964	734,288
Oil and Gas	14,216	85,462	315,139	114,652	1,159	35,736	1,195,815	2,023,118	1,217,959

Source: BLM 2012f

BLM Bureau of Land Management
WHMA Wildlife Habitat Management Area

Wildlife would benefit from conservative management of physical and biological resources. Alternative B management actions are anticipated to result in beneficial impacts to big game. These actions are anticipated to improve forest and woodland habitats, potentially providing improved habitat conditions that benefit black bears in the planning area. Under Alternative B, impacts to mountain lions are anticipated to be similar impacts to big game and big-game habitats. In addition, Alternative B would maintain or enhances large, contiguous blocks of aspen habitat.

Alternative B would manage all riparian areas toward mid- to late-successional stage vegetation, which would benefit riparian and wetland species such as beaver. This alternative places greater restrictions on surface disturbance in riparian and wetland areas by not allowing this type of disturbance within 0.25 mile of these areas and not allowing new permanent facilities in these areas. These actions are anticipated to ultimately result in riparian systems with increased vegetative and structural diversity throughout the planning area, with benefits to beaver, muskrat, mink, and other riparian and wetland species. Actions pertaining to water and riparian and wetland habitats also are anticipated to benefit migratory game birds. The buffer around wetlands, riparian areas, perennial streams, and 100-year floodplains where surface disturbance cannot occur would be large under Alternative B. These areas would be closed rather than avoided, which

would benefit migratory game birds. In addition, management under Alternative B would reduce channel erosion, bank erosion, and channel incision, and restore damaged wetlands.

Restrictions around raptor nests are more extensive under Alternative B, because all buffers are 1.5 miles; resulting in fewer direct impacts to nesting raptors. Seasonal restrictions vary based on the species of raptor. Alternative B also would manage sagebrush, aspen, and mountain shrub communities in large, contiguous blocks and maintain connections among these communities. In addition, Alternative B would protect riparian areas and increase control of invasive species. These actions are anticipated to benefit birds and small mammals comprising raptor prey in the planning area.

Alternative B actions that would benefit different vegetative types in the planning area would benefit habitat generalists such as furbearing animals, predators, small game, or nongame mammals.

Impacts from conservative management of resources under Alternative B would, in some cases, be similar to those described for Alternative A and Impacts Common to All Alternatives. Where impacts to wildlife would vary in degree from impacts described for Alternative A, further rationale is provided below.

Physical Resources

Air Quality (major beneficial)
Under Alternative B, air quality modeling would be performed on a project-specific basis. In addition, projects expected to approach or exceed emissions standards would be evaluated for potential mitigation strategies, which would have a major beneficial effect on wildlife.

Soil, Water Resources, and Cave and Karst Resources (major beneficial)
Alternative B would analyze impacts to soil, water, and cave and karst resources on a project-specific basis. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in Washington Office Instruction Memorandum 2010-181, which would reduce threats from WNS to bats. In addition, Alternative B would prohibit surface-disturbing activities or apply NSO stipulations to activities on badlands, rock outcrops, and slopes susceptible to mass movement, and prohibit prescribed fires on highly erodible soils; prohibit such activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat; and prohibit activities in cave and karst areas. Prohibiting surface-disturbing activities for the protection of soil resources under Alternative B would conserve greater than ten percent of habitats important to all wildlife species. Prohibiting surface-disturbing activities for the protection of water resources under Alternative B would conserve greater than ten percent of habitats important to big game (five to ten percent of habitats important to trophy game, small game birds, non-game migratory birds, and raptors, and one to five percent of habitat important to all other wildlife species). Prohibiting surface-disturbing activities for the protection of cave and karst resources under Alternative B would conserve greater than ten percent of habitats important to big game (five to ten percent of habitats important to trophy game; one to five percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals; and less than one percent of habitats important to all other wildlife species. Overall, Alternative B management of soils, water, and cave and karst resources would result in major beneficial effects on wildlife.

Mineral Resources

Locatable Minerals (minor adverse)
The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable mineral resources (habitat loss and degradation). Under Alternative B, 618,256 acres would be withdrawn from mineral entry and 2,727,957 acres of BLM surface would be left open to mineral entry. Locatable mineral entry could be permitted within one to five percent of habitats important to small game mammals, small game birds, migratory game birds, predator species, furbearers and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore locatable mineral management actions under Alternative B will have minor adverse effects on wildlife resources.

Leasable Minerals – Coal (moderate adverse)
The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for coal resources (habitat loss and degradation). Under Alternative B, 715,388 acres would be left open to coal exploration. Coal exploration, under Alternative B could be permitted within five to ten percent of habitats important to big game, migratory game birds, and non-migratory game birds (one to five percent of habitats important to all other wildlife species); therefore, coal mineral management actions under Alternative B will have moderate adverse effects on wildlife resources.

Leasable Minerals – Fluids (major adverse)
The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid mineral resources (habitat loss and degradation). Under Alternative B, all oil and gas exploration would be subject to license stipulations necessary to protect other resource values. Fluid mineral development, under Alternative B could be permitted within greater than ten percent of habitats important all wildlife species, except big game, migratory game birds, and raptors; therefore, fluid mineral management actions under Alternative B will have major adverse effects on wildlife resources.

Salable Minerals (major adverse)
The types of effects from Alternative B would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable mineral resources (habitat loss and degradation). Under Alternative B, 129,430 acres of BLM surface would be left open to salable mineral exploration. Salable mineral exploration, under Alternative B, could be permitted within greater than ten percent of habitats important to small game mammals, small game birds, predator species, furbearers, non-game mammals, and non-game migratory birds (five to ten percent of habitats important to migratory game birds and less than one percent of habitats important to all other wildlife species); therefore, salable mineral management actions under Alternative B will have major adverse effects on wildlife resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (major adverse)
Alternative B would not limit the use of wildland fire as a tool for achieving objectives for vegetation, wildlife habitat, or forage. Alternative B would manage rehabilitation wherever there is fire-related damage. Adverse impacts to wildlife are expected from these actions. Alternative B would also restrict the use of heavy equipment to existing roads and trails. Unplanned fire management actions under Alternative B are likely to occur in greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (five to

ten percent of habitats important to migratory game birds and big game; one to five percent of habitats important to trophy game and non-game migratory birds, and less than one percent of habitat important to migratory game birds and raptors) therefore, unplanned fire management actions under Alternative B would have major adverse effects on wildlife resources.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
Alternative B forests and woodlands management would promote a natural landscape with little physical management or alteration of the forests and woodlands environment. In this natural environment, wildlife would likely thrive. Stochastic events that destroy large expanses of wildlife habitat would be more likely to occur under Alternative B without specific management to control insects, diseases, and wildfires, although treatment to prevent these events are just as likely to impact wildlife habitats as drastically over the short term.

Forest and woodland management actions under Alternative B are likely to occur in greater than ten percent of habitats important to big game, small game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to trophy game and migratory game birds and less than one percent of habitat important to all other wildlife species); therefore, forests and woodlands management actions under Alternative B would have major beneficial effects on wildlife resources.

Vegetation – Grassland and Shrubland Communities (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat improvement). Under Alternative B, native plant species would be the only type authorized for reclamation activities. This would be beneficial to wildlife habitats as it would promote natural reclamation and regeneration of vegetative communities. Under Alternative B, native plant reclamation would occur within greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, grassland and shrubland community management actions under Alternative B will have major beneficial effects on wildlife resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for riparian/wetland resources (habitat improvement). Under Alternative B, natural riparian and wetland ecosystems would be restored and surface-disturbing restriction would be applied within 500 feet of riparian/wetland systems, aquatic habitat, and floodplains. These restrictions would also encompass greater than ten percent of habitats important to big game, trophy game, small game birds, migratory game birds, non-game migratory birds and raptors (five to ten percent of habitats important to all other wildlife species); therefore, riparian/wetland resource management actions under Alternative B will have major beneficial effects on wildlife resources.

Invasive Species and Pest Management (negligible adverse)
Not limiting aerial application of pesticides and treating cheatgrass on a landscape scale would provide an opportunity to apply large-scale treatments on a variety of topography. Over the long term this would benefit wildlife by improving the ecological condition of the treated sites. Over the short term this could greatly increase adverse effects on wildlife. The greater the distance

from riparian and wetland areas that chemicals are applied, the less the potential for impacts associated with vegetation removal, soil disturbances, or chemical spills to these resources. Therefore, direct adverse impacts to wildlife habitat associated with management actions for invasive species and pests under Alternative B are expected to be negligible.

Fish and Wildlife Resources – Fish (major beneficial)

The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for fish resources (habitat improvement and conservation). Under Alternative B, reservoirs and riparian areas would be improved or enhanced and surface-disturbing restriction would be applied within 0.25 mile of water bodies containing native and desirable non-native fish. These restrictions would also encompass greater than ten percent of habitats important to all wildlife species, except trophy game and small game birds; therefore, fish resource management actions under Alternative B will have major beneficial effects on wildlife resources.

Special Status Species – Plants (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status plant species (habitat improvement and conservation). Under Alternative B, livestock grazing would be managed to protect special status plant species and surface-disturbing restriction would be applied within habitat for special status plant species. These restrictions would also encompass greater than ten percent of habitats important to big game and trophy game (five to ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals; one to five percent of habitats important to small game birds and less than one percent of habitats important to all other wildlife species); therefore, special status plant species management actions under Alternative B will have major beneficial effects on wildlife resources.

Special Status Species – Fish (moderate beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status fish resources (habitat improvement and conservation). Under Alternative B, stream segments important to special status fish species would be improved or enhanced and surface-disturbing restriction would be applied within 0.25 mile of water bodies containing special status fish species. These restrictions would also encompass five to ten percent of habitats important to migratory game birds (one to five percent of habitats important to big game, trophy game, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore, special status fish species management actions under Alternative B will have moderate beneficial effects on wildlife resources.

Special Status Species – Wildlife (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status wildlife species (habitat improvement and conservation). Under Alternative B, wildlife habitats would be enhanced; wildlife migration corridors would be maintained; fences would be altered to reduce hazards to Greater Sage-Grouse; anti-perching devices would be required on all overhead powerlines; Greater Sage-Grouse habitat restoration would occur throughout the planning area; and surface occupancy prohibitions and surface-disturbing restrictions would be applied within habitat for numerous special status wildlife species. These improvements and restrictions would also occur in greater than ten percent of habitats important to all wildlife species; therefore, special status

wildlife species management actions under Alternative B will have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Under Alternative B, prohibiting surface-disturbing activities within 5 miles or the visual horizon of historical properties would have beneficial effects to wildlife habitat where these resources overlap. Cultural site avoidance areas would also conserve greater than ten percent of habitats important to all wildlife species, except raptors (five to ten percent) and migratory game birds (less than one percent), therefore, cultural resources management actions under Alternative B would have major beneficial effects on wildlife resources.

Paleontological Resources (major adverse)
Under Alternative B, identifying paleontological casual collection areas, would not occur. This has the potential to adversely impact wildlife and wildlife habitat by trampling or eliminating vegetation and compacting soils throughout the footprint of the access and general causal use of areas containing wildlife and wildlife habitats. Therefore, direct adverse impacts to wildlife and wildlife habitat associated with the management actions for unidentified casual collection areas in Alternative B are anticipated to be major.

Visual Resources (major beneficial)
Under Alternative B, management of VRM Class II areas could prohibit or limit some surface-disturbing activities and therefore protect wildlife habitats. VRM Class III and IV areas would have minor limitations. Alternative B visual resources management would benefit greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, visual resource management actions under Alternative B would have major beneficial effects on wildlife resources.

Land Resources

Forest Products (minor adverse)
Limiting saw timber sales to specified forest areas and to limited acreage would lessen adverse impacts to wildlife and wildlife habitat. In coordination with wildlife specialists, important wildlife areas could be specified as saw timber sale avoidance areas during times of the year when it is most crucial for these species to remain undisturbed. Forest product harvest would be allowed in one to five percent of habitats important to small game mammals, migratory game birds, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, forest product management actions under Alternative B would have minor adverse effects on wildlife resources.

Lands and Realty (major beneficial)
Under Alternative B, retaining lands with agricultural potential, water, or important natural resource values would benefit wildlife. These lands would be identified early and given a heightened level of importance, therefore retaining lands that might also be important to wildlife. Acquiring new lands also would benefit wildlife, because when new lands are acquired, management for wildlife and wildlife habitat on those lands would increase in intensity. Lands available for tenure adjustments under Alternative B contain greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to

five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore, management actions for lands and realty under Alternative B would have major beneficial effects on wildlife resources.

Renewable Energy (major adverse)
Alternative B would have the fewest adverse impacts to wildlife through the exclusion of renewable-energy development in areas also closed to other forms of energy development (minerals leasing, locatable minerals, salable minerals, ROW, and other areas where there are restrictions on surface disturbance). Renewable energy would be allowed on 4,407 acres. This would impact greater than ten percent of habitats important to big game, trophy game, small game birds, non-game migratory birds and raptors (five to ten percent of habitat important to all other wildlife species); therefore, renewable energy management actions under Alternative B would have major adverse effects on wildlife resources.

Rights-of-Way and Corridors (major adverse)
Alternative B ROW and corridors management actions would benefit wildlife. Requiring collocation of facilities and identifying and implementing specified utility corridors in coordination with the wildlife specialist would decrease the potential for adverse impacts to wildlife and wildlife habitats by ensuring their complete avoidance. Acreages of ROW avoidance and exclusion areas would be greatest under this alternative. Exclusion restrictions would affect wildlife by preventing surface-disturbing activities that are detrimental to resource values in areas of potential sensitive habitats and by reducing the potential for habitat fragmentation or increased human-caused disturbance. Limiting linear ROW development to existing routes would protect habitat quality, minimize fragmentation in sensitive areas, and help protect riparian areas. Under Alternative B, ROWs and corridors would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, ROW and corridor management actions under Alternative B would have major adverse effects on wildlife resources.

Travel and Transportation Management (major adverse)
Under Alternative B, allowing travel in areas other than those limited to designated routes only under a special use permit would benefit wildlife and wildlife habitats. Such permits specifically direct permit holders to avoid locations where the BLM has identified important wildlife habitats. Transportation and access impacts would be allowed in greater than ten percent of habitats important to big game and trophy game (five to ten percent of habitats important to small game mammals, small game birds, predator species, furbearers, non-game mammals, and non-game migratory birds; one to five percent of habitats important to migratory game birds and less than one percent of habitats important to raptors); therefore, management actions for travel and transportation management under Alternative B would have major adverse effects on wildlife resources.

Recreation (minor beneficial)
The types of impacts to wildlife under Alternative B from recreation management actions would be generally the same as under Alternative A, except Burnt Hollow, Cabin Canyon, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole-in-the-Wall all would be managed as SRMAs. This action would reduce disturbance to wildlife and wildlife habitat by on 55,529 acres, and 84,668 additional acres would be protected through the implementation of a 0.5-mile buffer surrounding SRMAs that would be closed to minerals leasing. These restrictions would conserve one to five percent of habitats important to all wildlife species except small game birds, non-game migratory birds, and raptor (less than

one percent); therefore, recreation management actions under Alternative B would have minor beneficial effects on wildlife resources.

Wilderness Characteristics (minor beneficial)
Managing areas with wilderness characteristics and lands with wilderness characteristics areas to emphasize primitive recreational opportunities and natural values would benefit wildlife and wildlife habitat. Management would include closing areas to or limiting use of motorized vehicles, closing areas to minerals leasing, excluding ROW, and prohibiting surface-disturbing activities not compatible with retaining or enhancing the areas' natural values. These prohibitions/restrictions would encompass one to five percent of habitats important to small game mammals, predator species, furbearers, and non-game migratory birds (less than one percent of habitats important to all other wildlife species); therefore, management actions for lands with wilderness characteristics would have minor beneficial effects on wildlife resources.

Livestock Grazing Management (major beneficial)
Alternative B incorporates several actions to adjust livestock grazing management to achieve multiple resource health and objectives. These measures would result in slightly less grazing pressure and trampling damage to wildlife habitat. Grazing livestock management under Alternative B would occur in greater than ten percent of habitats important to all wildlife species, except small game birds, non-game migratory birds, raptors (five to ten percent) and migratory game birds (one to five percent), therefore livestock grazing management actions under Alternative B would have major beneficial effects to wildlife resources.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Under Alternative B, designating approximately 536,304 acres of ACECs in eight areas would protect sensitive habitats (see Table 4.46, " Habitats Important to Wildlife in ACECs under Alternative B" (p. 1009)).

Table 4.46. Habitats Important to Wildlife in ACECs under Alternative B

ACEC Designations	Habitats Important to Wildlife							
	Crucial big-game ranges	Big-game migration corridors	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest biologic buffers	Within 1.5 mile of raptor nests
Cantonment Reno	0	0	0	0	0	0	523 / 0.02%	523 / 0.01%
Burnt Hollow	0	365 / 0.03%	0	0	0	0	0	1,548 / 0.04%
Dry Creek Petrified Tree EEA	0	0	0	0	0	0	0	1 / 0.0%
Fortification Creek Elk Area	23,623 / 5%	0	20,308 / 2%	29,243 / 29%	74 / 2%	1,372 / 1%	7,134 / 0.3%	21,335 / 0.6%
Hole-in-the-Wall	75,909 / 17%	0	0	0	0	0	0	543 / 0.01%
Pumpkin Buttes	0	0	0	0	0	0	1,239 / 0.1%	1,691 / 0.04%

ACEC Designations	Habitats Important to Wildlife							
	Crucial big-game ranges	Big-game migration corridors	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest biologic buffers	Within 1.5 mile of raptor nests
Welch Ranch	0	0	0	0	0	89 / 0.1%	48 / 0.0%	685 / 0.02%
Sagebrush Ecosystem	22,112 / 0.3%	4,035 / 0.05%	13,179 / 0.18%	15,871 / 0.22%	250 / 0.00%	3,581 / 0.05%	198,257 / 2.7%	317,613 / 4.32%

Source: BLM 2012f

Note: Percentages in table represent the percent of the habitats important to wildlife (columns) that overlaps ACECs (rows).

ACEC Area of Critical Environmental Concern
EEA Environmental Education Area
WHMA Wildlife Habitat Management Area

Measures identified for the proposed ACECs that would directly benefit wildlife and wildlife habitat include: (1) closing or limiting motorized vehicle use; (2) closing the areas to minerals leasing; (3) recommending withdrawal from locatable mineral entry; (4) closing the areas to salable minerals; (5) excluding ROW; and (6) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values.

Scenic or Back Country Byways and Wild and Scenic Rivers (no effect)
Management actions for scenic or BCBs and management actions for WSRs would have no effect on wildlife resources.

Wilderness Study Areas (minor beneficial)
Alternative B management of the three areas proposed to Congress as WSAs would provide an additional 28,931 acres of protection of sensitive habitats (Table 4.47, "Habitats Important to Wildlife in Wilderness Study Areas" (p. 1010)). This would have a minor beneficial effect on wildlife and wildlife habitats.

Table 4.47. Habitats Important to Wildlife in Wilderness Study Areas

Wilderness Study Areas	Habitat Important to Wildlife							
	Big-game ranges	Big-game migration corridors	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest buffers	Within 1.5 mile of raptor nests
Gardner Mountain	1,034 / 0.2%	204 / 0.2%	5,354 / 0.6%	12,417 / 12%	0	0	0	0
North Fork Powder River	2,150 / 0.5%	1,639 / 1%	10,019 / 1%	0	0	0	0	0

Wilderness Study Areas	Habitat Important to Wildlife							
	Big-game ranges	Big-game migration corridors	Elk security habitat	Fortification Creek WHMA, including yearlong	Within 750 feet of sharp-tailed grouse leks	Within 0.64 mile of sharp-tailed grouse leks	Raptor nest buffers	Within 1.5 mile of raptor nests
Fortification Creek	12,184 / 3%	0	11,233 / 1%	0	73 / 2%	1,318 / 1%	530 / 0.002%	7,212 / 0.2%

Source: BLM 2012f

Note: Percentages in table represent the percent of habitats important to wildlife (columns) that overlaps wilderness study areas (rows).

WHMA Wildlife Habitat Management Area

Measures identified for the WSAs that would directly benefit wildlife and wildlife habitat include: (1) closing the areas to minerals leasing; (2) recommending withdrawal from locatable minerals entry; (3) closing the areas to salable minerals; (4) excluding ROW; (5) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values; and potentially (6) prohibiting all motorized and mechanized equipment.

4.4.6.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to wildlife resources due to its implementation.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative C wildlife management actions include not modifying fences that prevent wildlife movements; not augmenting wildlife populations; not applying restrictions (seasonal or year-round) to surface-disturbing or disruptive activities, other than seasonal restrictions for raptor nests; and not requiring burial of new powerlines. This approach would protect only nesting raptors during incubation periods and would not protect other wildlife resources. Under Alternative C, activities allowed in suitable habitat could preclude the potential for future management decisions to expand or maintain the proliferation of these species through active management.

Alternative C impacts to wildlife would, in most cases, be similar to those described for Alternative A and under Impacts Common to All Alternatives. Where impacts to wildlife would vary in degree from impacts under Alternative A, further rationale is provided below.

Physical Resources

Air Quality (major adverse)
There would be no air quality modeling under Alternative C. Industrial projects would be expected to approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse impacts to wildlife. Vegetation is possibly more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, which can reduce photosynthesis by as much as 50%. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. At lower elevations in the western United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems. Plants also become more vulnerable to attacks by pests, disease,

and environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. Adverse impacts to vegetation would directly correlate with adverse impacts to wildlife and would be major.

Soil (major adverse)
Under Alternative C, soils management actions would include allowing surface-disturbing activities on slopes equal to or greater than 25% and on soils with a severe erosion hazard, and allowing proposed activities in badlands, on rocky outcrops, and on slopes susceptible to mass movement, all of which would affect 218,928 acres. Alternative C would not limit vehicular travel on saturated soils or require closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available. All these actions would allow activities on all soil types, regardless of soil-limiting properties. These actions would not protect soil resources and would promote soil and water erosion. This would have an indirect adverse impact on wildlife by reducing the health of the medium in which vegetation (wildlife habitat) grows. Surface-disturbing activities on soils would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, management actions under Alternative C would have major adverse effects on wildlife resources.

Water Resources (major adverse)
Alternative C water management actions that would allow surface disturbances within 500 feet of natural or man-made water features would have a direct adverse effect on wildlife habitats where these resources overlap. Additional project-specific allowances for on-channel reservoirs, even though they could adversely affect natural flow regimes, could have an indirect adverse impacts to wildlife habitat by transitioning the plant species in those communities and providing the opportunity for invasive plant species to move into these sites, making habitat no longer suitable for native wildlife. Surface-disturbing activities would now also be allowed within greater than ten percent of habitats important to small game birds and migratory game birds (five to ten percent of habitat important to big game, trophy game, and raptors and one to five percent of habitats important to all other wildlife species); therefore, management actions for water under Alternative C would have major adverse effects on wildlife resources.

Cave and Karst Resources (major adverse)
Alternative C management actions for cave and karst resources include establishing project-specific buffers (100 feet, for a total of 11 acres of protection) from significant cave entrances to minimize the effects of surface-disturbing activities in cave and karst areas. Implementation of a Cave Management Plan would directly benefit wildlife communities because it would limit disturbance of the vegetative community from minerals development or by people. Development of the plans considering direction described in Washington Office Instruction Memorandum 2010-181, would reduce threats to bats from WNS. Mineral activities would be managed near cave entrances. Alternative C would not restrict livestock grazing in areas with cave and karst resources. This would have direct adverse impacts on wildlife and wildlife habitat where these resources are adjacent to one other. Cave and karst areas encompass greater than ten percent of habitats important to big game and trophy game (less than one percent of habitats important to all other wildlife species); therefore the management actions for cave and karst resources under Alternative C should have major adverse effects to wildlife resources.

Mineral Resources

Locatable Minerals (major adverse)
At present, the Amsden Creek, Middle Fork Canyon, and Kerns game ranges are withdrawn

from minerals location. Locatable minerals activities are restricted in the Fortification Creek, Gardner Mountain, and North Fork WSAs. Alternative C does not include recommendations for new withdrawals or restrictions. The existing withdrawals and restrictions were imposed for the protection and preservation of other resource values. Not protecting additional areas from minerals location would have a direct, minor adverse effect on wildlife and wildlife habitats. Locatable mineral activities would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, management actions for locatable minerals under Alternative C would have major adverse effects on wildlife resources.

Leasable Minerals – Coal (major adverse)
Alternative C would open all federal coal lands (federal mineral estate for coal retained by the federal government) outside the high development potential areas (outside is approximately 753,364; inside is approximately 28,738 acres of public land) to study and exploration and would subject these activities to license stipulations necessary to protect other resource values. Allowing these surface-disturbing activities would have a direct, major adverse impacts on suitable habitat and wildlife movements in these areas. Coal exploration and development could be permitted within greater than ten percent of habitats important to all wildlife species, except trophy game (no effect), therefore, management actions for coal under Alternative C would have major adverse effects on wildlife resources.

Leasable Minerals – Fluids (major adverse)
Under Alternative C, fluid mineral development would be permitted, under some constraints, on all but 30,520 acres in the planning area. This would allow development within greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent) and trophy game (no effect), therefore, management actions for fluid minerals under Alternative C would have major adverse effects on wildlife resources.

Salable Minerals (major adverse)
3,290,908 acres of federal mineral estate would be open to salable mineral activities. Salable mineral development could occur in greater than ten percent of habitats important to all wildlife species, except small game birds and migratory birds (five to ten percent), big game (one to five percent), and trophy game (less than one percent), therefore, management actions under Alternative C would have major adverse effects on wildlife resources. There is no anticipated disturbance from geothermal activities.

Fire and Fuels Management

Unplanned Fire (Wildfire) (moderate adverse)
Management actions involving the application of full suppression regardless of other resource objectives would have a direct adverse impact to wildlife communities. The use of heavy equipment with few constraints would have a direct adverse impact over the short and long terms by increasing opportunities for soil and water erosion and invasive plant establishment. Unplanned fire is likely to occur in five to ten percent of habitats important to small game birds, non-game migratory birds, and raptors (and one percent or less of habitats important to all other wildlife species; therefore, management actions for unplanned fire under Alternative C would have moderate adverse effects on wildlife resources.

Planned Fire (Prescribed Fire) (major adverse)
The adverse effects described in the unplanned fire portion above would also be the adverse effects of planned fire. Prescribed fires are planned, during the next 20 years, within greater than

ten percent of habitats important to all wildlife species, except migratory game birds and raptors (five to ten percent), big game (one to five percent), and trophy game (less than one percent); therefore, management actions for planned fire under Alternative C would have major adverse effects on wildlife resources.

Biological Resources

Vegetation – Forests and Woodlands (moderate adverse)
Alternative C impacts to wildlife and wildlife habitat from forests and woodlands management would be the same as impacts under Alternative A, except that Alternative C would increase the removal of trees. This would open larger spaces in the forest, which would alter habitats for most of the forest-dwelling wildlife in the planning area. Forest and woodland management would impact five to ten percent of habitats important to big game and migratory game birds (one to five percent of habitat important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for forest and woodlands would have moderate adverse effects on wildlife resources.

Vegetation – Grassland and Shrubland Communities (major adverse)
Under Alternative C, allowing desirable non-native plant species for initial reclamation activities would have an adverse impacts to wildlife and wildlife cover and forage. This action could promote the growth of non-native plant species that might out-compete the native plants that wildlife desire. This type of reclamation would occur in greater than ten percent of habitats important to big game (five to ten percent of habitats important to trophy game and migratory game birds and less than one percent of habitats important to all other wildlife species); therefore, management actions for grassland and shrubland communities under Alternative C would have major adverse effects on wildlife resources.

Vegetation – Riparian/Wetland Resources (major adverse)
Under Alternative C, management actions for riparian and wetland areas would have the same major adverse effects on wildlife resources as described in the *Water* section of Alternative C.

Invasive Species and Pest Management (moderate adverse)
Allowing aerial application to only insecticides would limit the application of pesticides to terrain accessible only by foot, which would mean only small acreages would be treated. This would have a short-term beneficial impact to wildlife because it would be less disruptive. However, there would be an adverse impact to vegetative communities over the long-term by giving invasive species a competitive advantage over native vegetation. Annually treating only designated areas for cheatgrass would be ineffective because there would be only small, scattered treatments; therefore, most of the cheatgrass would be unaffected. This would have a moderate adverse effect on wildlife habitat.

Fish and Wildlife Resources – Fish (major beneficial)
Fish management actions under Alternative C include allowing surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies, but not within 500 feet of these areas. These management actions would not limit the number of projects and would apply a minimal distance for projects way from streams. Disturbing soil and vegetation increase the potential for soil and water erosion and indirectly contributes to the decline in water quality over the long term. These areas are also very susceptible to hydrophilic invasive species such as Canada thistle and salt cedar that would out-compete native vegetation, essentially removing riparian communities. This would reduce wildlife habitat protection zones by 703,581 acres

compared to Alternative B. Prohibition/restrictions would encompass greater than ten percent of habitats important to big game and migratory game birds only (five to ten percent of habitats important to trophy game and small game birds, one to five percent of habitats important to non-game migratory birds, and less than one percent of habitats important to all other wildlife species); therefore, management actions for fish under Alternative C would have major beneficial effects on wildlife resources.

Special Status Species – Fish (minor beneficial), **Special Status Species – Plants and Wildlife** (major beneficial)
Under Alternative C, prohibitions on surface-disturbing activities for the protection of special status plant, fish, and wildlife species would reduce adverse impacts to all wildlife. This management would have a major beneficial impact to wildlife habitats where these resources overlap. Avoidance areas for other resources would, by nature, be NSO areas for important wildlife habitats. Prohibitions for special status fish species would also conserve one to five percent of habitats important to big game, trophy game and migratory game birds (less than one percent for all other wildlife species); therefore, management action for special status fish species would have minor beneficial effects on wildlife resources. Surface-disturbing prohibitions for special status plant species would also conserve greater than ten percent of habitats important to big game and trophy game (one percent or less for all other wildlife species) and, for special status wildlife species, greater than ten percent of habitats important to all wildlife species, except trophy game (five to ten percent) and non-game migratory birds (one to five percent); therefore, management actions for both special status plant and wildlife species would have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Under Alternative C, allowing surface disturbance in areas with historic properties would impact wildlife habitat adversely by increasing opportunities for soil and water erosion, invasive species to establish, and direct removal of habitat. There are 330,592 acres of important wildlife habitats on BLM surface within 5 miles of historic properties in the planning area. Alternative C management actions for cultural resources would be the same as under Alternative A (major beneficial).

Paleontological Resources (minor beneficial)
Alternative C management actions that limit the requirement for paleontological field surveys to all PFYC Class 4 and 5 formations potentially affected by proposed activities would affect 28,177 acres. Not restricting surface-disturbing activities would subject wildlife habitats to possible large-scale surface disturbance. This would increase the opportunity for wildlife habitat to be directly removed and further fragmented. However, identifying paleontological casual collection areas could reduce adverse impacts to wildlife and wildlife habitat from trampling or eliminating vegetation, compacting soils throughout the footprint of the access, and general disruption to wildlife from causal use of these areas. The greater the avoidance distance from riparian areas, wetlands, sand dunes, and other such habitats, the less the potential for impacts associated with vegetation and soil disturbances. Prohibitions/restrictions for paleontological resources would encompass one to five percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, management actions for paleontological resources under Alternative C would have minor beneficial effects on wildlife resources.

Visual Resources (negligible beneficial)
Under Alternative C, managing VRM Class II areas as VRM Class III would allow more surface-disturbing activities; 167,334 acres would be managed as VRM Class III. This would reduce the beneficial effects of visual resource management on wildlife habitat by increasing opportunities for soil and water erosion and for invasive species to get established. Active management would now occur on less than one percent of habitats important to all wildlife species; therefore, Alternative C management of visual resources would have a negligible beneficial effect on wildlife.

Land Resources

Forest Products (major adverse)
Alternative C impacts to wildlife from forest product management actions would be similar to effects under Alternative A, except that adverse impacts would be greater under Alternative C because the sale of forest products would no longer be limited to minor products without limits to acreage, and with the intent to maximize the removal of harvested products. Offering a greater array of products would intensify the adverse impacts. In addition, not fencing regeneration areas could subject wildlife habitat in these areas to grazing and potential loss. Forest product harvests could occur in greater than ten percent of habitats important to migratory game birds (one to five percent of habitats important to big game and trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for forest products under Alternative C would have major adverse effects on wildlife resources.

Lands and Realty (major adverse)
Under Alternative C, disposing of lands with agricultural potential, water, or important natural resource values would have a major adverse effect on wildlife and wildlife habitats. Alternative C does not consider these values on a project-specific basis and does not require that these lands be retained based on these important values. Disposal of these lands would dispose greater than ten percent of habitats important to small game mammals, predator species, furbearers, and non-game mammals (one to five percent of habitats important to small game birds, non-game migratory birds, and raptors and less than one percent of habitats important to all other wildlife species); therefore, management actions for lands and realty under Alternative C would have major adverse effects on wildlife resources.

Renewable Energy and Rights-of-Way and Corridors (major adverse)
Renewable energy and ROWs and corridors management actions would not promote relocations of proposed new roads and access routes to those already in existence and would not prohibit renewable energy or ROWs and corridors on slopes equal to or greater than 25% and on highly erodible soils. Exclusion areas for ROWs, including renewable energy, would include 28,554 acres. Renewable energy and ROWS and corridors could be permitted within greater than ten percent of habitats important to all wildlife species, except small game migratory birds (one to five percent), therefore, management actions for renewable energy and ROWs and corridors under Alternative C would have major adverse effects on wildlife resources.

Travel and Transportation Management (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in the Alternative A section for travel and transportation management (habitat loss, degradation and fragmentation). Travel and transportation could be permitted within greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent)

and raptors (less than one percent), therefore, management actions for travel and transportation management under Alternative C would have major adverse effects on wildlife resources.

Recreation (moderate adverse)
Recreational activities that result in increased human presence would have localized impacts on wildlife. These activities would include hiking, biking, camping, boating, fishing, hunting, and sightseeing. Although many recreational activities are nonconsumptive, they can affect wildlife and their habitats. Increased human presence could result in habitat or wildlife disturbance (e.g., dispersal or avoidance). If recreational activities occurred in non-crucial habitats or during seasons when sensitive wildlife species were not present and in compliance with recreation management actions, impacts likely would be negligible. During seasonally sensitive periods (e.g., winter, calving, breeding, nesting, and early brood rearing), recreational activities could significantly alter animal behavior and result in increased winter mortality or lowered reproductive success. Surface-disturbing and salable mineral development activities would be allowed, where consistent with other resource values. The management actions under Alternative C would impact five to ten percent of habitats important to wildlife species. Over the long term and where the two resources overlap, recreational activities would have moderate adverse impacts on wildlife.

Lands with Wilderness Characteristics (no effect)
Alternative C management actions include no specific management for wilderness characteristic. BLM's 1979 wilderness inventory (BLM 1979) concluded that there were no areas within the planning area that contained wilderness characteristics outside the three WSAs. Alternative C management of areas of wilderness characteristics would have no effect on wildlife and wildlife habitat.

Livestock Grazing Management (major adverse)
Livestock grazing management actions under Alternative C include allowing increases in livestock stocking rates as a result of vegetative treatments, and providing a maximum of two years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments. These actions would compromise the health of wildlife habitat. Livestock are often attracted to new vegetation following vegetative treatments and fires. If not monitored, these sites can be overutilized, and if stocking rates are increased, could compound the issue. Two years of rest might not be enough to achieve preferred ecological condition and vegetation management goals. Alternative C also incorporates actions to adjust management of livestock grazing to make grazing the first priority. This measure would result in increased grazing pressure and trampling damage to wildlife habitat. Anticipated adverse impacts to wildlife from livestock grazing under Alternative C are anticipated to increase where grazing allotments contain suitable habitat for wildlife. (See the livestock grazing analysis under Alternative A for this overlap.) In addition, livestock salt or mineral supplements would be permitted within 500 feet of water sources, riparian areas, and aspen stands. This would decrease protection buffers for wildlife habitat in these areas by 19,861 acres throughout the planning area. Overall, livestock grazing management under Alternative C would impact greater than ten percent of habitats important to all wildlife species; therefore, having major adverse effects on wildlife resources.

4.4.6.6. Alternative D

This section describes management actions under Alternative D, which employs a combination of resource conservation and resource use, and the likely impacts to wildlife resources due to their implementation and potential impacts to wildlife resources from those management actions.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative D impacts to wildlife would be similar to those under Alternative B, except that the following would be allowed by exception:

- Surface-disturbing and disruptive activities throughout the life of the project during seasons important for wildlife.
- Aboveground powerlines.
- Fluid minerals production and byproducts not be piped out of crucial elk winter range and calving areas.
- Aboveground facility development in elk crucial winter range and calving areas.
- Surface disturbance and occupancy within USFWS-recommended biologic buffer zones around active nests of raptor species of conservation concern.

In addition, although timber harvest would be allowed in crucial elk habitat and hiding cover, this activity would performed in such a way as to maintain current amounts of functional habitat, and all other activities in elk seasonal ranges would remove or alter no more than 15% of the existing security habitat. These two management actions provide less protection for elk habitat, but would provide adequate elk habitat while allowing other uses on the landscape.

The types of impacts to wildlife associated with maintenance and reestablishment of travel corridors for big-game species would be the same as impacts under Alternative B, except that Alternative D would retain only identified priority travel corridors. This would result in 15,559 acres of travel corridor avoidance. Alternative D would prohibit surface-disturbing activities around plains sharp-tailed grouse leks on 3,601 acres, because the buffer under Alternative D would be within 0.25 mile of the perimeter of these leks.

Physical Resources

Air Quality (major beneficial)
Alternative D impacts to wildlife from air quality management would be the same beneficial as impacts under Alternative B (habitat conservation). Under Alternative D, though, modeling would only occur on a project-specific basis and mitigation strategies would then be developed. The modeling and mitigation would likely occur within greater than ten percent of habitats important to big game, small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent of habitats important to all other wildlife species); therefore, management actions for air quality under Alternative D would have major beneficial effects on wildlife resources.

Soil (major beneficial)
Alternative D impacts on wildlife from soils management would be similar to impacts under Alternative B, except that Alternative D could allow activities by exception on 215,496 acres of highly erosive soils, 170,590 acres on slopes equal to or greater than 25%, on 455,090 acres of soils with poor reclamation suitability, on a limited basis, on 218,928 acres of badlands, rock outcrops and slopes susceptible to mass movement. In addition, applying a CSU stipulation to oil and gas leases would protect wildlife on an additional 669,739 acres of highly erosive soils, 412,145 acres on slopes equal to or greater than 25%, 1,514,445 acres of soils with poor reclamation suitability, and on a limited basis, on 685,950 acres of badlands, rock outcrops and slopes susceptible to mass movement that might be associated with a federal mineral leases. For the impacts to remain the same as those described under Alternative B, these exceptions must be evaluated for site-specific impacts to wildlife and must not be granted where there would be conflicts. These CSU areas would encompass greater than ten percent of habitats important to

all wildlife species; therefore, management actions for soil under Alternative D would have major beneficial effects on wildlife resources.

Water Resources (major beneficial)
The following Alternative D water management actions would impact wildlife the same as Alternative A: prohibiting surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams, applying a CSU stipulation on oil and gas leases, and evaluating unneeded reservoirs. These CSU areas would encompass greater than ten percent of habitats important to big game (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore management actions for water under Alternative D would have major beneficial effects on wildlife resources.

Beneficial impacts to wildlife would be the same as described for Alternative B and result from management actions associated with water that encourage the use of alternative energy sources to power new water resource developments as opposed to overhead power or petroleum-based, and that manage riparian and upland areas to restore perennial flows or standing water. Conversely, adverse impacts to wildlife would be the same as described for Alternative C and result from management actions associated with water that allow on-channel reservoirs, surface water discharge, maintenance of existing water supply sources, and conversion of abandoned oil and gas wells to water supply wells.

Cave and Karst Resources (major beneficial)
The types of impacts associated with Alternative D management of cave and karst resources would be generally the same types of impacts as Alternative A. In addition, implementation of a Cave Management Plan for the entire planning area would increase potential beneficial impacts to wildlife where these resource overlap. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in Washington Office Instruction Memorandum 2010-181, which would reduce threats to bats from WNS. Cave and karst resources contain greater than ten percent of habitats important to big game (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for cave and karst resources under Alternative D would have major beneficial effects on wildlife resources.

Mineral Resources

Locatable Minerals (major adverse)
Alternative D locatable minerals management actions would have effects on wildlife similar to management under Alternative B, although Alternative D would open more area (3,232,508 acres) to locatable minerals entry. Locatable minerals entry would be permitted within greater than ten percent of habitats important to small game mammals, predator species, furbearers and non-game mammals (five to ten percent of habitats important to migratory game birds, one to five percent of habitats important to small game birds, and less than one percent of habitats important to all other wildlife species); therefore, management actions for locatable minerals under Alternative D would have major adverse effects on wildlife resources.

Leasable Minerals – Coal (major adverse), **Leasable Minerals - Fluid** (major adverse), **and Salable Minerals** (major adverse)
Alternative D impacts to wildlife from the management of leasable minerals would be similar to impacts described under Alternative C, with coal leasing subject to suitability screening, 138,558 acres open to oil and gas leasing, and 2,957,960 acres open to salable minerals disposal. The

amount of minerals extraction that would occur under this alternative would create a substantial increase in land use intensity, and would result in greater potential for loss or degradation of habitats that support various wildlife species. Coal development would be permitted in greater than ten percent of habitats important to all wildlife species, except big game (five to ten percent) and trophy game (no effect). Leasable fluid minerals would be permitted in greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent) and trophy game (no effect). Salable minerals would be permitted in greater than ten percent of habitats important to all wildlife species, except migratory game birds (five to ten percent), big game and trophy game (less than one percent). Management actions for coal, fluid minerals, and salable minerals would have major adverse effects on wildlife resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (major adverse)
Under Alternative D, impacts to wildlife would be similar to effects under in Alternative B. However, Alternative D would decrease adverse impacts through rehabilitation after fires on an as-needed basis only; this could result in an increase in natural regeneration of wildlife habitat communities.

Biological Resources

Vegetation – Forests and Woodlands (moderate beneficial)
Alternative D effects on wildlife from management of forests and woodlands and grassland and shrubland communities would be similar to effects under Alternative C, although Alternative D would place slightly more emphasis on multiple resource values than Alternative C. Alternative D would allow desirable non-native plant species for short-term reclamation activities, which would result in effects similar to Alternative B. Desirable non-native plant persistence could increase adverse impacts to wildlife if non-native proliferation causes loss of suitable wildlife habitats.

Grassland and Shrubland Communities (moderate beneficial)
Impacts to wildlife from grassland and shrubland communities management actions would be the same as *Forests and Woodlands* management actions, described above.

Vegetation – Riparian/Wetland Resources (major beneficial)
Under Alternative D, activities may be permitted by exception within 500 feet of riparian/wetland systems and aquatic habitats. For impacts on wildlife to be the same as those described for Alternative B, exceptions would have to be evaluated for the presence of special status plant species presence or habitat suitability and would not be granted where there would be conflicts. The prohibitions/restrictions would encompass greater than ten percent of habitats important to small game birds and non-game migratory birds (five to ten percent of habitats important to all other wildlife species), therefore, management actions for riparian/wetland resources under Alternative D would have major beneficial effects on wildlife resources.

Invasive Species and Pest Management (moderate adverse)
Under Alternative D, impacts to wildlife from management actions associated with invasive species and pest management would be the same as effects under Alternative A.

Fish and Wildlife Resources – Fish (major beneficial) **and Special Status Species – Fish** (moderate beneficial)
Alternative D impacts on wildlife from fish management, including special status fish species,

would be similar to those under Alternative B, except that Alternative D could allow activities by exception within a 0.25-mile CSU area around naturally occurring water bodies containing native and desirable non-native fish species. For the impacts to be the same as those under Alternative B, those exceptions would have to be evaluated for the presence of special status fish species or habitat suitability and would not be granted where there would be conflicts. Restrictions for the protection of fish resources would conserve greater than ten percent of habitats important to small game birds and migratory game birds (five to ten percent of habitats important to all other wildlife species). Restrictions for the protection of special status fish species would conserve five to ten percent of habitats for migratory game birds (one percent of less for all other wildlife species). Management actions under Alternative D would have major beneficial effects on wildlife resources for fish resources and moderate beneficial effects on wildlife resources for special status fish resources.

Special Status Species – Plants (major beneficial)
Alternative D impacts on wildlife from management of special status plant species would be the same as those under Alternative C, except that a CSU stipulation would be placed on mineral leases, which would require surveys before disturbance activities could be allowed.

Special Status Species – Wildlife (major beneficial)
Alternative D impacts on wildlife from management of special status wildlife species would be similar to those under Alternative B, except that Alternative D could allow disturbance activities by exception in black-tailed prairie dog colonies (6,156 acres) and special status amphibian, reptile, and bat species habitat (176,636 acres). For the impacts to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status wildlife species or habitat suitability and would not be granted where there would be conflicts. With habitat removal allowances under Alternative D, less acres of suitable Greater Sage-Grouse habitat would be protected than under Alternative B. Alternative D does provide surface occupancy restrictions for Greater Sage-Grouse leks in and outside of Core Population Area and Connectivity Corridor (0.6 mile and 0.25 mile, respectively). In addition, Greater Sage-Grouse habitats would be restored throughout the planning area in areas meeting specified criteria. The prohibitions/restrictions would encompass greater than ten percent of habitats important to all wildlife species, except big game and trophy game (less than one percent). Therefore, management actions for special status wildlife species would have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (major beneficial)
Alternative D impact types associated with cultural and paleontological resources management would be the same as those under Alternative B, except Alternative D would protect 15,382 acres through cultural resources NSO restrictions, 613,601 acres through cultural resources CSU restrictions, and 860 acres through paleontological resources restrictions. Table 4.48, "Habitats Important to Wildlife that Overlap Heritage Resources" (p. 1022) identifies where these restrictions overlap areas currently identified as important to wildlife.

Table 4.48. Habitats Important to Wildlife that Overlap Heritage Resources

Heritage Resources	Habitats Important to Wildlife						
	WGFD big-game HMAs	Crucial big game ranges	Priority travel corridors for big game	Elk security habitat	Proposed Fortification Creek elk WHMA	Within 0.25 mile of plains sharp-tailed grouse leks	USFWS recommended buffer zones for raptor nests
Cultural NSOs	0	607 / 0.1%	590 / 0.0%	4,174 / 0.4%	0	0	12,140 / 0.6%
Cultural CSUs	12,095 / 45%	103,494 / 24%	40,268 / 34%	215,001 / 22%	0	996 / 2%	213,669 / 10%
Paleontological NSOs	0	0	0	0	0	0	524 / 0.0%

Source: BLM 2012f

Note: Percentages in table represent the percent of habitat important to wildlife (columns) that overlaps heritage resources (rows).

CSU Controlled Surface Use
HMA Habitat Management Area
NSO No Surface Occupancy
USFWS U.S. Fish and Wildlife Service
WHMA Wildlife Habitat Management Area
WGFD Wyoming Game and Fish Department

Visual Resources (major beneficial)

Under Alternative D, effects to wildlife resources from management actions associated with visual resource management would be the same as the effects under Alternative B.

Land Resources

Forest Products (minor adverse)
Temporary adverse impacts on wildlife and wildlife habitats would be the same under Alternative D as under all other alternatives, except that Alternative D would include forest products harvest with no area size limit, although managed within ecologically stable limits. Long-term beneficial effects would be similar to those under alternatives B and C. Under Alternative D, conflicts between the harvest of forest products and management of suitable habitat for wildlife species could occur in one to five percent of habitats important to small game mammals, migratory game birds, predator species, furbearers, and non-game mammals (less than one percent of habitats important to all other wildlife species); therefore, management actions for forest products under Alternative D would have minor adverse effect to wildlife resources.

Lands and Realty (major beneficial)
Impacts and the types of impacts to wildlife species and their habitat from the management of land and realty under this alternative would be similar to Alternative B.

Renewable Energy and Rights-of-Way and Corridors (major adverse)
The types of impacts on wildlife under Alternative D management of renewable energy would be the same as those under Alternative B, except that areas excluded from renewable-energy development would total 413,001 acres, areas to be managed as ROW exclusion areas would total 101,081 acres, and ROW avoidance areas would total 290,336 acres. Renewable energy and rights-of-way and corridors would be allowed within greater than ten percent of habitats important

to all wildlife species; therefore, management actions for renewable energy and for rights-of-way and corridors would have major adverse effects on wildlife resources.

Alternative D could authorize new communications sites, transmission lines, and ground facilities outside existing disturbance areas or ROW corridors by exception. For the impacts to wildlife be same as those in Alternative B, exceptions would have to be evaluated for the presence of special status plant and wildlife species or habitat suitability and would not be granted where there would be conflicts.

Travel and Transportation Management (major adverse)
Alternative D impact to wildlife from management of travel and transportation would be similar to those under Alternative B, except that the following acres of areas currently identified as important to wildlife would be Closed to motorized vehicle use: greater than ten percent of the proposed Fortification Creek Elk WHMA; one to five percent of areas within WGFD big-game HMAs, crucial big-game ranges, priority travel corridors for big game, elk security habitat, and within 0.25 mile of plains sharp-tailed grouse leks and less than one percent of areas within USFWS-recommended biologic buffer zones for raptor nests. Travel and transportation would be permitted in greater than ten percent of habitats important to all wildlife species; therefore, management actions for travel and transportation management would have major adverse effects on wildlife resources.

Recreation (moderate beneficial)
The types of effects on wildlife under Alternative D management of recreation would be the same as those under Alternative B, except that no additional buffer would be provided around SRMAs to prevent minerals leasing. Seven areas would be designated as SRMAs (54,160 acres), six of which contain areas important to wildlife. Table 4.49, "Habitats Important to Wildlife that Overlap Proposed Special Recreation Management Areas" (p. 1023) lists these SRMAs and CSU areas overlap with areas currently identified as important to wildlife.

Table 4.49. Habitats Important to Wildlife that Overlap Proposed Special Recreation Management Areas

Proposed Special Recreation Management Areas	Habitats Important to Wildlife				
	WGFD big-game HMAs	Crucial big-game ranges	Priority travel corridors for big game	Elk security habitat	USFWS recommended buffer zones for raptor nests
Dry Creek Petrified Tree	0	0	0	0	65 / 0.0%
Middle Fork Canyon	2,068 / 8%	1,041 / 0.2%	3 / 0.0%	1,985 / 0.2%	0
Mosier Gulch	0	374 / 0.09%	169 / 0.1%	278 / 0.03%	0
Welch Ranch	0	0	0	0	48 / 0.0%
Weston Hills	0	0	0	0	365 / 0.02%
Hole-in-the-Wall	0	0	0	0	464 / 0.02%

Source: BLM 2012f

Note: Percentages in table represent the percent of habitat important to wildlife (columns) that overlaps Special Recreation Management Areas (rows).

HMA Habitat Management Area
USFWS U.S. Fish and Wildlife Service
WGFD Wyoming Game and Fish Department

Lands with Wilderness Characteristics (negligible beneficial)
The types of effects on wildlife under Alternative D management of lands with wilderness characteristics would be the same as those under Alternative B, except that the overall acreage would be less (6,864 acres).

Livestock Grazing Management (major beneficial)
Under Alternative D, the types of impacts to wildlife from management actions for livestock grazing would be the same as those under Alternative B, except that areas have been identified as incompatible with livestock grazing due to recreation designation, steep slopes, etc. These areas also contain the following currently identified important habitats for wildlife, In addition, Alternative D would not allow the placement of salt or mineral supplement, thereby avoiding trampling damage to habitat. Restrictions for livestock grazing conserve greater than ten percent of habitats important to all wildlife species, except small game birds, migratory game birds, non-game migratory birds, and raptors (five to ten percent), therefore management actions for livestock grazing under Alternative D would have major beneficial effects on wildlife species.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
The types of impacts to wildlife associated with ACEC management actions under Alternative D would be the same as under Alternative B, except that only the Fortification Creek Elk Area (32,602 acres), Pumpkin Buttes (1,733 acres), and Welch Ranch (1,116 acres) would be designated ACECs. Restrictions for these ACECs would encompass five to ten percent of habitats important to big game (one to five percent of habitats important to trophy game and less than one percent of habitats important to all other wildlife species); therefore, management actions for ACECs under Alternative D would have moderate effects to wildlife resources.

Scenic or Back Country Byways and Wild and Scenic Rivers (no effect)
Management actions for scenic and BCBs and for Wild and Scenic Rivers would have no effect on wildlife resources.

Wilderness Study Areas (moderate beneficial)
WSA management actions and effects on wildlife under Alternative D would be the same as those under Alternative B.

4.4.6.7. Cumulative Impacts

Although the BLM proposes only minor amounts of sagebrush treatments on public lands, continued modification of sagebrush on other ownerships would cumulatively reduce the availability and quality of that habitat. Cumulative effects on riparian habitats would be much more localized and site-specific due to the scattered land ownership along most streams, although livestock grazing and upland vegetative treatments on all ownerships could lead to riparian habitat concerns. Management changes implemented on BLM-administered lands to improve riparian conditions also could improve conditions on lands of other ownerships if the same management is applied to those lands. If some uses are restricted or eliminated on BLM-administered lands, that could cause increased use on adjacent ownerships, which would lead to degraded riparian conditions on these lands.

Forest management activities could lead to timber harvest on adjacent private and State of Wyoming lands that would use roads left in place on BLM-administered lands if they suit the

activity on adjacent lands. Such activities could reduce big-game hiding cover, increase road density, and increase the overall impacts of treatments on BLM-administered lands because they would effectively be larger in scale. There also could be some cases where vegetative treatments such as prescribed fires and fuel-reduction projects that might have similar cumulative impacts would extend to adjacent ownerships, because land owners would find it more economical to have their land treated at the same time as public lands.

Cumulative effects on raptors that would result from current, proposed, and future activities such as gas and minerals exploration and development, agriculture, and urban development could include increased disturbance to nesting raptors, degradation or destruction of nesting habitats, increased raptor collisions with powerlines, increased electrocutions, and increased vehicular collisions with raptors feeding on carrion. As development brings additional powerlines to the planning area, the availability of power poles, when built to most current Avian Power Line Interaction Committee (APLIC) standards, for use as perches could benefit raptors.

Effects on migratory birds described for each of the alternatives would be in addition to impacts that have already occurred and that would occur as a result of other activities in the planning area. Similar types of direct and indirect effects have already occurred, including direct mortality, habitat loss, displacement, habitat fragmentation, and population-level effects. Evaluating the cumulative impacts of past, ongoing, and reasonably foreseeable activities is difficult because of the general lack of data on migratory birds in the planning area and the range of effects that would occur in varying degrees to various species.

Cumulative effects on upland game from current, proposed, and future activities such as gas and mineral exploration and development, agriculture, and urban development could include increased mortality, especially from collisions with vehicles and powerlines; displacement and harassment; and physical degradation or destruction of leks and reproductive areas (nesting and brood-rearing areas).

4.4.6.8. Conclusion

Table 4.50, “Summary of Impacts to Wildlife” (p. 1025) summarizes impacts to wildlife by alternative.

Table 4.50. Summary of Impacts to Wildlife

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible beneficial	Major beneficial	Major adverse	Major beneficial
Soil	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Water Resources	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Cave and Karst Resources	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Mineral Resources				
Locatable Minerals	Major adverse	Minor adverse	Major adverse	Major adverse
Leasable Minerals – Coal	Major adverse	Moderate adverse	Major adverse	Major adverse
Leasable Minerals – Fluids	Major adverse	Major adverse	Major adverse	Major adverse
Salable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Fire and Fuels Management				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Unplanned Fire (Wildfire)	Minor adverse	Major adverse	Moderate adverse	Major adverse
Planned Fire (Prescribed Fire)	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Moderate beneficial	Major beneficial	Moderate adverse	Moderate beneficial
Vegetation – Grassland and Shrubland Communities	Moderate beneficial	Major beneficial	Major adverse	Moderate beneficial
Vegetation – Riparian/Wetland Resources	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Invasive Species and Pest Management	Moderate adverse	Negligible adverse	Moderate adverse	Moderate adverse
Fish and Wildlife Resources – Fish	Major adverse	Major beneficial	Major beneficial	Major beneficial
Fish and Wildlife Resources – Wildlife	Major beneficial	Major beneficial	Major beneficial	Major beneficial
Special Status Species – Plants	Minor beneficial	Major beneficial	Major beneficial	Major beneficial
Special Status Species – Fish	Major adverse	Moderate beneficial	Minor beneficial	Moderate beneficial
Special Status Species – Wildlife	Minor beneficial	Major beneficial	Major beneficial	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Major beneficial	Major beneficial	Major beneficial	Major beneficial
Paleontological Resources	Negligible beneficial	Major adverse	Minor beneficial	Major beneficial
Visual Resources	No effect	Major beneficial	Negligible adverse	Major beneficial
Land Resources				
Forest Products	Minor beneficial	Minor adverse	Major adverse	Minor adverse
Lands and Realty	Major adverse	Major beneficial	Major adverse	Major beneficial
Renewable Energy	Negligible adverse	Major adverse	Major adverse	Major adverse
Rights-of-Way and Corridors	Major adverse	Major adverse	Major adverse	Major adverse
Travel and Transportation Management	Major adverse	Major adverse	Major adverse	Major adverse
Recreation	Minor adverse	Minor beneficial	Moderate adverse	Moderate beneficial
Lands with Wilderness Characteristics	No effect	Minor beneficial	No effect	Negligible beneficial
Livestock Grazing Management	Major adverse	Major beneficial	Major adverse	Major beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Minor beneficial	No effect	Moderate beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Wilderness Study Areas	Minor beneficial	Minor beneficial	Minor beneficial	Moderate beneficial
Socioeconomic Resources				
Social and Economic Conditions	Major adverse	Minor adverse	Major adverse	Major adverse
Health and Safety	No effect	No effect	No effect	No effect

4.4.7. Special Status Species – Plants

This section describes potential direct, indirect, short-term, and long-term effects on special status plant species under each alternative and whether those effects would be beneficial or adverse. Map 28 shows the distribution of special status plants in the planning area.

Direct impacts to special status plant species would result from actions that may cause the loss of individual special status plants. Surface-disturbing activities, urbanization, logging activities, quarrying, sand mining, herbivory, trampling, fire, and herbicide and pesticide application would be the primary means by which special status plants would be directly affected. Plant collection, improper grazing management practices, and OHV use also could remove vegetation and disturb soil, which would directly affect special status plant populations. Indirect effects to special status plants would result from actions that aid or compromise the protection of those plant species. The loss or degradation of suitable habitats for special status plant species would be an indirect effect. Indirect effects on potential habitats for special status plant species also could result when actions change habitats in a way that makes them unsuitable for future colonization. Alterations in stream function, demands for water, and competition from invasive plant species would be the primary sources of indirect effects on special status plant species.

For purposes of this analysis, short-term effects on special status plant species result from activities that contribute to the decline in abundance or distribution of a species and can be reversed within 5 years after the activities; long-term effects would require more than 5 years to restore.

Allowable uses and management actions that contribute to the decline in abundance or distribution of special status plant species would be adverse. Beneficial effects would result from activities that protect habitats or reduce the risk of harm to these special status plants. An increase in populations of special status plant species in response to enhanced habitat or the increased viability of a species would be beneficial.

4.4.7.1. Methods and Assumptions

This analysis and its conclusions are based on review of existing literature, interdisciplinary team knowledge of resources in the planning area, and information provided by other agencies. Existing literature and analyses include the 1985 Buffalo RMP (BLM 1985c), the 2003 PRB EIS (BLM 2003c), the Wyoming Natural Diversity Database (WYNDD), and WGFD Spatial Mapping and Analysis. Effects are quantified where possible. Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. In addition to literature review and in the absence of quantitative data, best professional judgement was used. Effects are sometimes described using ranges, or in qualitative terms if appropriate. Many effects are qualitatively assessed due to the unavailability of suitable data.

Analysis methods and assumptions and include, the following:

- Assumptions described in the *Vegetation – Riparian/Wetland Resources* section of this chapter are used to analyze effects on potential habitat for Ute ladies'-tresses orchid, an orchid not known to be present in the planning area, but which typically occurs in riparian and wetland habitat. Special status plant species present or with the potential to be present in riparian and wetland habitats could be affected by water quality or water use in the planning area.
- Consultation with the USFWS and following conservation measures identified in the Biological Assessment for all listed and sensitive species for the BLM Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Final Programmatic EIS (BLM 2007g) are anticipated to mitigate most impacts to special status plant species.
- Actions that reduce the threat of establishment or spread of invasive species directly benefit special status plant species. Instruction Memorandum 2006-073 (BLM 2006b) establishes policy and guidance for the use of certified weed seed-free products and mulch in restoration projects on public lands.
- Reclaiming areas of surface disturbance and reestablishing vegetation minimizes adverse effects on soils and therefore to special status plant species. The sooner vegetation is reestablished, the greater the benefit to special status plant species.
- Management actions 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 management action boundaries.
- The total amount of new surface disturbance allowed under an alternative is an index of potential effects on special status plants. Success of reclamation measures prescribed as a condition of development is unknown, and could underestimate the potential effect of surface disturbance on special status plant populations.
- Surface-disturbing activities in special status plant habitat would adversely affect special status plant species.
- Because the densities and locations of special status plant species in the planning area are not entirely known and because the locations of potential actions under the different alternatives also are not known, the impact analysis is 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 affect special status plant species.
- Existing provisions (e.g., presence/absence surveys by a qualified botanist during the appropriate phenological stage [e.g., blooming] for positive identification and performed before proposed actions) to protect special status plants species are implemented and conditional monitoring is performed (e.g., grazing and surface disturbance reclamation) to ensure special status plant species are not jeopardized.
- As more monitoring and survey data become available, it is possible that additional populations of existing special status plants could be found.

Significance Criteria

In addition to the significance criteria indicated in the beginning of this chapter, project actions would be considered potentially significant if the following occurred:

- Substantial loss of the biological integrity and habitat function of terrestrial and aquatic ecosystems that would make a species eligible for listing under the ESA.
- Decreased viability or increased removal of Threatened, Endangered, Proposed, or Candidate species, or adverse alteration of their critical habitats.
- Substantial loss of habitat function or disruption of life history requirements of special status plant species that would preclude improvement of their status.

4.4.7.2. Impacts Common to All Alternatives

Special Status Species – Plants (major beneficial)
Implementing all actions prescribed in USFWS Biological Opinions for Threatened or Endangered plant species would have major beneficial effects on special status plants. Biological Opinions provide guidance for the protection and recovery of special status plant species.

Physical Resources

Air Quality (major beneficial)
Adherence to rules and regulations and enhancing cooperative processes are administrative processes that would have no direct effect on special status species plants. Dust that covers vegetation reduces the photosynthesis process by blocking light and potentially water from reaching the plant cells. Travel on roads that are or will be surfaced with either gravel or scoria, if untreated, would force large amounts of dust into the air; this dust could settle on vegetation. Reducing dust emissions and overall air quality management throughout the planning area would have a major beneficial effect on special status plant species.

Soil (major beneficial)
Evaluating proposed surface-disturbing activities for effects on soils also would allow for surveys of plant species. Through this process, more populations of special status plant species could be discovered and adverse effects on those species avoided. Including reclamation plans in any authorized surface-disturbing activity would have a major beneficial effect on special status plants, if implemented on every project, because these plants could be identified and avoided or enhanced during the reclamation process throughout the entire planning area.

Water Resources (moderate adverse)
Altering water quantity, including alternative water supplies and flow controls, or water quality in any known population of special status plant species could have an adverse effect on species that rely on the existing water regime. Altering water quantity and quality also could provide water in areas suffering from drought, thereby supplementing existing populations or creating habitat for special status plant species in new areas. This would have a beneficial effect on special status plant species. Reducing channel and bank erosion and associated loss of riparian habitats would have beneficial effects on special status plants that inhabit riparian areas. Erosional features such as these, if uncontrolled, would alter habitat, potentially making it unsuitable for populations of special status plant species to persist, or would destroy existing populations. There are 19,861 acres (BLM surface) of suitable habitat for special status plants within 500 feet of riparian waterway segments in the planning area. Management actions common to all alternatives occur within five to ten percent of special status plant habitats; therefore, they would have moderate beneficial or adverse effects on special status plant resources. Other water management actions common to all alternatives, such as filing for water rights and plugging unneeded wells would have no to negligible effects on special status plant species. Due to the potential adverse effects, the overall conclusion is that the water management actions would have a moderate adverse effect on special status plants.

Cave and Karst Resources (major beneficial)
Cave inventories could benefit special status plant species. There are 101,455 acres (BLM surface) of suitable habitat for special status plants in the cave formations area. Cave inventories include surveys for special status plant species. New population information could be acquired through these inventories. However, the geologic formations likely to contain caves are limited

to the western edge of the planning area in the Big Horn Mountains; this is also where special status plant species are likely to occur. Inventories would occur within greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives would have major beneficial effects on special status plant resources.

Mineral Resources

Development of new and concurrence with existing MOUs between the BLM and other agencies are administrative processes that would not effect special status plant species.

Locatable Minerals (negligible adverse)
Fifty-five acres of special status plant species occur in areas open to locatable mineral extraction. Impacts would include removal of vegetation and loss of habitat, potentially including removal of individual plants and/or entire populations of special status plants. This is less than one percent of all special status plant habitats, therefore, the loss of habitat would be negligible.

Leasable – Coal (major beneficial)
Coal leasing management actions common to all alternatives will have no effect on special status plant species. There are no special status plant species on existing leased coal parcels. The leasing process involves NEPA analysis, thereby identifying any conflicts for special status plant species before there could be adverse effects. The consideration of new coal leases also would involve a screening process, which would allow for avoidance of special status plant species. This and any decisions for deferral of coal leasing would have a major beneficial effect on special status plant species.

Leasable Minerals – Fluids (minor adverse)
A requirement that lessees perform operations in a way that minimizes adverse effects to other resources and other land uses and users would also minimize adverse effects and result in minor beneficial effects on special status plant species. There is one population of William's wafer-parsnip on leased parcels. Opening all oil and gas mineral estate to leasing would have a major adverse effect on this special status plant at this location. Management of any acquired mineral estate in accordance with management of the surrounding areas might or might not affect special status plant species. Management of any mineral estate should be to avoid effects on special status plant species, regardless of management of surrounding areas. Any decisions for closures to fluid mineral leasing would not affect special status plant species. Making geothermal resources available for leasing would have a negligible adverse effect on special status plant species. The potential for geothermal development in the planning area is low. Effects identified above would be localized, and would occur only where leasable fluid minerals and special status plant species overlap. Fluid mineral development could occur in one to five percent of special status plant habitats; therefore, the management actions common to all alternatives would have minor adverse effects on special status plant resources.

Salable Minerals (minor adverse)
Salable minerals extraction would result in direct, long-term, impacts on special status plant species. Impacts would include removal of vegetation and loss of habitat, potentially including removal of individual plants and/or entire populations of special status plants. The level of impacts would depend on the size of the salable minerals area. Many sand and gravel areas are associated with riverine and alluvial plains. The vegetative communities normally associated with these areas would be significantly impacted by the extraction of salable minerals.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible adverse)
Implementing the BLM Emergency Stabilization and Burned Area Rehabilitation standards and rehabilitating fire lines would reclaim areas faster, and therefore have a beneficial effect on special status plant species. Landscape treatments to achieve enhanced fuels management or restore fire-adapted ecosystems could result in short-term adverse effects through their removal during fire treatments. Long-term effects from treatments would be beneficial because the ecosystem would be returned to a more natural state in which these native plant species would thrive. In areas where these potential treatment areas and special status plant species directly overlap, there would be adverse or beneficial effects, respectively, on special status plant species. However, projected over the entire planning area, the locations where wildfires are most likely to occur compared to locations of most of the populations of special status plant species in the planning area make these adverse effects negligible.

Planned Fire (Prescribed Fire) (minor beneficial)
Adhering to the current District Fire Management Plans and ensuring all prescribed fire activities comply with standards and rules are administrative processes that would have no effect on special status plant species. Consulting with a resource advisor on all wildland fires that involve or threaten BLM-administered lands would decrease the likelihood of effects on special status plant species. Resource advisors would be aware of known locations of special status plant species and would advise activities that would result in reducing risks to special status plant species as much as possible. These actions would have beneficial effects on special status plant species. Prohibiting the use of retardant or foam within 300 feet of surface water sources would have a beneficial effect. There is one population of Williams' wafer-parsnip within 300 feet of surface water resources in the planning area. There are approximately 10,762 acres (BLM surface) of suitable habitat for special status plant species within 300 feet of surface water resources. Special status plant species inhabiting riparian corridors surrounding surface water sources would be protected from the smothering effect of these chemicals. This protection would occur in one to five percent of special status species habitats; therefore, management actions common to all alternatives would have a minor beneficial effect on special status plant resources.

Biological Resources

Biological resources management actions common to all alternatives and that are administrative processes (e.g., development and prioritization of plans, providing outreach and education, updating plans, and adhering to rules, regulations, and agreements such as MOUs) would have no to negligible effects on special status species plants.

Management actions common to all alternatives that promote a balanced management of these resources in the planning area would promote a natural landscape, thereby promoting the growth of native plant species such as special status plant species. These management actions include such things as managing for forage enhancement, implementing cooperative IPM programs, and providing suitable wildlife habitat. These would have minor to major beneficial effects on special status plant species overall.

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for forests and woodlands.

Vegetation – Grassland and Shrubland Communities and Riparian/Wetland Resources (major beneficial)
Reducing impacts to vegetative resources, by nature, would reduce impacts to special status plant species. Management actions common to all alternatives that would achieve this goal would have beneficial effects on special status plant species. Vegetation inventories on all lands (grasslands and shrublands and lotic and lentic riparian/wetland systems, and evaluation of CBNG-created riparian and wetland systems for retention or reclamation) would have beneficial effects on special status plant species. Inventories would help identify new populations and help monitor existing populations of special status plant species throughout the planning area. Knowledge of special status plant species locations and status would help the BLM make land management decisions. To date, there are 21 known populations of special status plant species (3 Porter's sagebrush 18 William's wafer-parsnip) on BLM-administered lands in the planning area. The effects identified would be localized, and would occur only where targeted vegetation and special status plant species overlap. Inventories for vegetation under these other resources would occur within greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives for grassland and shrubland communities would have major beneficial effects on special status plant habitats.

Restoring disturbed sites, including split estate lands, close to suitable habitat for special status plant species and known populations of such plants would increase suitable habitat and promote new, restore historic, or promote the spread and enhance the viability of known populations of special status plant species. This would have beneficial effects on special status plant species. Expansion and enhancement of riparian/wetland systems and habitat would have these same long-term beneficial effects on special status plant species that inhabit riparian/wetland ecosystems. There are three populations of Williams' wafer-parsnip on split estate lands in the planning area. There are 243,929 acres of suitable habitat for special status plant species on split estate lands (fluid minerals) in the planning area. Habitat restoration and enhancements for riparian/wetland systems would occur within greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives for riparian/wetland resources would have major beneficial effects on special status plant habitats.

Invasive Species and Pest Management (minor beneficial)
Controlling grasshoppers and Mormon crickets on public lands would have adverse effects on special status plant species over the short term, but could prove to be beneficial over the long term. Initial treatment for grasshoppers and Mormon crickets could destroy flowering and fruiting special status plant species if pesticides were applied close to known populations of special status plant species while these plants were in bloom and these plants were trampled or otherwise destroyed during the application process. Reducing the numbers of these two pests would improve vegetative condition over the long term, thereby beneficially affecting special status plant species. In areas where these pesticide application and special status plant species overlap, there would be adverse effects on special status plants. However, projected over the entire planning area, the estimated amount of overlap would make these beneficial effects minor.

Fish and Wildlife Resources – Fish and Wildlife, **and Special Status Species – Fish and Wildlife** (major beneficial)
Management of barriers to fish passage would have no effect on special status plant species because these barriers and populations of special status plant species are not present in the same locations. Effects on special status plant species from the management of activities potentially affecting native and desirable non-native fish species are not known at this time. It is difficult to predict impacts to special status plant species from these, at present, undefined activities.

Management of public access to fish bearing waters or to protect crucial habitats could have adverse effects on special status plant species. Future access routes have the potential to adversely affect special status plants and their habitats by stripping away vegetation as part of access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access. Construction of new fences, even in accordance with the BLM Fencing Handbook, would have the same potential adverse effects on special status plant species for the same reasons. There are three known populations of Williams' wafer-parsnip on BLM-administered lands close to fish-bearing waters. There are 51,745 acres of suitable special status plant species habitat on BLM-administered lands close (within 0.25 mile) of fish-bearing waters. Access management and new fence construction is likely to occur within greater than ten percent of special status plant habitats.

The NEPA and permitting processes would be expected to result in indirect beneficial effects on special status plant species as a result of protecting fish and wildlife (including special status species), protecting fish and wildlife habitats, and mitigating impacts to fish and wildlife habitats (including habitats for special status species). Special status fish species and non-special status fish species management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species. This would have beneficial effects on special status plant species, in particular species that inhabit these same riparian corridors, such as Ute ladies'-tresses orchid. Special status wildlife species and non-special status wildlife species management actions common to all alternatives support efforts to protect and improve ecosystems of varying habitat types throughout the planning area. The actions that include managing vegetative diversity, minimizing disturbances to springs and riparian zones, and improving sagebrush plant communities are actions that would help maintain natural landscapes; this would have major beneficial effects on all special status plant species.

Avoidance areas, whether for application of broad-spectrum insecticides or protect nesting bald eagles, would have a beneficial effect on special status plant species where avoidance areas and populations of special status plant species overlap. Avoidance areas for other species would, by nature, be avoidance areas for special status plant species. Avoidance areas for fish, special status fish, wildlife, and special status wildlife will occur in greater than ten percent of special status plant habitats; therefore management actions common to all alternatives for fish, wildlife, and special status fish and wildlife will have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (major beneficial)
Maintaining and developing relationships with Native American tribes and maintaining federal ownership of areas important to Native Americans or with significant paleontological values are administrative processes and would have no effect on special status plant species. Other cultural resources management actions common to all alternatives, such as the stabilization and protection of sites, are actions that would create avoidance areas to protect cultural resources. These avoidance areas would, by nature, be avoidance areas for special status plant species. There are 12 populations of Williams' wafer-parsnip within 5 miles of significant cultural sites in the planning area. These avoidance ares occur within greater than ten percent of special status plant habitats, therefore, management actions common to all alternatives for cultural and paleontological resources would have major beneficial effects on special status plant resources.

Visual Resources (no effect)
No effects are anticipated from visual resource management actions common to all alternatives.

Land Resources

Forest Products (moderate adverse)
Prohibiting timber harvest and recreational camping within 200 feet of surface water sources would create avoidance areas to protect surface water; these would, by nature, be avoidance areas for special status plant species. There is one population of Williams' wafer-parsnip within 200 feet of surface water resources in the planning area. There are approximately 5,584 acres (BLM surface) of suitable habitat for special status plant species within 200 feet of surface water resources. Areas prohibited from timber harvests encompass one to five percent of special status plants habitats.

Personal use of forest products by the public could cause an adverse effect on special status plant species. Access routes to retrieve forest products have the potential to adversely affect special status plant species and their habitats by stripping away vegetation as part of access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access. There are five populations of Williams' wafer-parsnip on BLM-administered lands with forest products. There are 16,234 acres of suitable habitat for special status plant species on BLM-administered lands with forest products. Forest products occur within five to ten percent of special status plant habitats; therefore, management actions common to all alternatives would have moderate adverse effects on special status plant resources.

Lands and Realty (negligible beneficial)
Lands and realty management actions common to all alternatives would have no to negligible effects on special status plant species. Project-specific analysis of lands and realty actions, such as approval of R&PP permits, land use authorizations, and withdrawals and land disposals require NEPA analyses, which would identify any conflicts for special status plant species before adverse effects could occur.

Renewable Energy (no effect)
Promotion and coordination of renewable-energy opportunities are administrative processes that would have no effect on special status plant species.

Rights-of-Way and Corridors (major adverse)
ROW and corridors management actions common to all alternatives that promote identified preferred locations and minimize surface disturbance, including transportation and communications site planning, in the planning area also require NEPA analyses. There are 21 known populations of two special status plant species (3 Porter's sagebrush and 18 Williams' wafer-parsnip) on BLM-administered lands in the planning area. There are 126,811 acres of suitable habitat for special status plant species on BLM-administered lands. ROWs and corridors may be permitted in greater than ten percent of special status plant habitats; therefore, management actions common to all alternatives would have major adverse effects on special status plant resources.

Travel and Transportation Management (major adverse)
Management of public access common to all alternatives that are administrative processes (negotiation across non-BLM-administered lands to isolated public parcels, a BLM transportation

system, road and trail closures and abandonment decisions, including inventories of all roads and trails, completion of Recreation Area Management Plans (RAMPs), providing general or educational information to the public) would have no effect on special status plant species.

Future access routes (roads and trails to isolated parcels of public land, to caves, or for any other recreational purposes) would have the potential to adversely affect special status plants species plants and their habitats by stripping away vegetation as part of access route creation, trampling or eliminating vegetation, and compacting soils throughout the footprint of the access. Allowing casual use of all public lands would intensify this effect because access would then be undirected and there would be no protection for special status plant species or their habitats. There are 21 known populations of two special status plant species (3 Porter's sagebrush and 18 Williams' wafer-parsnip) on BLM-administered lands. There are 126,811 acres of suitable habitat for special status plant species on BLM-administered land in the planning area. Areas where these future access routes may be created occur within greater than ten percent of special status plant habitat; therefore, management action common to all alternatives would have major adverse effects on special status plant resources.

Recreation (minor beneficial)
Minimizing recreation impacts in riparian habitats and providing for temporary or permanent closures for public health and safety reasons would have a beneficial effect on special status plant species. Avoidance areas for other resource concerns would, by nature, be avoidance areas for special status plant species. In areas where these avoidance areas and populations of special status plant species directly overlap, there would be beneficial effects on special status plant species. However, projected over the entire planning area, the estimated small amount of overlap would make these beneficial effects minor.

Lands with Wilderness Characteristics (moderate beneficial)
Evaluations of BLM-administered lands for wilderness characteristics would likely include surveys for special status plant species. These inventories could provide new information on plant populations. There are three populations of Williams' wafer-parsnip in lands with wilderness characteristics. Areas with wilderness characteristics occur in five to ten percent of special status plant habitats; therefore, management actions common to all alternatives for lands with wilderness characteristics would have moderate beneficial effects on special status plant resources.

Livestock Grazing Management (major beneficial)
Management actions common to all alternatives that promote balanced management of land resources in the planning area would promote a natural landscape, thereby promoting the growth of native plant species such as special status plants. These management actions include such things as adjusting grazing leases; implementing new AMPs; and managing livestock grazing to sustain riparian, wetland, mountain mahogany, and other habitats. These actions would have beneficial effects on special status plant species. There are 29 populations of two special status plant species (3 Porter's sagebrush and 26 Williams' wafer-parsnip) within BLM grazing allotments. There are 126,811 acres of suitable habitat for special status plant species within BLM grazing allotments. Livestock grazing allotments occur in greater than ten percent of special status plant species habitats; therefore, management actions common to all alternatives would have major beneficial effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
Management actions common to all alternatives associated with ACECs would have no effect on special status plant species.

Wild and Scenic Rivers (negligible beneficial)
The canyon of the Middle Fork Powder River that is suitable and eligible for WSR designation overlaps with potential special status plants habitat. Preserving the outstandingly remarkable values would limit disturbance and development within Middle Fork Canyon, resulting in a benefit to special status plant species. Because there are no known populations within Middle Fork Canyon, the overall benefit would be negligible to minor.

Scenic or National Back Country Byways (minor adverse)
Increased road maintenance and human activity on byways would have adverse impacts to plant species from dust, soil erosion, spread of invasive species, and unauthorized plant collection. Management actions common to all alternatives associated with scenic or BCBs will have a minor adverse effect on special status plant resources.

Wilderness Study Areas (moderate beneficial)
There are three populations of Williams' wafer-parsnip in WSAs. There are 28,931 acres of suitable habitat for special status plant species in WSAs. WSAs contain five to ten percent of all of the special status plant habitats in the planning area; therefore, management actions common to all alternatives would have moderate beneficial effects to special status plant resources.

Socioeconomic Resources

Social and Economic Conditions (no effect)
Management actions common to all alternatives are administrative processes and will have no effect on special status plant resources. Impacts to social and economic resources will be quantified on a project specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section

Health and Safety (negligible adverse)
Any health and safety management actions common to all alternatives would likely have an adverse effect on special status plant species. Emergency response activities are likely to involve efforts in which little to no time is allowed to adjust actions to avoid impacts to special status plant species. Special status plant species are likely to be trampled, bulldozed, or otherwise altered by hazardous waste cleanup, reclamation of abandoned mines, and contaminant spills. Actions related to human health and safety could occur at any location throughout the planning area. It is likely that these would occur on a small scale. There would be adverse effects on special status plant species in locations where human health and safety actions and populations of special status plant species overlap. However, projected over the entire planning area and over an extended period, these adverse effects would be negligible.

The following sections describe impacts by alternative. These impacts would be in addition to the impacts common to all alternatives described above. Only management actions common to all alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.7.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to special status plant species from management of other resources under Alternative A.

Special Status Species – Plants (major beneficial)
Neither Alternative A nor other previous land use plans have included decisions for management of special status plant species. This lack of decision has left protections for special status plant species to be included in the analyses for individual projects. Thus far, this has provided adequate protections for known populations of special status plant species; however, absent surveys to discover new populations, there could have been activities that permanently altered habitat for these species or existing populations could have been missed and destroyed.

There are common themes throughout Alternative A for all resources. Where pertinent, these common themes are analyzed together.

Physical Resources

Air Quality (negligible beneficial)
The types of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for air quality (habitat conservation). In Alternative A, though, these impacts would be analyzed on a project specific basis. Without monitoring or oversight on a programmatic level, lack of consistency would cause the beneficial effects to likely only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial effects on special status plant resources.

Soil (major beneficial)
The types and magnitude of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for soil (habitat conservation). In Alternative A, management actions for soil are beneficial where habitats are conserved through prohibitions of surface-disturbing activities and/or surface occupancy, both of which occur in greater than ten percent of special status plant habitats. Soil resource management actions under Alternative A would have major beneficial impacts on special status plant resources.

Water Resources (negligible beneficial)
The types of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for water resource management (habitat conservation and improvement). Management actions are beneficial when habitats are conserved through prohibitions of surface disturbance, which occurs in five to ten percent of special status plant habitats. Within Alternative A, the impacts to water resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that the beneficial effects would be reduced by half, making the moderate beneficial effects only negligible.

Cave and Karst Resources (minor beneficial)
The types of effects to special status plant species from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cave and karst (habitat conservation). Management actions are beneficial when habitats are conserved

through prohibitions of surface disturbance, which occurs in greater than ten percent of special status plant habitats. Within Alternative A, the impacts to cave and karst resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only minor.

Mineral Resources

Effects to special status plant resources from management actions associated with all mineral resources in Alternative A would be the same as those described in the *Impacts Common to All Alternatives* section above.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse)
Under Alternative A, suppression efforts and restricting the use of some types of suppression equipment would have a direct, short-term beneficial effect on special status plant species for the life of the fires. Long-term, the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives is estimated to affect approximately 14,000 acres from BLM actions. Due to the potential long-term degradation of forest and woodland resources (limber pine habitats), but likely scattered nature of effects to all other special status plant habitats in the planning area, the adverse effects of habitat or individual removal from unplanned fire are likely to be minor.

Planned Fire (Prescribed Fire) (major beneficial)
Impacts to special status species plants from management actions associated with planned (prescribed) fire in Alternative A would be the same as those described in the unplanned fire section above. Due to the locations of potential prescribed fire projects in the planning area, more than ten percent of limber pine habitats could be impacted. These actions also would have a direct beneficial effect on vegetation over the short and long terms because burn conditions (air and soil temperatures, wind conditions, and fuel types) would be less severe than in wildfires. Management actions for planned fire under Alternative A would have major beneficial effects on special status plant resources.

Biological Resources

Vegetation – Forests and Woodlands (moderate beneficial)
Under Alternative A, forest management practices that convert late-seral stage stands to early and mid-seral stage would adversely affect special status plant species adapted to late-seral forest types. However, forest management practices would create a diversity of seral stages for different plant species habitat requirements, thereby increasing habitat for plant species diversity and richness. Temporary roads created for commercial timber harvesting would fragment habitat and possibly disturb existing populations of special status plant species for the life of the project. Reclaiming roads would decrease the amount of time it would take for native vegetation to reestablish, thereby facilitating special status plant species regeneration in the project area. Forests and woodlands contain five to ten percent of limber pine, William's waferparsnip, and Porter's sagebrush habitats; therefore management actions for forests and woodlands under Alternative A would have moderate beneficial effects on special status plant resources.

Vegetation – Grassland and Shrubland (major beneficial)

Under Alternative A, reclamation seeds mixes are determined on a project-specific basis, allowing for site specific management of resource objectives and having a major beneficial effect to special status plant resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Under Alternative A, surface-disturbing activities would not be prohibited within 500 feet of riparian and wetland areas, protecting special status plant species that inhabit these areas from direct loss. Site-specific management for desired species would allow for greater flexibility in restoring desired species and functionality to habitats. Management actions associated with Alternative A for riparian/wetland resources will have major beneficial effects on special status plant resources.

Invasive Species and Pest Management (minor beneficial)
Under Alternative A, invasive species and pest control projects are decided on an annual basis and in conjunction with the county weed and pest. Short-term beneficial effects on special status plant species would result from small-scale planning and less pesticide applications, with the ability to prioritize areas annually. However, adverse effects to these plant species would be likely over the long term by giving invasive species a competitive advantage over the native special status plant species. Annually treating cheatgrass on a project-by-project basis would be ineffective, because only small, scattered treatments would occur; therefore, most of the cheatgrass would be unaffected. This would have an adverse effect on native special status plant species. Overall, Alternative A invasive species and pest management would have a minor beneficial effect on special status plant species.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (major beneficial)
Alternative A actions that promote balanced management of biological resources in the planning area would promote a natural landscape, thereby promoting the growth of native plant species such as special status plants. These management actions include such things as managing vegetative resources for special status wildlife species, and controlling invasive plant species.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Impacts to special status species plants from management actions associated with wildlife and special status species – wildlife in Alternative A would be the same as those described in the fish and special status species fish section above. In addition, management actions for wildlife and special status wildlife include prohibitions of surface disturbance and/or surface occupancy for the protection of wildlife and special status wildlife resources. These prohibition areas also contain greater than ten percent of special status plant habitats; therefore, wildlife and special status wildlife management actions under Alternative A would have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Impacts to special status species plants from management actions associated with all heritage and visual resources in Alternative A would be the same as those described in the *Impacts Common to All Alternatives* section above.

Land Resources

Forest Products (moderate beneficial)
Under Alternative A, the layout and timing of timber sales would largely determine the degree of

effects on special status plant species. Regeneration of commercial harvested areas begins with early successional stage vegetation, which provides habitat for plant species that depend on early successional habitats. The subsequent years would allow for natural seral-stage progression of the habitat and thereby provide habitat for various special status plant species that depend on different seral stages. This natural succession happens over an 80- to 100-year period. Over the short term and where the forest products and populations of special status plant species overlap, timber sales would have an adverse effect on such species. Over the long term and where the two resources overlap, natural regeneration would have a beneficial effect on special status plant species. Fencing the regeneration areas would help the natural succession to return to each of the seral stages and promote the growth of special status plant species. BLM-administered land with forest products also contains five to ten percent of special status plant habitats; therefore, management actions for forest products under Alternative A would have moderate beneficial effects on special status plant habitats.

Lands and Realty (no effect)
No parcels available for land tenure adjustments contain special status plant habitats.

Renewable Energy and Rights-of-Way and Corridors (no effect)
No areas suitable for renewable energy or ROWs and corridors contain special status plant habitats.

Travel and Transportation Management (major adverse)
Under Alternative A, there would be direct and indirect effects on special status plant species from travel management and OHV use. OHV use on and off designated trails has the potential to destroy vegetation, compact soils, and lead to soil erosion and ponded water. Special status plant species could be crushed and their habitats degraded. Higher, rockier terrain and remote areas are becoming more accessible over time as OHVs become more sophisticated and powerful, and as the human population in the planning area increases. These areas are also the areas where most of the special status plant species in the planning area are likely to be found. By designating areas where OHV use is limited to designated roads and trails, adverse effects on special status plants species can be reduced. In cases where motorized vehicle use is closed for only portions of the year, these closures would not be as great a benefit to special status plant species. Although this might prevent the removal of many special status plant species during their time of flowering or fruiting, it would not preclude removal of the vegetative layer as a whole. Allowing surface occupancy during any time of year would have an adverse effect on special status plant species. Regardless of intensity of management, OHV use is still anticipated to have a major adverse effect on special status plant species where OHV use and populations of such species overlap (greater than ten percent).

Recreation (minor adverse)
Under Alternative A, there could be adverse effects on special status plant species from recreation activities. Hiking to or occasional repeated use of remote camp sites could have direct effects on special status plant species. Plants could be trampled or crushed, and soil could be compacted or disturbed. Holders of Special Recreation Permits are required to follow all rules and regulations, therefore, should avoid camping at locations where the BLM has identified populations of special status plant species. Given the low level of recreation use on most BLM-administered lands in the planning area, and the scattered, infrequent locations of populations of special status plant species, these adverse effects would mostly be minor.

Lands with Wilderness Characteristics (no effect)
Alternative A does not identify any lands with wilderness characteristics, thus special status plant habitats are not affected.

Livestock Grazing Management (major adverse)
Livestock grazing has the potential to have major adverse effects on special status plant species through partial or complete removal of individual plants and through damage by trampling. The degree of effects would depend upon the number of animals involved and seasonal frequency of presence in special status plant species habitat. There are 29 populations of special status plant species (3 Porter's sagebrush and 26 Williams' wafer-parsnip) within BLM grazing allotments. There are 288,498 acres of suitable habitat for special status plant species within BLM grazing allotments, including 84% of all Williams' wafer-parsnip habitat in the planning area. Under Alternative A livestock grazing is not authorized on approximately 10,000 acres of public land where grazing has been determined to be incompatible with other resource values, specifically, 4,000 acres in the canyons and slopes of the southern Big Horn Mountains. Greater than ten percent of special status plant habitats are present in the BLM grazing allotments; therefore, management actions for livestock grazing management would have major adverse effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
Alternative A does not identify any ACECs, thus special status plant habitats are not affected.

Scenic and Back Country Byways (no effect)
Alternative A does not identify any BCBs, thus special status plant habitats are not affected.

Wild and Scenic Rivers (no effect)
Alternative A does not identify any management actions for WSRs, thus special status plant habitats are not affected.

Wilderness Study Areas (moderate beneficial)
Vegetation inventories on all lands included in WSAs would have a moderate beneficial effect on special status plant species. Inventories would help identify new and help monitor existing subpopulations or populations of special status plant species throughout the planning area. Knowledge of special status plant species locations and status would help the BLM make land management decisions. There are four known populations of special status plant species in WSAs. There are 28,931 acres of suitable habitat for special status plant species in WSAs. WSAs contain five to ten percent of special status plant habitats; therefore, management actions for WSAs under Alternative A would have moderate beneficial effects on special status plant resources.

4.4.7.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to special status plant species due to their implementation.

Special Status Species – Plants (major beneficial)
Alternative B management actions for special status plant species include prohibiting activities (surface disturbances, minerals exploration, motorized vehicle use, explosives and blasting, aerial application of herbicides, and use of fire suppression chemicals) in suitable habitat for special

status plant species. This approach is the most conservative of all alternatives because it would allow for not only the protection of known populations of special status plant species populations, but would protect potential future populations. This type of protection greatly increases opportunities to expand the proliferation of these species through future active management decisions. There are approximately 126,811 acres (BLM surface) of suitable habitat for special status plant species in the planning area.

Impacts from conservative management of resources under Alternative B would, in most cases, be similar to impacts described for Alternative A and under *Impacts Common to All Alternatives*. Special status plant species would benefit from conscientious management of physical resources and biological resources. Where impacts to special status plant species vary in degree from impacts described for Alternative A, further rationale is provided below.

Physical Resources

Air Quality (moderate beneficial)
Under Alternative B, air quality would be modeled and analyzed on a project-specific level as under Alternative A. However, under Alternative B, projects expected to approach or exceed emissions standards also would be evaluated for potential mitigation strategies. This would have a moderate beneficial effect on special status plant species.

Soil (major beneficial)
Under Alternative B, effects on soil, resources would be analyzed on a project-specific basis. However, beneficial effects would be greatly increased under Alternative B through prohibiting surface-disturbing activities or applying an NSO stipulation to activities on badlands, rock outcrops, and slopes susceptible to mass movement and prohibiting prescribed fires on highly erodible soils. Avoidance areas for other resources would, by nature, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. Allowing surface occupancy during any time of year in populations of special status plant species or suitable habitat for those species would have adverse effects on special status plant species. These areas of protection for soil resources also conserves greater than ten percent of special status plant habitats; therefore, Alternative B management actions for soil would have major beneficial effects on special status plant resources.

Water Resources (major beneficial)
Under Alternative B, effects on water resources would be analyzed on a project-specific basis as under Alternative A. However, beneficial effects would be greatly increased under Alternative B through prohibiting surface-disturbing activities or applying an NSO stipulation to activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities with 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat. Avoidance areas for other resources would, by nature, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. These areas of protection for water resources also conserves greater than ten percent of special status plant habitats; therefore, Alternative B management actions for water would have major beneficial effects on special status plant resources.

Cave and Karst Resources (major beneficial)
Under Alternative B, effects on soil, resources would be analyzed on a project-specific basis as

under Alternative A. However, beneficial effects would be greatly increased under Alternative B through prohibiting surface-disturbing activities or applying an NSO stipulation to activities in cave and karst areas. Avoidance areas for other resources would, by nature, be NSO areas for special status plant species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. These areas of protection for cave and karst resources also conserves greater than ten percent of special status plant habitats; therefore, Alternative B management actions for water would have major beneficial effects on special status plant resources.

Mineral Resources

Locatable Minerals (major adverse)
Under Alternative B, closing 620,164 acres to leasing or exploration and development of mineral resources or to conserve other resource values would reduce disturbance to special status plant species and result in a restriction of locatable mineral development in one to five percent of special status plant habitats. This means that, conversely, locatable mineral exploration and development could be permitted in greater than ten percent of special status plant habitats; therefore, management actions for locatable minerals under Alternative B would have major adverse effects on special status plant resources.

Leasable – Coal Minerals (major adverse)
Impacts to special status species plants from management actions associated with leasable coal minerals in Alternative B would be the same as those described in the locatable minerals section above.

Leasable – Fluid Minerals (major adverse)
Alternative B limits the exploration and development of fluid mineral resources by the making 2,612,920 acres administratively unavailable to leasing. Areas outside of this, where fluid mineral development could be permitted, contain greater than ten percent of special status plant habitats; therefore, management actions for fluid minerals under Alternative B would have major adverse effects on special status plant resources.

Salable Minerals (major adverse)
Alternative B limits the exploration and development of salable mineral resources by the making 620,164 acres (BLM surface) closed or restricted to salable mineral exploration and development. Salable mineral development would be open on 129,430 acres of BLM surface that also contain greater than ten percent of special status plant habitats; therefore, management actions for salable minerals under Alternative B would have major adverse effects on special status plant resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse)
Alternative B does not limit use of wildland fire as a tool for achieving management objectives for vegetation, wildlife habitat, or forage, and would manage rehabilitation wherever there is fire-related damage. Alternative B also restricts the use of heavy equipment to existing roads and trails. Adverse effects to special status plant species from this action would likely be minor.

Planned Fire (Prescribed Fire) (minor adverse)
Effects to special status species plants from management actions associated with planned fire in Alternative B would be the same as those described in the unplanned fire section above.

Biological Resources

Though the majority of impacts to Biological Resources are analyzed on a project-specific basis within Alternative A, adverse impacts to special status plant species would be greatly reduced by prohibition of surface-disturbing activities for any other resources protection. This would have a major beneficial effect on special status plant species where targeted vegetation and special status plant species overlap. Avoidance areas for other resources would, in turn, be no surface occupancy areas for special status plant species. An NSO stipulation would not prevent all disturbances from occurring. Those activities that require surface disturbance to install underground facilities would still be permitted. Alternative B provides protections and minimizes effects.

Vegetation – Forests and Woodlands (major beneficial)
Alternative B forests and woodlands management would promote a natural landscape with little physical management or alteration. This would minimize adverse effects on special status plant species. In this natural environment, special status plant species would likely persist at current population levels, neither expanding nor decreasing in colony size. Stochastic events that kill entire populations of special status plant species would be more likely under Alternative B without specific management to control insects, disease, and wildfires. Stochastic events are unlikely to eliminate many special status plant populations; therefore, the overall effect is major beneficial due to the prohibitions of disturbance within special status plant habitat.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Reclaiming disturbed sites, including split estate lands, close to suitable habitat for special status plant species and known populations of such plants with only native plants would enhance the viability of known populations of special status plant species by decreasing risk of competition from non-native species. This would have beneficial effects on special status plant species. Reclamation of native plants would occur in five to ten percent of special status plant habitat, therefore; management actions for grassland and shrubland communities under Alternative B would have moderate beneficial effects on special status plant resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Under Alternative B, NSOs prohibit surface-disturbing activities within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. Restoring disturbed sites, including split estate lands, close to suitable habitat for special status plant species and known populations of such plants would increase suitable habitat and promote new, restore historic, or promote the spread and enhance the viability of known populations of special status plant species. Expansion and enhancement of riparian/wetland systems and habitat would have these same long-term beneficial effects on special status plant species that inhabit riparian/wetland ecosystems. These areas also conserve greater than ten percent of special status plant habitats; therefore, management actions for riparian/wetland resources under Alternative B would have major beneficial effects on special status plant resources.

Invasive Species and Pest Management (moderate beneficial)
Under Alternative B, not limiting aerial application of pesticides and treating cheatgrass on a landscape scale would provide an opportunity to apply large-scale treatments on a variety of topography. Over the long term, this management would benefit special status plant species by reducing competition from invasive species and improving the ecological condition of treated sites. Over the short term, this could greatly increase adverse effects on special status plant species. The farther away from riparian areas, wetlands, and special status plant species chemicals are applied, the less the potential for effects associated with vegetation removal, soil disturbances,

or chemical spills to these resources. Overall, invasive species and pest management actions associated with Alternative B will be moderately beneficial to special status plant species.

Fish and Wildlife Resources – Fish (major beneficial) **and Special Status Species – Fish** (minor beneficial)
In addition to analyzing impacts to fish resources on a project-specific basis, Alternative B prohibits surface-disturbing activities and applies NSO stipulations that would directly protect populations of special status plant species and suitable habitat for those species. Surface-disturbing prohibitions for fish resources also conserve greater than ten percent of special status plants habitats. Surface-disturbing prohibitions for special status fish species also conserve five to ten percent of special status plant habitats. Management actions for fish under Alternative B would have major beneficial effects on special status plant habitats. Management actions for special status fish under Alternative B would have minor beneficial effects on special status plant habitats.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
The types of effects to special status plant species from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wildlife and special status species wildlife. Under Alternative B, though, NSOs prohibit or restrict surface disturbance within greater than ten percent of special status plant habitats; therefore, management actions for both wildlife and special status wildlife resources would have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Though the majority of impacts to cultural resources are analyzed on a project specific basis within Alternative A, adverse impacts to special status plant species would be greatly reduced by prohibition of surface-disturbing activities for cultural resource protection in Alternative B. NSOs for cultural resources under Alternative B also conserve greater than ten percent of special status plant habitats; therefore, management actions for cultural resources under Alternative B would have major beneficial effects on special status plant resources.

Paleontological Resources (major beneficial)
The types and magnitude of effects to special status plant species from Alternative B would be the same major beneficial effects as described in the *Impacts Common to All Alternatives* section for paleontological resources.

Visual Resources (major beneficial)
The types and magnitude of effects to special status plant species from Alternative B would be the same major beneficial effects as described in the *Impacts Common to All Alternatives* section for visual resources.

Land Resources

Forest Products (minor adverse)
Under Alternative B, limiting sawtimber sales to specified forest areas and to limited acreages would result in adverse effects on special status plant species. In coordination with resource specialists, special status plant species areas could be specified as sawtimber sale avoidance areas during times of the year when it is most crucial for these plants to remain undisturbed.

Lands and Realty (negligible beneficial)
Under Alternative B, retaining lands with agricultural potential, water, or important natural resources would benefit special status plant species. These lands would be identified up front and assigned a higher level of importance, therefore retaining lands that could also be important for special status plant species. Acquiring new lands also would increase beneficial effects on special status plant species because management for such species on these lands would increase in intensity. Lands identified for tenure adjustments under Alternative B contain less than one percent of known special status plants habitats; therefore, until more inventory is completed, the management actions for lands and realty under Alternative B would have negligible beneficial effects on special status plant resources.

Renewable Energy (major adverse)
Alternative B would exclude renewable-energy development in areas also closed to other forms of energy development (minerals leasing, locatable minerals, salable minerals, ROW, and other areas where surface disturbance restrictions are applied). This would have beneficial effects on special status plant species where areas with renewable-energy potential and populations of special status plant species overlap. Avoidance areas for other resources would, by nature, be NSO areas for these plant species. Renewable energy could be permitted under Alternative B in greater than ten percent of special status plant habitats; therefore, management actions for renewable energy under Alternative B would have major adverse effects on special status plant resources.

Rights-of-Way and Corridors (major adverse)
Alternative B management of ROW and corridors would benefit special status plant species. Requiring collocation of facilities and identifying and implementing specified utility corridor areas and recreation areas would be a processes that, in coordination with resource specialists, could protect special status plant species by ensuring they are completely avoided. Allowing any other travel in areas limited to designated routes only under a special use permit also would benefit these plant species because holders of special recreation permits are specifically directed via permit stipulation to avoid locations where the BLM has identified populations of special status plant species. However, ROWs and corridors could be permitted within greater than ten percent of special status plant habitats; therefore, management actions for ROWs and corridors under Alternative B would have major adverse effects on special status plant resources.

Travel and Transportation Management (major adverse)
Effects to special status species plants from management actions associated with travel and transportation in Alternative B would be the same major adverse effects as those described in the *Rights-of-Way and Corridors* section above.

Recreation (minor beneficial)
Alternative B impacts to special status plant species from SRMA management actions would be the same as impacts under Alternative A, except that Alternative B would manage Burnt Hollow, Dry Creek Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole-in-the-Wall as SRMAs. This designation would protect 20,319 acres where special status plant species habitat occurs within the SRMA areas. Another 12,084 acres (fluid mineral estate) of special status plant habitat would be included with the institution of a 0.5-mile buffer surrounding the SRMAs that would be closed to mineral leasing. SRMAs conserve one to five percent of special status plant habitats; therefore, management actions for recreation under Alternative B would have minor beneficial effects on special status plant resources.

Lands with Wilderness Characteristics (minor beneficial)
Under Alternative B, managing lands with wilderness characteristics (12,237 acres) to emphasize primitive recreational opportunities and natural values would benefit special status plant species. Management would include closing areas to or limiting use of motorized vehicles, closing areas to minerals leasing, excluding ROW, and prohibiting surface-disturbing activities not compatible with retaining or enhancing the areas' natural values. Lands with wilderness characteristics contain one to five percent of special status plant habitats; therefore, management actions for lands with wilderness characteristics under Alternative B would have minor beneficial effects on special status plant resources.

Livestock Grazing Management (moderate adverse)
Alternative B incorporates several actions to adjust livestock grazing management to achieve multiple resource health and objectives. These measures would result in slightly less grazing pressure and trampling damage to special status plant species. The anticipated adverse effects on special status plant species from livestock grazing under Alternative B would not occur around most known locations of special status plant species. However, due to the greater emphasis on multiple resource values under Alternative B direct and indirect adverse effects on unknown locations of special status plant species, such as Ute ladies'-tresses orchid, are anticipated to produce slightly fewer adverse effects on populations of special status plant species. Overall, Alternative B livestock grazing management would likely impact between five to ten percent of special status plant habitats and would therefore have moderate adverse effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern (major beneficial)
Under Alternative B, designation of approximately 536,304 acres of ACECs in eight areas would provide additional protections for sensitive habitats and to known and undiscovered populations of special status plant species. Measures identified for the proposed ACECs that would directly benefit special status plant species include: (1) closing areas to or limiting motorized vehicle use; (2) closing areas to minerals leasing; (3) recommending withdrawal of areas from locatable minerals entry; (4) closing areas to salable minerals; (5) excluding ROW; and (6) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values. The eight ACECs contain five to ten percent of the special status plant habitats; therefore management actions for ACECs under Alternative B would have major beneficial effects on special status plant resources.

Scenic or National Back Country Byways (minor adverse)
Increased road maintenance and human activity on byways would have adverse impacts to plant species habitat from dust, soil erosion, spread of invasive species, and unauthorized plant collection. Management actions associated with Alternative B will have minor adverse effects on special status plant resources.

Wild and Scenic Rivers (negligible beneficial)
If Congress denies the nomination to designate the Middle Fork Powder River as a WSR, the river will be managed to maintain its natural characteristics, resulting in negligible beneficial effect to special status plant resources, as management would occur on less than one percent of special status plant habitat.

Wilderness Study Areas (moderate beneficial)
Under Alternative B, ensuring protective management of WSAs would provide an additional 28,931 acres of protection for sensitive habitats and known and undiscovered population of special status plant species. Measures identified for the WSAs that would directly benefit special status plant species include: (1) closing the areas to minerals leasing; (2) recommending withdrawal of the areas from locatable minerals entry; (3) closing the areas to salable minerals; (4) excluding ROW; (5) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values; and potentially (6) prohibiting all motorized and mechanized equipment. The three WSAs contain five to ten percent of the special status plant habitats; therefore, management actions for WSAs under Alternative B would have moderate beneficial effects on special status plant species.

4.4.7.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to special status plant species due to its implementation.

Special Status Species – Plants (major adverse)
Alternative C management actions for special status plant species include prohibiting activities (surface disturbances, minerals exploration, motorized vehicle use, explosives and blasting, aerial application of herbicides, and use of fire suppression chemicals) in known populations of special status plant species. This approach would protect only known populations of special status plant species populations. Although this is a protective approach for special status plant species, it would not protect potential future populations and, absent the conservative approach under Alternative B, activities allowed in suitable habitat for these plant species could preclude proliferation of these special status plant species through future active management decisions.

Impacts from management of resources under Alternative C would, in most cases, be similar to those described for Alternative A and under the *Impacts Common to All Alternatives* section. Where impacts to special status plant species would vary in degree from impacts under Alternative A, further rationale is provided below.

Physical Resources

Air Quality (moderate adverse)
Under Alternative C, there would be no air quality modeling. Industrial projects would approach or exceed emissions standards, and no mitigation strategies would be examined. This would have indirect adverse effects on special status plant species. Plants are perhaps more sensitive to air pollutants than humans. In particular, acid rain has left areas barren or with severely damaged vegetation. Entering leaves of plants from the stomata during normal gas exchange, both ground-level ozone and reactive nitrogen can cause discoloration, damage, and loss of leaves, reducing photosynthesis by as much as 50%. Reactive nitrogen increasingly wafts into the atmosphere from exhaust pipes, power plants and factories, and from fields doused with ammonia-based fertilizer and from manure piles associated with cattle feedlots. As a result, biologically significant quantities of reactive nitrogen are now reaching the highest places. In the Colorado Rockies, reactive nitrogen has increased the metabolic activity of certain soil microbes and overturned once-stable communities of algae in high-altitude lakes. Some species such as native bunchgrasses and alpine bluebells are responding favorably. Others, however, appear to be losing ground, among them a slow-growing bog sedge. At lower elevations in the western

United States, introduced grasses stoked by nitrogen are overwhelming many ecosystems (Nash 2009). Plants also become more vulnerable to attacks by pests, disease, and other environmental disasters. Consequently, the plant's ability to store food, grow, and reproduce is hindered. The effect would be moderate and adverse.

Soil (major adverse)
Under Alternative C, soils management actions would include allowing surface-disturbing activities on slopes equal to or greater than 25% and on soils with a severe erosion hazard, and allowing proposed activities on badlands, rocky outcrops, or on slopes susceptible to mass movement. This would affect 218,928 acres. Alternative C would not limit vehicular travel on saturated soils or require closure and reclamation of roads if they are heavily eroded, washed out, or if other access roads in better condition are available. All these actions would allow activities on all soil types, regardless of any soil-limiting properties. These actions would not protect soil resources and would promote soil and water erosion, which would have an indirect, major adverse effect on special status plant species by reducing the health of the medium in which plants grow. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions from soil under Alternative C would have major adverse effects on special status plant resources.

Water Resources (major adverse)
Watershed management actions that would allow surface disturbances within 500 feet of any natural or man-made water feature would have a direct adverse effect on special status plant species where these resources overlap, and on water quality in these sensitive sites. Additional project- specific allowances for on-channel reservoirs even though they could adversely affect natural flow regimes could indirectly adversely affect special status plant species communities by transitioning the plant species in those communities and providing an opportunity for invasive plant species to move into these sites. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for water under Alternative C would have major adverse effects on special status plant resources.

Cave and Karst Resources (moderate adverse)
Management actions under Alternative C for cave and karst resources include establishing project-specific buffers from significant cave entrances to minimize the effects of surface-disturbing activities in cave and karst areas. Implementation of a Cave Management Plan would directly benefit special status plant species because it would limit disturbance of the vegetative community from minerals development or by people. The area of protection would be just at the cave entrances. Alternative C would not restrict livestock grazing in areas with cave and karst resources. Although known populations of special status plant species would be avoided, this would have a direct adverse effect on special status plant species where cave and karst resources and populations of special status plant species are adjacent to each other. Surface-disturbing activities would be permitted within five to ten percent of special status plant habitats otherwise protected by cave and karst resources. Management actions for cave and karst resources under Alternative C would have a moderate adverse effect on special status plant species.

Mineral Resources

Locatable Minerals (moderate adverse)
At present, the Amsden Creek, Middle Fork Canyon, and Kerns game ranges are withdrawn from minerals location. Locatable minerals activities are restricted in the Fortification Creek, Gardner Mountain, and North Fork WSAs. Alternative C does not include new recommendations

for withdrawals or restrictions. The existing withdrawals and restrictions were imposed for the protection and preservation of other resource values. Effects to special status species plants associated with locatable mineral management actions in Alternative C would be the same as those described in Alternative A.

Leasable Minerals – Coal (major adverse)
Opening all federal coal lands (federal mineral estate for coal retained by the federal government) outside the high development potential areas (outside is 753,364; inside is 28,738 acres of public land), to study and exploration, would be subject to license stipulations necessary to protect other resource values. Though known special status plant populations would be still be protected, this would have direct adverse effects on suitable habitat and undocumented special status plants in these areas by allowing surface-disturbing activities to occur. Effects to special status species plants associated with coal mineral management actions in Alternative C would be the same as those described in Alternative A.

Leasable Minerals – Fluids (major adverse)
Continuing to lease and allow development of federal oil and gas would result in disturbance adjacent to 34 known populations of special status plant species and 243,929 acres of suitable habitat for such species. Most surface-disturbing activities would require successful reclamation. Native grasses and forbs would dominate reclaimed sites initially, and forbs and shrubs would return over a longer period. Erosion and decreased vegetative cover would occur from soil compaction and the channelization of surface runoff in ruts and road ditches. There is no anticipated disturbance from geothermal activities.

Alternative C does not include new recommendations for withdrawals or restrictions. The existing withdrawals and restrictions were imposed for the protection and preservation of other resource values. Under Alternative C, not protecting additional areas would have an adverse effect on special status plant species.

Leasable fluid mineral development would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for fluid mineral under Alternative C would have major adverse effects on special status plant species.

Salable Minerals (minor adverse)
Effects to special status species plants associated with salable mineral management actions in Alternative C would be the same as those described in Alternative A.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
Alternative C management actions involving the application of full suppression regardless of other resource objectives would have a direct adverse effect on populations of special status plant species. The use of heavy equipment with few constraints would have a direct adverse effect on these vegetative communities over the short and long terms by increasing opportunities for water and soil erosion and invasive plant establishment. Alternative C fire and fuels management would have a minor adverse effect on special status plant species.

Biological Resources

Vegetation – Forests and Woodlands (major adverse)
The removal of trees would increase under Alternative C. This would open larger spaces in the forest, which would alter the habitats of most of the special status plant species in the planning area. Forests and woodlands contain greater than ten percent of special status plant habitats; therefore, the management actions for forests and woodlands under Alternative C would have major adverse effects on special status plant resources.

Vegetation – Grassland and Shrubland Communities (major adverse)
Under Alternative C, allowing desirable non-native plant species for initial reclamation activities would have an adverse effect on special status plant species. Although reclamation of any kind is generally beneficial to special status plant species, this action could promote the growth of non-native plant species that could out-compete these special status plant species. This type of reclamation is likely to occur adjacent to greater than ten percent of populations of special status plants; therefore, management actions for grassland and shrubland communities would have major adverse effects on special status plant resources.

Vegetation – Riparian/Wetland Resources (major adverse)
Under Alternative C, management actions for riparian and wetland communities would allow surface-disturbing and disruptive activities and apply standard lease terms for mineral leasing within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains. This would have a direct adverse effect on the adjacent grassland and shrubland communities by promoting activities that would lead to erosion of soils and water. Restoring vegetation only on direct CBNG disturbance areas (e.g., dams and reservoirs) rather than on all CBNG-supported riparian and wetland systems would apply reclamation only to a very small number of the systems overall. The larger systems would be very susceptible to water-tolerant invasive species such as salt cedar and Canada thistle. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, the management actions for riparian/wetland resources under Alternative C would have major adverse effects on special status plant resources.

Invasive Species and Pest Management (minor beneficial)
Under Alternative C, restricting aerial application to only the use of pesticides would limit the application of pesticides to terrain accessible only by foot. This would mean only small acreages would be treated. This would have a short-term beneficial effect on special status plant species because it would be less likely that populations of these species would receive any pesticide application. However, adverse effects to these plant species would be likely over the long term by giving invasive species a competitive advantage over the native special status plant species. Annually treating only designated areas for cheatgrass would be ineffective, because only small, scattered treatments would occur; therefore, most of the cheatgrass would be unaffected. This would have an adverse effect on native special status plant species. Overall, Alternative C invasive species and pest management would have a minor beneficial effect on special status plant species.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (minor adverse)
Fish management actions under Alternative C include allowing surface-disturbing and disruptive activities within 0.25 mile of naturally occurring water bodies or WGFD Class 1 or 2 trout streams, but not within 500 feet of these areas. This management would not limit the number of activities and would apply a minimal project distance from streams. Disturbing soils and vegetation increases the potential for soil and water erosion and indirectly contributes to the decline in water quality over the long term. These areas also are very susceptible to hydrophilic invasive species such as Canada thistle and salt cedar that would out-compete special status plant species, essentially removing populations of these plant species communities. Surface-disturbing

activities would be permitted in one to five percent of special status plant habitats; therefore, management actions for fish and special status fish resources under Alternative C would have minor adverse effects on special status plant resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major adverse)
A number of wildlife management actions would be implemented on a project-specific basis under Alternative C. There would be no limitations on distance and timing for projects. There would be no prohibitions on surface disturbance and occupancy in or near big game or other wildlife areas. Traditional migration and travel corridors would be managed in coordination with other resources and there would be no effort to introduce or augment wildlife species. Not prohibiting or limiting surface-disturbing activities in designated areas and during designated periods would increase opportunities for soil and water, provide additional large-scale opportunities for invasive species to establish, decrease the ecological condition of communities of special status plant species and associated habitats, and augment fragmentation of these plant communities. This would have an indirect adverse effect on communities of special status plant species over the long term. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for wildlife and special status wildlife resources would have major adverse effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources (major adverse)
Alternative C would allow surface disturbance in areas with historic properties, or within 5 miles of historic properties. This would adversely affect special status plant species by increasing opportunities for soil and water erosion, invasive species to become established, and for direct removal of special status plant species. Surface-disturbing activities would be permitted within greater than ten percent of special status plant habitats; therefore, management actions for cultural resources under Alternative C would have major adverse effects to special status plant resources.

Paleontological Resources (minor adverse)
Management actions limiting the requirement for paleontological field surveys to all PFYC Class 4 and 5 formations potentially affected by proposed activities would affect 28,177 acres. Not restricting surface-disturbing activities would subject the vegetation for possible large scale surface disturbance. This would increase the opportunity for undocumented special status plant species to be directly removed. Alternative C would have adverse impacts to special status plant species. Conversely, though, by identifying paleontological casual collection areas, Alternative C effects could reduce the potential of trampling or eliminating vegetation and compacting soils throughout the footprint of the access and general casual use areas. The greater the distance from riparian areas, wetlands, sand dunes, and other such habitats containing special status plants are avoided, the lesser the potential for effects associated with this vegetation and soil disturbance. It is likely that one to five percent of special status plant habitats would be impacted; therefore, direct minor adverse effects to special status plant species would occur from paleontological management actions associated with Alternative C.

Visual Resources (major adverse)
VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect potential special status plant communities. VRM Class III and IV areas have minor limitations. Managing VRI Class II as VRM Class III would manage more permissively, thus allowing more surface-disturbing activities to occur which would adversely affect special status plant species by increasing the opportunities for soil and water erosion and invasive species to get

established; 167,334 acres would be managed as VRM Class III. Thirty-three special status plant species populations (greater than ten percent of all known populations) are contained in areas currently classified as VRM Class II. The effects of this management would be major and adverse.

Land Resources

Forest Products (major adverse)
Alternative C effects special status plant species from forest product management actions would be similar to effects under Alternative A, except management under Alternative C would increase adverse effects because the sale of forest products would no longer be limited to minor products, there would be no acreage limits, and the intent would be to maximize the removal of harvested products. Offering an greater array of products would intensify the adverse effects described for Alternative A. In addition, not fencing regeneration areas would subject special status plant species that would colonize these areas to grazing and potential removal. Alternative C management of forest products would increase the adverse effects from the moderate effects identified in Alternative A to major for Alternative C.

Lands and Realty (negligible beneficial)
Under Alternative C, disposing of lands with agricultural potential, water, or important natural resource values would likely reduce beneficial effects on special status plant species compared to Alternative A or B, which either considers these values on a project-specific basis or requires the retention of these lands based on these important values, respectively.

Renewable Energy (negligible adverse)
Alternative C would allow renewable-energy development in areas open to other forms of energy development (minerals leasing, locatable minerals, and salable minerals). This would have an adverse effect on special status plant species where areas with renewable-energy potential and populations of special status plant species overlap. Renewable energy would be permitted in less than one percent of special status plant habitats; therefore, management actions for renewable energy under Alternative C would have negligible adverse effects on special status plant resources.

Rights-of-Way and Corridors (major adverse)
Alternative C ROW and corridors management actions would greatly increase potential adverse effects on special status plant species. Management actions would not relocate proposed new roads and access routes to those already in existence and would not prohibit ROW on slopes equal to or greater than 25% or on highly erodible soils. Not limiting surface disturbance and not avoiding activities on slopes equal to or greater than would have an adverse effect on vegetation by increasing the potential for soil and water erosion. (See the *Soil* section above for a description of direct adverse effects on special status plant species from this management.)

Travel and Transportation Management (major adverse)
Effects to special status species plants from management actions associated with travel and transportation in Alternative C would be similar to those described in the *Rights-of-Way* section above. The area available for motorized recreation would have an adverse effect on vegetative resources, including special status plant species habitat.

Recreation (minor adverse)
Under Alternative C, there could be adverse effects on special status plant species from management actions specific to recreation. Hiking to or occasional repeated use of remote camp sites could have direct effects on special status plant species. Plants could be trampled or

crushed, and soil could be compacted or disturbed. Holders of Special Recreation Permits are required to follow all rules and regulations, therefore, should avoid camping at locations where the BLM has identified populations of special status plant species. Lands will be managed in accordance with other resource values, including surface disturbing activities and placement of recreational facilities, which should alleviate some impacts to special status plant species. Given the low level of recreation use on most BLM-administered lands in the planning area, and the scattered, infrequent locations of populations of special status plant species, these adverse effects would mostly be minor.

Lands with Wilderness Characteristics (no effect)
Alternative C actions include managing areas with wilderness characteristics consistent with management for the surrounding areas; there would be no specific management objectives for these areas. Alternative C would result in no effect on special status plant species.

Livestock Grazing Management (major adverse)
Livestock grazing management actions under Alternative C include allowing increases in livestock stocking rates as a result of vegetative treatments and providing a minimum of two years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments. These actions would compromise the health of vegetative communities, potentially including special status plant species. Livestock are often attracted to new vegetation following vegetative treatments and fires. If not monitored, these sites can be over utilized, and increasing stocking rates could compound the issue. Two years of rest might not be sufficient to achieve preferred ecological condition and vegetation management goals. Grazing of young seedling plants would reduce their competitiveness toward more aggressive type plants, which often are invasive or less-preferred species. This could prevent the restoration of populations of special status plant species or spread of existing plant populations, or permanently change the vegetative composition of suitable habitat for special status plant species. By not allowing for a more natural landscape in areas important to special status plant species, Alternative C would have fewer beneficial effects on these species, although increases in adverse effects are not discernible. Alternative C also incorporates actions to adjust livestock grazing management to make livestock grazing the first priority. This measure would result in increased grazing pressure and trampling damage to special status plant species. The anticipated adverse effects on special status plant species from livestock grazing under Alternative C would likely increase in grazing allotments that contain suitable habitat for special status plant species. (See Alternative A for this overlap.) In addition, Alternative C would allow livestock salt or mineral supplements within 500 feet of water sources, riparian areas, and aspen stands. Overall, Alternative C livestock grazing management would have a major adverse effect on special status plant species.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways (no effect)
Impacts to special status species plants associated with special designations management actions for ACECs and scenic or BCBs in Alternative C would be the same as those described in Alternative A.

Wild and Scenic Rivers (negligible adverse)
Under Alternative C, if Congress decides not to designate the Middle Fork Powder River as a Wild and Scenic River, then its flee-flowing and natural characteristics will not be maintained. Increased surface disturbance near the river could impact flow regime, water quality, and riparian

vegetation communities could occur on less than one percent of habitat important to special status plants, resulting in negligible adverse impacts.

Wilderness Study Areas (moderate beneficial)
Effects to special status plant resources from management actions for wilderness study areas in Alternative C will be the same as those described in Alternative A.

4.4.7.6. Alternative D

This section describes management actions under Alternative D, which employs a combination of resource conservation and resource use, and the likely impacts to special status plant species resources due to their implementation and potential impacts to special status plant species from those management actions.

Special Status Species – Plants (minor beneficial)
Similar to Alternative B, Alternative D management actions for special status plant species include prohibiting activities in known populations of special status plant species. Alternative D would allow aerial application of narrow-spectrum herbicides to protect habitat areas from invasive species encroachment. Use of fire suppression chemicals would be allowed consistent with the biology of the plant or where human safety or property is at risk. In addition, a CSU stipulation would be applied to mineral leases in special status species plant habitat, and livestock grazing would be managed in a way to protect special status plants. Before the BLM approved any project or activity that could affect habitat for these species (as modeled by the WYNDD or the BLM), surveys for potential special status species plants would be performed. Through this management, there should be no adverse effects on existing populations of special status plant species. However, this approach would not protect future populations. Absent the conservative approach of Alternative B, activities allowed in suitable habitat for special status plant species could preclude proliferation of these species through future active management decisions. Overall, Alternative D would have a minor beneficial effect on special status plant species.

Impacts from management of resources under Alternative D would, in most cases, be similar to those described for Alternative A and under Impacts common to all alternatives. Where impacts to special status plant species would vary in degree from impacts under Alternative A, further rationale is provided below.

Physical Resources

Air Quality (moderate beneficial)
Impacts to special status species plants associated with air quality management actions in Alternative D would be the same as those described in Alternative B.

Soil (major beneficial)
Alternative D effects on special status plant species from soils management actions would be similar to impacts under Alternative B, except that Alternative D could allow activities by exception on 215,496 acres of highly erosive soils, 170,590 acres on slopes equal to or greater than 25%, 455,090 acres of soils with poor reclamation suitability and, although on a limited basis, on 218,928 acres of badlands, rock outcrops, and slopes susceptible to mass movement. In addition, applying a CSU stipulation to oil and gas leases could result in effects on special status plant species: 669,739 acres of highly erosive soils, 412,145 acres on slopes equal to or greater than 25%, 1,514,445 acres of soils with poor reclamation suitability and, although on a limited basis,

on 685,950 acres of badlands, rock outcrops, and slopes susceptible to mass movement that could be associated with a federal mineral lease. For Alternative D effects to be he same as those under Alternative B, these exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would be granted where there would be conflicts. CSU stipulations would overlap greater than ten percent of special status plant habitats; therefore, Alternative D soils management would have major beneficial effects on special status plant species.

Water Resources (major beneficial)
Alternative D water management actions would allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams; would apply a CSU stipulation on oil and gas leases; and would evaluate unneeded reservoirs. There is no identified habitat for special status plant species habitat within the CSU areas. Under Alternative D, beneficial effects on special status plant species would be the same as under Alternative B, and would result from water management actions that encourage the use of alternative energy sources to power new water resource developments rather than overhead power or petroleum-based power and actions that manage riparian and upland areas to restore perennial flows or standing water and consider other resource values. Overall water management actions in this alternative will have a major beneficial effect on special status plant species.

Cave and Karst Resources (major beneficial)
Under Alternative D, the types of effects associated with cave and karst resource management actions would, in general, be the same as effects under Alternative A, except that Alternative D would restrict livestock from cave entrances. This would decrease the potential for impacts caused by trampling or grazing of special status plant species. In addition, implementing a Cave Management Plan for the entire planning area would increase potential beneficial effects on special status plant species where cave and karst resources overlap such species. Cave and karst resources in the planning area overlap greater than ten percent of suitable habitat for special status plant species. Overall, Alternative D cave and karst management would have a major beneficial effect on special status plant species.

Mineral Resources

The amount of minerals extraction that would occur under this alternative would substantially increase land use intensity, and would result in a greater potential for loss or degradation of riparian and other habitats that support special status species plants. Alternative D would have a major adverse effect on special status plant species.

Locatable Minerals (moderate adverse)
Alternative D management actions for locatable minerals would have effects on special status plant species similar Alternative B, although Alternative D opens more area (3,232,508 acres) to locatable minerals entry. This would have a moderate adverse effect on special status plant species.

Leasable Minerals – Coal (major adverse)
Alternative D effects on special status plant species from leasable minerals management would be the same as effects under Alternative C, with 4,775,136 acres open to coal leasing. The areas open to coal could affect less than one percent of special status plant habitats; therefore, management actions for coal minerals under Alternative D would have negligible adverse effects to special status plant resources.

Leasable Minerals – Fluids (major adverse)
Alternative D effects on special status plant species from fluid minerals management would be the same as effects under Alternative C, with 138,558 acres open to oil and gas leasing. The areas open to fluid mineral development could affect greater than ten percent of special status plant habitats; therefore, management actions for coal minerals under Alternative D would have major adverse effects to special status plant resources.

Salable Minerals (major adverse)
Alternative D effects on special status plant species from salable minerals management would be the same as effects under Alternative C, with 2,957,960 acres open to salable minerals disposal. The areas open to salable mineral development could affect greater than ten percent of special status plant habitats; therefore, management actions for salable minerals under Alternative D would have major adverse effects to special status plant resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor beneficial)
Under Alternative D, effects on special status plant species would be similar to the effects under Alternative B, except that Alternative D would increase beneficial effects through rehabilitating fire damage on an as-needed basis only. This could result in an increase in natural (re)occurrences of special status plant species.

Biological Resources

Allowing desirable non-native plant species for short-term reclamation activities and managing riparian and wetland systems capable of achieving DFC are actions included in Alternative D vegetation management. The persistence of desirable non-native plants could have more adverse effects on special status plants if proliferation of non-native plants caused loss of suitable habitat for special status species plants. In addition, under Alternative D, activities could be allowed by exception on greater than ten percent of habitat for special status plant species within 500 feet of riparian/wetland systems and aquatic habitats. For Alternative D effects to be the same as effects under Alternative B, these exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts.

Vegetation – Forests and Woodlands (major adverse)
The types of effects to special status plant species from Alternative D would be the same beneficial effects as described in Alternative C section for forests and woodland resources.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Allowing use of desirable non-native plant species for short-term reclamation activities will result in better soil stabilization and reclamation success over the long-term. Following up with native plants will benefit special status plants species by decreasing the risk of competition with non-native species. Overall, management actions associated with Alternative D for grassland and shrubland communities will have major beneficial effects on special status plant species.

Vegetation – Riparian/Wetland Resources (major beneficial)
Under Alternative D, both adverse and beneficial effects to special status plant species will occur. Allowing surface disturbance within 500 feet of riparian and wetland areas could result in adverse impacts to potential habitat for special status plant species; however, a CSU on fluid mineral leases and restoration of CBNG supported habitats according to ecological site potential

will allow for management of DPCs and control over surface disturbing activities. Overall, management activities for riparian/wetland resources associated with this alternative will have a major beneficial effect on special status plant species.

Invasive Species and Pest Management (minor beneficial)
Effects to special status species plants associated with invasive species and pest management actions in Alternative D would be the same as those described in Alternative B.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (moderate beneficial)
Alternative D effects on special status plant species from fish management, including special status species fish, would be similar to effects under Alternative B. Under Alternative D, though, activities could be permitted by exception within greater than ten percent of suitable habitat for special status plant species within 0.25 mile of naturally occurring water bodies that contain native and desirable non-native fish species; therefore, management actions for fish and special status fish resources would have moderate beneficial effects on special status plant resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative D effects on special status plant species from wildlife management actions would be similar to those under Alternative B. Alternative D, though, could allow aboveground facilities by exception on the 75,175 acres of elk crucial winter range and calving areas that overlap currently identified special status species plant habitat, and could allow disturbance by exception on greater than ten percent of special status species plant habitat; therefore, management actions for wildlife under Alternative D would have major beneficial effects on special status plant resources. For Alternative D effects to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts.

Special Status Species – Wildlife (major beneficial)
Alternative D effects on special status plant species from wildlife management would be similar to those under Alternative B. Alternative D, though, could allow disturbance activities by exception on 6,156 acres of black-tailed prairie dog colonies and 176,636 acres of special status amphibian, reptile, and bat species habitat that overlaps currently identified habitat for special status plant species plant. For these effects to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts. In addition, under this alternative, the NSO stipulations for special status raptor species would increase or decrease compared to other alternatives because the buffers would be species specific; these raptor buffers overlap 17,417 acres of suitable habitat for special status plant species.

With its habitat removal allowances, compared to Alternative B, Alternative D would protect 56,516 fewer acres of suitable habitat for special status plant species present in areas with suitable nesting habitat for Greater Sage-Grouse and 13,016 fewer acres of suitable habitat for special status plant species present in areas of suitable winter habitat for Greater Sage-Grouse.

Overall, surface-disturbing activity restrictions for special status wildlife resources would conserve greater than ten percent of special status plant habitats; therefore, management actions for special status wildlife resources would have major beneficial effects on special status plant resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
The types of effects under Alternative D cultural resources management would be the same as those under Alternative B, except that Alternative D would protect one to five percent of suitable habitat for special status plant species through cultural resources NSO restrictions and greater than ten percent through cultural resources CSU restriction. This would have a major beneficial effect on special status plant species.

Paleontological Resources (major beneficial)
Effects to special status species plants associated with paleontological resource management actions in Alternative D would be the same as those described in Alternative B.

Visual Resources (major beneficial)
Effects to special status species plants associated with visual resource management actions in Alternative D would be the same as those described in Alternative B.

Land Resources

Forest Products (minor adverse)
Under Alternative D, short-term adverse effects on special status plant species and their habitats would be the same as under all other alternatives. However, Alternative D would allow harvest with no limit on area size managed within ecologically stable limits. Long-term beneficial effects would be similar to those under alternatives B and C. Under Alternative D, there would be conflicts between the harvest of forest products and management five to ten percent of suitable habitat for special status plant species. This would have a minor adverse effect on special status plant species.

Lands and Realty (minor beneficial)
Impacts to special status species plants associated with lands and realty management actions in Alternative D would be the same as those described in Alternative B.

Renewable Energy (minor adverse)
The types of effects associated with renewable energy management under Alternative D would be the same as those under Alternative B, except that Alternative D would exclude greater than ten percent of suitable habitat for special status plant species from renewable energy development and would manage greater than ten percent as ROW exclusion or avoidance areas. New communications sites, transmission lines, and ground facilities outside existing disturbance areas or ROW corridors could be allowed by exception. For these effects to be the same as those under Alternative B, exceptions would have to be evaluated for the presence of special status plant species or suitable habitat, and would not be granted where there would be conflicts.

Rights-of-Way and Corridors (minor adverse)
Effects to special status species plants from management actions associated with ROWs in Alternative D would be the same as those described in the renewable energy section above.

Travel and Transportation Management (minor adverse)
Alternative D effects on special status plant species plants and their habitat from the management of transportation and access would be similar to Alternative B, except that Alternative D would close 31,536 acres of suitable habitat to motorized vehicle use.

Recreation (minor beneficial)
The types of effects from Alternative D management of recreation would be the

same as those under Alternative B. Alternative D would designate seven areas, three of which contain a total of one to five percent of suitable all habitat for special status plant species, as SRMAs. Therefore, management actions for recreation under Alternative D would have minor adverse effects on special status plant resources.

Lands with Wilderness Characteristics (minor beneficial)
The types and magnitude of effects to special status plant species from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wilderness characteristics.

Livestock Grazing Management (major adverse)
Under Alternative D, the types of effects on special status plant species from management actions associated with livestock grazing management would be the same as those under Alternative B. Alternative D identifies areas that are incompatible to livestock grazing (recreation, steep slopes, etc.) that also coincides with five to ten percent of suitable habitat for special status plant species. Alternative D would also prohibit the placement of salt or mineral supplements on greater than ten percent of suitable habitat, which would avoid trampling damage. Unrestricted livestock grazing could be permitted in greater than ten percent of special status plant habitats; therefore, management actions for livestock grazing management would have major adverse effects on special status plant resources.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
Under Alternative D, the types of effects on special status plant species associated with ACEC management actions would be the similar to Alternative B; however, the benefits would be reduced to moderate due to less special status plant habitat protected by ACECs.

Scenic and Back Country Byways (minor adverse)
Effects to special status plant species associated with scenic and BCBs management actions in Alternative D would be the same as those described in Alternative B.

Wild and Scenic Rivers (negligible beneficial)
Effects to special status plant species associated with Wild and Scenic Rivers management actions in Alternative D would be the same as those described in Alternative B.

Wilderness Study Areas (moderate beneficial)
Effects to special status species plants associated with wilderness study area management actions in Alternative D would be the same as those described in Alternative B.

4.4.7.7. Cumulative Impacts

Cumulatively, adverse effects on Threatened, Endangered, Proposed, Candidate, and Sensitive species are expected in the planning area. There would be many cumulative short- and long-term disturbances to these species, which would stem from several sources. Included in the cumulative effects evaluated are the direct effects of oil and gas (CBNG and non-CBNG) extraction and development of new oil and gas wells on adjacent lands. Oil and gas development would occur on a mix of federal, state, private, and split estate lands. Additional activities that occur on all of these lands and contribute to cumulative effects on special status plant species in the planning

area include coal mining; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; construction of roads and railroads; recreation; and development of rural and urban housing.

The primary uses and management practices on lands adjacent to BLM-administered lands would have the greatest potential to affect special status plant populations and their habitats. Adjacent ownerships that have been converted to hayland or cropland or that are overgrazed provide little opportunity for populations of special status plant species to expand.

Dewatering of streams for irrigation and development of springs and headwaters of small streams for livestock watering alters the hydrologic cycle and contributes to a reduction in riparian and wetland habitat that supports special status riparian plants. Trampling of spring sources and stream banks by livestock and wildlife also contributes to lowered water tables and a diminution of wetland habitat. Loss of riparian and wetland habitat would likely result in population declines of species such as the Ute ladies'-tresses orchid.

4.4.7.8. Conclusion

Table 4.51, "Summary of Impacts to Special Status Species – Plants" (p. 1061) summarizes impacts to special status plant species.

Table 4.51. Summary of Impacts to Special Status Species – Plants

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible beneficial	Moderate beneficial	Moderate adverse	Moderate beneficial
Soil	Major beneficial	Major beneficial	Major adverse	Major beneficial
Water Resources	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
Cave and Karst Resources	Minor beneficial	Major beneficial	Moderate adverse	Major beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Major adverse	Moderate adverse	Moderate adverse
Leasable Minerals – Coal	Major beneficial	Major adverse	Major adverse	Major adverse
Leasable Minerals – Fluids	Minor adverse	Major adverse	Major adverse	Major adverse
Salable Minerals	Minor adverse	Major adverse	Minor adverse	Major adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor adverse	Minor adverse	Minor adverse	Minor beneficial
Planned Fire (Prescribed Fire)	Major beneficial	Minor adverse	Minor adverse	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Moderate beneficial	Major beneficial	Major adverse	Major adverse
Vegetation – Grassland and Shrubland Communities	Major Beneficial	Moderate beneficial	Major adverse	Major beneficial
Vegetation – Riparian/Wetland Resources	Major beneficial	Major beneficial	Major adverse	Major beneficial
Invasive Species and Pest Management	Minor beneficial	Moderate beneficial	Minor beneficial	Minor beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Fish and Wildlife Resources – Fish	Major beneficial	Major beneficial	Minor adverse	Moderate beneficial
Fish and Wildlife Resources – Wildlife	Major beneficial	Major beneficial	Major adverse	Major beneficial
Special Status Species – Plants	Major beneficial	Major beneficial	Major adverse	Minor beneficial
Special Status Species – Fish	Major beneficial	Major beneficial	Minor adverse	Moderate beneficial
Special Status Species – Wildlife	Major beneficial	Major beneficial	Major adverse	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Major Beneficial	Major beneficial	Major adverse	Major beneficial
Paleontological Resources	Major beneficial	Major beneficial	Minor adverse	Major beneficial
Visual Resources	No effect	Major beneficial	Major adverse	Major beneficial
Land Resources				
Forest Products	Moderate beneficial	Minor adverse	Major adverse	Minor adverse
Lands and Realty	No effect	Negligible beneficial	Negligible beneficial	Minor beneficial
Renewable Energy	No effect	Major adverse	Negligible adverse	Minor adverse
Rights-of-Way and Corridors	Major adverse	Major adverse	Major adverse	Major adverse
Travel and Transportation Management	Major adverse	Major adverse	Major adverse	Minor adverse
Recreation	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Lands with Wilderness Characteristics	No effect	Minor beneficial	No effect	Minor beneficial
Livestock Grazing Management	Major adverse	Moderate adverse	Major adverse	Major adverse
Special Designations				
Areas of Critical Environmental Concern	No effect	Moderate beneficial	No effect	Moderate beneficial
Scenic or Back Country Byways	No effect	Minor adverse	No effect	Minor adverse
Wild and Scenic Rivers	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Wilderness Study Areas	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.8. Special Status Species – Fish

This section describes potential direct, indirect, short-term, and long-term effects on special status fish species under each alternative and whether those effects would be beneficial or adverse. The Yellowstone cutthroat trout is the only special status fish found in the planning area. Map 22 shows the distribution of special status fish in the planning area.

Actions that contribute to the decline in special status fish abundance or range would result in adverse effects. Conversely, beneficial effects would result from actions that increase special

status fish population numbers or viability, protect habitats, or reduce the risk of harm to these species in the planning area.

For purposes of this analysis, short-term impacts to special status fish species would result from activities that contribute to the decline in abundance or distribution of a species, but which recover within five years of after the activities. Long-term effects would require more than five years for recovery.

Surface-disturbing activities, water depletions, sedimentation, changes instream hydrology, increased sedimentation, changes in water quality, and introduction of exotic species (e.g., mussels or whirling disease) could affect special status fish. The primary means by which direct impacts to special status fish could occur are surface development (e.g., mining and urbanization), loss of sufficient upland and riparian vegetation that increases sedimentation, and discharge or runoff of poor-quality water. Indirect effects on special status species would result from actions that aid or compromise the protection of special status fish species. Indirect effects on potential habitats for special status fish species also could result from actions, such as those listed above, that change habitats in a way that makes them unsuitable.

Erosion can lead to increased turbidity and sedimentation, which can inhibit feeding and spawning success. Sedimentation can suffocate or starve bottom-dwelling insects, an important food source for fish. Developing eggs can be smothered in sediment, and newly hatched fry can be killed by sediment that prevents emergence from spawning gravels and interferes with respiration. Suspended sediments can inhibit respiration. Developing fish eggs and larvae need a constant supply of cold, oxygen-rich water that flows through the interstitial spaces instream gravels. Embedded sediments limit essential winter habitat used by juvenile fish for feeding and cover from predators. The filling of pools with sediment further limits overwintering sites for juvenile and adult fish.

A second, potentially major adverse impact to Yellowstone cutthroat trout is the introduction of diseases, such as whirling disease, and invasive species, such as mussels. Humans, vehicles, water haul trucks or aircraft, and livestock, can transport infected sediments or water. The effects of introduced species such as mussels or whirling disease can be major. Managing to protect against introduced species or disease is problematic. The only practical way to mitigate this issue is through outreach and education.

4.4.8.1. Methods and Assumptions

This section describes the methods and assumptions used in impact analysis. The assumptions and methods include the following:

- The analysis in on a watershed scale.
- Management actions that preclude or restrict development, including those not specifically aimed at conserving special status fish species, are assumed to benefit those species where populations overlap management action boundaries.
- The total amount of new surface disturbance allowed under each alternative is an index of potential impacts to special status fish. The success of reclamation measures would vary. It is assumed that BLM-applied reclamation would be successful in preventing impacts to special status fish
- Surface-disturbing activities in special status fish habitat would result in adverse effects.
- Implementing all actions prescribed in USFWS Biological Opinions for Threatened or Endangered species would have a beneficial effect on sensitive fish species.

Significance Criteria

In addition to the scale of impacts listed in the beginning of this chapter, an adverse impact on fish species as a result of project actions would be considered potentially significant if there was: (1) substantial loss of the biological integrity and habitat function of aquatic ecosystems that would make species eligible for listing under the ESA; (2) decreased viability or increased removal of Threatened, Endangered, Proposed, or Candidate species, or adverse alteration of their critical habitats; and (3) substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status.

Management of **Air Quality, Forest Products, Lands with Wilderness Characteristics, Back Country Byways, Wild and Scenic Rivers**, and **Wilderness Study Areas** would have no effect on special status fish species and are not further addressed in the **Special Status Species – Fish** section.

4.4.8.2. Impacts Common to All Alternatives

Physical Resources

There would be beneficial effects on special status fish species from proper management of soil and water resources. Implementing mitigation measures to protect soils and water on a project-specific basis, particularly in riparian zones of watersheds, would reduce disturbance to fish habitats and help in the recovery of aquatic habitats from permitted uses. Improper management of soil and water resources can lead to increased sediment loads in affected watersheds.

Soil (major beneficial)
Evaluating the effects on soil resources from a proposed surface-disturbing activity using NRCS Soil Survey data or onsite investigations would help in the application of mitigation measures, relocate the activity to a more suitable soil type, or deny the authorization. This management of soil resources would influence greater than ten percent of the special status fish habitats in the planning area; therefore, management actions common to all alterrnatives for soil would have a major beneficial effect on special status fish resources.

Water Resources (major beneficial)
Water resources management actions would beneficially affect special status fish by reducing sedimentation, increasing aquatic vegetation and macro-invertebrates through (1) providing an alternative or "off-source" water supply (e.g., piping water to troughs, tanks, or ponds) in locations where BLM-authorized uses are fenced out of water sources; (2) installing flow-control devices on new and existing BLM-authorized water wells and spring developments and evaluating the need for additional flow-control devices on a project-specific basis; (3) managing water resources to meet the Wyoming Standards for Healthy Rangelands and achieve PFC; (4) take appropriate actions to improve the biological, chemical, and geomorphic conditions of streams adversely affected by BLM-authorized actions and permitted activities; and (5) design and manage land use and surface-disturbing activities to reduce channel and bank erosion and the associated loss of riparian habitats. All these actions influence greater than ten percent of the special status fish habitats in the planning area and would have a major beneficial effect on special status fish resources.

Cave and Karst Resources (no effect)
Management actions common to all alternatives for cave and karst include inventories of cave and karst resources. This would have no effect on special status fish resources.

Mineral Resources

Instream reaches where there is Yellowstone cutthroat trout habitat congruent with BLM-administered lands, mineral rights are held by the federal government. Most streams representing Yellowstone cutthroat trout habitat are administered by the USFS, with the BLM holding the federal mineral estate. In such situations, minerals development would require a permit from the USFS for surface disturbance and a permit from the BLM for the federal mineral. Mining on National Forest System lands could affect Yellowstone cutthroat trout and its habitat on BLM-administered lands.

In general, surface mining activities increase erosion and accelerate sediment production and input into nearby lakes and streams. Streams can be dewatered or rechanneled to accommodate surface mines. Surface mining operations also have the potential to increase pollution that could enter streams through runoff and disrupt subsurface and surface water flow patterns. Bridges, culverts, and low-flow crossings are integral features in road development associated with surface mining. If not properly designed, these features also can interfere with fish migrations to spawning, feeding, rearing, and overwintering sites. Proper placement of these structures is critical to minimizing impacts to fish.

Locatable Minerals (minor adverse)
Leaving lands open to locatable minerals exploration and development could adversely affect Yellowstone cutthroat trout through increased sedimentation, removal of riparian vegetation, changes instream channel morphology, and decreased water quality. Locatable minerals could occur within the drainages of one to five percent of the special status fish habitat in the planning area; therefore the management actions common to all alternatives for locatable minerals would have a minor adverse effect on special status fish resources.

Leasable Minerals – Coal (major adverse)
Occupied stream segments are outside areas with the potential for coal development. Making federal coal lands with high development potential in north central Sheridan County available for consideration for competitive coal leasing could affect streams in the historic range for Yellowstone cutthroat trout, such as the Tongue River, Little Earley Creek, Youngs Creek, and Ash Creek would have an adverse effect on the trout. These waters are not occupied and currently do not have water temperatures conducive to trout populations. Yellowstone cutthroat trout could occupy these waters seasonally. If coal mining affected these stream segments, effects on Yellowstone cutthroat trout would not rise to a population level. Overall, potential coal development could occur within greater than ten percent of the special status fish habitats in the planning area; therefore, management actions common to all alternatives for coal would have major adverse effects on special status fish resources.

Leasable Minerals – Fluids (major adverse)
Surface disturbance from fluid minerals development in Yellowstone cutthroat trout drainages could increase sedimentation. Produced water from oil and gas wells could pollute streams if untreated water reaches them. Opening all oil and gas mineral estate to fluid minerals leasing could influence greater than ten percent of the streams identified as special status fish habitat.

Management actions common to all alternatives for fluid minerals would have major adverse effects on special status fish resources.

Salable Minerals (minor adverse)
Opening all salable minerals exploration, unless the estate is specifically identified as administratively unavailable for minerals leasing during the planning period, could affect Yellowstone cutthroat trout if those minerals are discovered in western Sheridan County. At present, there are no identified minerals of these types that overlap populations of Yellowstone cutthroat trout. Salable mineral potential, though, does exist within one to five percent of the drainages identified as Yellowstone cutthroat trout habitat; therefore, the management actions common to all alternatives for salable minerals would have minor adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
Fire affects fish populations through physical and chemical changes (increased siltation, altered water quality [dissolved oxygen, pH, suspended and dissolved solids, total hardness, turbidity], and water temperature changes). Nutrient flow changes that adversely affect aquatic insect production also would affect fish populations. Although there is limited BLM surface estate congruent with Yellowstone cutthroat trout streams, the threat of wildfire and prescribed fire occurs on all lands surrounding Yellowstone cutthroat trout streams, and could affect any populations in streams on BLM-administered lands.

The extent of surface erosion after a fire depends largely on the topography and soil types in the immediate area. Stream siltation can occur following fire. Siltation is a particular problem where severe burns occur on steep or moderate slopes, in riparian habitats, or where heavy equipment is used in suppression activities. There could be changes in water temperature in cold-water fisheries, such as Yellowstone cutthroat trout habitat, if shading vegetation is removed from the side of the stream. Fish will generally re-invade fire-affected areas rapidly from areas upstream of the affected area, surrounding watersheds, and mainstem rivers where migration is not limited. Fuels projects are designed and implemented in a non-emergency manner that minimizes impacts to aquatic resources.

Competent planning and implementation will minimize the effects of fuels treatments on special status fish. Prescribed fires in spring and fall are less likely to escape containment and are therefore less of a threat to riparian vegetation and less likely to contribute to erosion. To protect water quality and the diversity of habitats for fish, amphibians, and other aquatic organisms, standard operating procedures are in place to protect the PFC of riparian areas and stream characteristics.

The impacts of erosion from fire suppression would likely be localized, and could be minimized by rapid rehabilitation after the fire is under control, although improperly located bulldozer fire lines could greatly increase local stream sediment loads. Uncontrolled fires more than likely would create more erosion than the suppression activities. The use of certain types of fire retardant in or near fish-bearing streams would be a serious threat to these aquatic ecosystems. The byproducts of the retardant can be toxic to fish and would result in fish kills.

Adhering to the National Wildland Fire Management Policy and current Fire Management Plan for the Wyoming High Plains District, ensuring all prescribed-fire activities comply with Wyoming DEQ standards and rules, using a resource advisor and prohibiting the use of retardants

or foam within 300 feet of surface water sources would reduce impacts to fish. Some runoff into occupied stream segments would be likely, which would kill individual fish, but population-level effects are not anticipated. Implementation of the BLM Emergency Stabilization and Burned Area Rehabilitation standards and rehabilitation of fire lines would reduce sedimentation from runoff. Landscape treatments to enhance fuels management and restore fire-adapted ecosystems could result in a short-term, adverse effect on fish and fisheries from sedimentation during fire treatments. Long-term effects from treatments would be beneficial because the threat of catastrophic wildfire would be reduced.

Overall, management actions common to all alternatives for planned and unplanned fire would have minor adverse effects on special status fish resources.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
No management actions common to all alternatives have been identified for forests and woodlands.

Vegetation – Grassland and Shrubland Communities (minor beneficial)
Managing vegetative communities in accordance with the Wyoming Standards for Healthy Rangelands, and siting facilities and related infrastructure, travel routes, recreational uses, mineral exploration and development sites, and ROW to reduce impacts to vegetative resources would keep sedimentation and channel modifications, and their resultant impacts to sensitive fish species, to a minor level. Maintaining sustainable forage levels for livestock and wildlife habitat would minimize sedimentation. The management actions common to all alternatives for grassland and shrubland communities would have minor beneficial effects on special status fish resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prioritizing and developing activity and implementation plans to manage riparian systems to be at or above, or continue to be improving toward PFC while achieving the Wyoming Standards for Healthy Rangelands would reduce sedimentation and channel modifications, and their resultant impacts to sensitive fish species. Managing riparian and wetland systems to enhance forage conditions and improve water quality to a succession stage appropriate for that system, including vertical and horizontal vegetative structure and composition, would also reduce sedimentation and channel modifications, and their resultant impacts to sensitive fish species. These management actions would influence greater than ten percent of the special status fish habitat in the planning area. Management actions common to all alternatives for riparian/wetland resources would have major beneficial effects on special status fish resources.

Invasive Species and Pest Management (major beneficial)
BLM weed and pest control work on public lands adjoining deeded and state lands could have an adverse effect if chemical applications encounter occupied habitat. Proper use of chemicals, for example not applying them within 200 feet of fish-bearing water, would minimize this risk. Specific, careful and appropriate grasshopper and Mormon cricket treatments can prevent overuse, as well as management of invasive plant species, and thereby limit erosion, resulting in a beneficial effect. These actions should reduce impacts to all identified special status fish habitats. Management actions common to all alternatives for invasive species and pest management would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Fish (major beneficial)
Management actions common to all alternatives that are administrative processes (e.g., development and prioritization of plans; providing fisheries outreach and education; updating existing HMPs; and adherence to rules, regulations, and agreements such as MOUs) would have no effects on special status fish species. Managing barriers to fish passage in cooperation with the WGFD and other stakeholders would have a beneficial effect on sensitive fish species because these barriers can be used to allow Yellowstone cutthroat trout to move into new habitats or keep competitor fish, such as rainbow trout, out of cutthroat trout waters. Effects from managing activities that could affect native and desirable non-native fish species in collaboration with the WGFD and other stakeholders should benefit special status fish species.

Managing public access to fish-bearing waters or to protect crucial habitats could have major adverse effects. Future access routes would increase the likelihood of introducing whirling disease or invasive species into Yellowstone cutthroat trout waters. These impacts could be mitigated to minor through education programs for fishermen. Constructing new fences, even in accordance with the BLM Fencing Handbook, could reduce sedimentation by excluding livestock from riparian areas that support Yellowstone cutthroat trout. Management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species, and will have beneficial effects on Yellowstone cutthroat trout.

Management actions for fish would encompass all Yellowstone cutthroat trout habitats. Management actions for fish would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Management actions common to all alternatives support efforts to protect and improve riparian ecosystems. These actions include restoring fish habitats and managing harmful non-native riparian vegetation in river and stream systems important to fish species, and would have beneficial effects on fish. Management actions common to all alternatives support efforts to protect and improve various ecosystems throughout the planning area. These actions include managing vegetative diversity, minimizing disturbances to springs and riparian zones, and improving riparian plant communities within one to five percent of the drainages identified as containing Yellowstone cutthroat trout habitat. Management actions Common to all Alternatives for wildlife would have minor beneficial effects on special status fish resources.

Special Status Species – Plants (moderate beneficial)
Management actions common to all alternatives for special status plant species include allowing treatments that would benefit the plant species. Special status plant species occur along five to ten percent of the special status fish habitats in the planning area. Treatments that improve the health of vegetation would also improve the health of the neighboring stream; therefore, management actions common to all alternatives for special status plant species would have moderate beneficial effects on special status fish resources.

Special Status Species – Wildlife (major beneficial)
Avoidance areas, whether for the application of broad-spectrum insecticides or to protect nesting bald eagles, would have a beneficial effect on Yellowstone cutthroat trout where these resources overlap. These avoidance areas encompass greater than ten percent of identified Yellowstone cutthroat trout habitat. Management actions for special status wildlife species would have major beneficial effects on special status fish resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Management actions include completion of site stabilization and long-term protection of significant sites. This would benefit fish through habitat conservation when the sites occur within close proximity to fish habitats. Currently, significant sites occur within greater than ten percent of identified Yellowstone cutthroat trout habitat in the planning area. Management actions for cultural resources would have major beneficial effects on special status fish resources.

Paleontological Resources (negligible beneficial)
Management actions common to all alternatives would have a negligible beneficial effect on special status fish resources by retaining public lands under the management of the BLM.

Visual Resources (negligible beneficial)
Special status fish resources are not present in any WSAs or Wild and Scenic Rivers identified in the resource area. VRM Class IV areas have minor limitations on surface-disturbing activities. Managing visual resources would indirectly affect special status fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management action common to all alternatives would occur on less than one percent of habitats important to special status fish species, and would therefore have negligible beneficial effects on special status fish resources.

Land Resources

Lands and Realty (negligible adverse)
Lands and realty management actions common to all alternatives would have negligible effect on special status fish species. Project-specific analyses of lands and realty actions, such as approval of R&PP permits, land use authorizations, land withdrawals, and land disposals require NEPA analysis, thereby identifying any conflicts in order to limit adverse effects on special status fish.

Renewable Energy (no effect)
Management actions common to all alternatives for renewable energy are administrative and will have no effect on special status fish resources.

Rights-of-way and Corridors (minor adverse)
Reasonable access could be provided for ROWs and corridors within the drainages of one to five percent of the Yellowstone cutthroat trout habitat in the planning area. ROWs cause habitat degradation through vegetation removal and trampling. Adverse effects to fish-bearing waters from ROWs would occur when these accesses cause increased sedimentation in the streams. Management actions common to all alternatives for ROWs and corridors would have minor adverse effects on special status fish resources.

Travel and Transportation Management (minor adverse)
Negotiating with willing landowners for access across non-BLM-administered lands to isolated public land parcels that have streams with Yellowstone cutthroat trout would increase the risk of spreading whirling disease or unwanted introduced species. Introduction of disease or unwanted species could have adverse effects on Yellowstone cutthroat trout. Travel and transportation management could influence one to five percent of the streams identified as Yellowstone cutthroat trout habitat. Management actions common to all alternatives for travel and transportation management would have minor adverse effects on special status fish resources.

Recreation (minor beneficial)
Avoiding riparian habitat or developing and managing recreation sites, recreation facilities, and recreation access in a manner that minimizes impacts to riparian habitats, and prohibiting dispersed camping and commercial camps within 200 feet of surface water would benefit Yellowstone cutthroat trout.

Yellowstone cutthroat trout are pursued as a recreational game fish. At present, there is no public access to BLM-administered lands that have streams containing Yellowstone cutthroat trout. BLM access on the Tongue River at Welch Ranch is downstream from occupied habitat. It is possible Yellowstone cutthroat trout seasonally occupy that portion of the river, but there are no records of occupation. Recreational access to Yellowstone cutthroat trout in the Bighorn National Forest is common and could affect populations and habitat in streams on BLM-administered lands. Over-fishing would not occur on BLM-administered lands because of poor access to streams with Yellowstone cutthroat trout. Overall, these impacts are likely to occur in one to five percent of the identified Yellowstone cutthroat trout habitats. Management actions common to all alternatives for recreation would have minor beneficial effects on special status fish resources.

Livestock Grazing Management (minor adverse)
Improper livestock grazing management could adversely impact stabilization of riparian vegetation, which can lead to stream instability and an associated loss of habitat complexity, and the loss of shading vegetation, which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris. The degree of adverse impact would depend on livestock grazing timing and intensity, site characteristics, and species habitat requirements. Livestock driveways impact wildlife habitats because they reduce vegetation and compact soils. Stock driveways tend to concentrate high levels of livestock use that can cause significant degradation (e.g., near-complete removal of vegetation and soil compaction). Beneficial impacts of proper grazing include reducing competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removing wildfire fuels; and controlling invasive plant and weed species with properly timed grazing rotations and species (e.g., goats). There are 779,034 acres of BLM surface in grazing allotments in the planning area, which occur along one to five percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions common to all alternatives for livestock grazing would have minor adverse effects on special status fish resources.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Management actions common to all alternatives associated with ACECs would evaluate and mitigate adverse impacts to them. This would benefit the special status fish resources as the integrity of Welch Ranch would be maintained. Welch Ranch encompasses less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions common to all alternatives for ACECs would have negligible beneficial effects on special status fish resources.

Socioeconomic Resources

Social and Economic Conditions (no effect)
Management actions common to all alternatives are administrative processes and will have no

effect on special status fish resources. Impacts to social and economic resources will be quantified on a project-specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section

Health and Safety (major beneficial)
Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials or environmental contamination would have beneficial impacts to special status fish by protecting riparian and wetland areas and water quality across the resource area. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian or wetland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts.

Only management actions in common to all alternatives are identified; therefore, health and safety will not be discussed further in this section.

4.4.8.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes management actions and potential impacts to sensitive species fish from implementing Alternative A. Current management allows the authorized officer to waive restrictions for surface disturbance activities, resulting in non-application of some restrictions in some locations.

Special Status Species – Fish (major adverse)
Currently, there are no management actions addressing the impacts of any action on special status fish resources. Impacts are evaluated on a project-specific basis. Without oversight on a programmatic level and specified criteria for evaluation and application of restrictions, special status fish are likely to experience adverse effects. The lack of management actions for special status fish under Alternative A would have major adverse effects on them.

Physical Resources

Soil (major beneficial)
Under Alternative A, prohibiting surface-disturbing activities in areas of severe erosion hazard from March 1 through June 15, on slopes equal to or greater than 25%, and on soils with poor reclamation suitability would reduce but not prevent erosion and subsequent sedimentation. These prohibitions/restrictions, in general, would influence greater than ten percent of the Yellowstone cutthroat trout habitats in the planning area and constitute a major beneficial effect on special status fish resources.

Water Resources (major beneficial)
Under Alternative A, reservoir construction within historic Yellowstone cutthroat trout habitat would require site-specific analysis through BLM and EPA authorities. The potential for on-channel reservoirs in these locations is remote. If on-channel reservoirs were pursued in historic Yellowstone cutthroat trout habitat, effects likely would be adverse because such reservoirs would prevent fish passage.

Management of produced water from oil and gas development would not overlap with Yellowstone cutthroat trout habitat. Current prohibitions on placement of oil and gas wells and facilities prohibit these elements within 500 feet of streams. This prohibition protects Yellowstone cutthroat trout habitat from sedimentation reducing the adverse effects. These actions would influence greater than ten percent of the identified Yellowstone cutthroat trout habitat. Management actions for water under Alternative A would have major beneficial effects on special status fish resources.

Cave and Karst Resources (no effect)
There are no management actions for cave and karst resources under Alternative A.

Mineral Resources

Locatable Minerals (minor adverse)
Under Alternative A, withdrawing the Amsden Creek (525 acres), Ed O. Taylor (approximately 3,896 acres), and Kerns (163 acres) game ranges from mineral locations and restricting locatable minerals activities in the Fortification Creek, Gardner Mountain, and North Fork WSAs (approximately 28,931 acres) would not alter the effects on Yellowstone cutthroat trout described in the common to all alternatives section. Locatable mineral exploration and development is currently permitted within one to five percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for locatable minerals under Alternative A would have minor adverse effects on special status fish species.

Leasable Minerals – Coal (major adverse)
Under Alternative A, opening all federal coal lands (federal mineral estate for coal retained by the federal government) to study and exploration, subject to license stipulations necessary to protect other resource values, could affect Yellowstone cutthroat trout or their habitat if recoverable coal reserves were discovered in drainages where the trout or trout habitat are present. Coal mining in drainages that contain Yellowstone cutthroat trout could decimate local populations through dewatering, increased sedimentation, and pollution. Because the BLM administers the federal mineral estate on USFS lands, the effects of opening all federal coal lands to study and exploration could be of regional importance. There are no known coal deposits in Bighorn National Forest lands. Lands with high potential for coal overlap the following BLM-administered stream reaches: Earley Creek, Little Youngs Creek, and the Tongue River. Though Yellowstone cutthroat trout do not currently occupy these stream sections (Bradshaw et al. 2008), coal exploration and development could be permitted within greater than ten percent of the identified Yellowstone cutthroat habitats. Management actions for coal under Alternative A would have major adverse effects on special status fish resources.

Leasable Minerals – Fluids (major adverse)
Under Alternative A, continuing to lease and allow development of federal oil and gas could adversely effect Yellowstone cutthroat trout. Current knowledge of the distribution of coalbeds harboring natural gas indicate that there would be no development in occupied Yellowstone cutthroat range. Fluid mineral exploration and development could occur, though, within greater than ten percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for fluid minerals under Alternative A would have major adverse effects on special status fish resources.

Salable Minerals (minor adverse)
Alternative A salable minerals management would not be likely to affect occupied Yellowstone cutthroat trout habitat. Most of the trout's occupied range is on National Forest System lands, and

any action that could affect Yellowstone cutthroat trout would undergo a site-specific analysis of potential effects. Should salable minerals be developed in occupied Yellowstone cutthroat trout drainages, the effects could extend to the stream reach/population level. The entirety of identified habitat for this species, though is larger and salable mineral development could currently occur within one to five percent of the identified habitat. Management actions for salable minerals under Alternative A would have minor adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse)
Limited suppression of wildfires on BLM-administered land where fire control is very difficult or extremely hazardous to fire-fighting personnel could allow stream-damaging fires in occupied Yellowstone cutthroat trout range. Suppressing unwanted wildland fires would prevent sedimentation from post-fire erosion. Use of fire retardant could adversely affect Yellowstone cutthroat trout if the chemicals reached occupied streams. Rehabilitating fire and suppression damage would minimize effects on Yellowstone cutthroat trout by decreasing runoff and sedimentation. Overall, Alternative A management of unplanned fires would have a minor adverse effect on special status fish species.

Planned Fire (Prescribed Fire) (minor beneficial)
Using prescribed fire to support vegetation and wildlife habitat objectives could have adverse or beneficial effects on Yellowstone cutthroat trout. Prescribed fire could increase runoff and sedimentation (an adverse effect) or could increase streamflows by removing invasive plants (a beneficial effect). Long term, the effects would be minor beneficial.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
Treatments including cutting, thinning, and prescribed burning may pose an adverse short-term impact on fish resources resulting from soil erosion and potential sedimentation in streams and rivers. However, improved forest health (vegetation composition, soil stability, decreased risk of wildfire) resulting from the treatments will have beneficial effects on special status fish resources over the long term. Management actions under this alternative would benefit over ten percent of habitats important to special status fish species, making the effects major.

Vegetation – Grassland and Shrubland Communities (no effect)
There are no management actions for grassland and shrubland communities under Alternative A.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would benefit Yellowstone cutthroat trout by preserving the riparian and adjacent upland communities of all the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for riparian/wetland resources under Alternative A would have major beneficial effects on special status fish resources.

Invasive Species and Pest Management (minor beneficial)
IPM, as currently practiced and when appropriately applied in the planning area, complies with restrictions on chemical labels that provide adequate buffers from fish-bearing water. Aggressive treatment of invasive plants, particularly riparian plants, could adversely affect Yellowstone cutthroat trout over the short term by increasing sedimentation and removing shade. Over the long

term, these treatments would benefit the trout by replacing invasive plants with native species that generally require less water, and increasing streamflow.

Fish and Wildlife Resources – Fish (minor beneficial)
Cooperating with the WGFD to reintroduce native and desirable non-native fish in the planning area where there is potential habitat could benefit Yellowstone cutthroat trout. Due to the limited BLM surface in suitable Yellowstone cutthroat trout habitat, this beneficial effect would be minor.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Prohibiting surface disturbance in the Kerns and Amsden Creek big game winter ranges, and elk crucial winter range would result in a benefit to Yellowstone cutthroat by reducing erosion and sedimentation; however, the ability to grant waivers and implementing seasonal restrictions for the ranges reduces this benefit. These restrictions for wildlife also conserve vegetation within greater than ten percent of identified Yellowstone cutthroat trout habitat. Without oversight on a programmatic level and specified criteria for waiving these restrictions, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Special Status Species – Plants (no effect)
There are no management actions for special status plants or special status fish under Alternative A.

Special Status Species – Wildlife (moderate beneficial)
Managing vegetation resources to comply with the ESA and BLM policy associated with management of habitat for special status wildlife species would have beneficial effects to special status fish species. Surface disturbance restrictions for Greater Sage-Grouse breeding grounds and raptors nests would have beneficial effects on fish. Protections afforded Threatened, Endangered, and sensitive species, such as oil and gas disturbance-free zones around bald eagle nests and roosts, would prevent surface disturbance and have beneficial effects on fish. Overall, these protection zones for special status wildlife habitats encompass five to ten percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for special status wildlife species under Alternative A would have moderate beneficial effects on special status fish resources.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the Impacts *Common to All Alternatives* section for cultural resources (habitat conservation). These restrictions would be beneficial to any fish habitats they encompass as they would reduce the risk of harm to the fish resource. All other management of cultural resources is considered on a project specific basis. Under Alternative A, cultural resource protection would encompass less than one percent of the special status fish-bearing streams in the planning area. Management actions for cultural resources under Alternative A would have negligible beneficial effects on special status fish resources.

Paleontological Resources (negligible beneficial)
Under Alternative A, management of lands containing paleontological resources would be considered on a site-specific basis. In areas where mineral development was not allowed, water quality would remain unchanged, having a negligible beneficial effect on special status fish resources.

Visual Resources (major beneficial)
Management of VRM Class I and II areas could prohibit or limit some surface-disturbing activities and thereby protect special status fish habitats. VRM Class III and IV areas have minor limitations. Managing visual resources would indirectly affect fish habitats, depending on the locations, types, and durations of approved projects. Beneficial effects under the management actions associated with Alternative A would occur on over ten percent of habitats important to special status fish resources, and would therefore have major effects.

Land Resources

Lands and Realty (minor adverse)
Under Alternative A, land acquisitions or disposals should not affect Yellowstone cutthroat trout. Pursuing easements that would provide access to BLM-administered lands for recreation and administrative purposes could expose occupied Yellowstone cutthroat trout streams to whirling disease, mussels, or other introduced species and disease. This could result in a moderate adverse effect, but the probability of occurrence would be remote and therefore overall a minor impact.

Renewable Energy (no effect)
There are no management actions for renewable energy under Alternative A.

Rights-of-Way and Corridors (no effect)
No areas suitable for ROWs and corridors under Alternative A contain special status fish habitats.

Travel and Transportation Management (minor adverse)
Under Alternative A, there would be indirect effects on special status fish species from travel management and OHV use. OHV use on and off designated trails has the potential to destroy vegetation, compact soils, and lead to soil erosion and ponded water. By designating areas where OHV use is limited to designated roads and trails, adverse effects on special status fish habitats can be reduced. In cases where motorized vehicle use is closed for only portions of the year, these closures would not be as great a benefit to special status fish species. Regardless of intensity of management, OHV use is still anticipated to have an adverse effect on one to five percent of special status fish habitats. Management actions for travel and transportation management under Alternative A would have minor adverse effects on special status fish resources.

Recreation (negligible beneficial)
Under Alternative A, pursuing easements to provide access to BLM-administered lands for recreation and administrative purposes could expose occupied fish streams to whirling disease, zebra mussels, or other introduced species and disease, which would have a adverse effect on fish. Prohibiting surface disturbance and occupancy on slopes equal to or greater than 25% or more would minimize sedimentation. Areas where OHV use is limited to designated roads and trails would limit access to fisheries and reduce the potential for introduction of invasive species and disease. Recreational areas occur within less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area. The overall management actions for recreation under Alternative A would have negligible beneficial effects on special status fish resources.

Livestock Grazing Management (minor beneficial)
Improper grazing management at Welch Ranch on the Tongue River could adversely affect Yellowstone cutthroat habitat potential. Under Alternative A, any permanent increases in the amount of forage produced are considered for wildlife and watershed protection before

additional livestock use is allowed. This should have a beneficial effect on Yellowstone cutthroat trout. Currently, livestock grazing allotments contain one to five percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for livestock grazing management under Alternative A would have minor beneficial effects on special status fish resources.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are no ACECs proposed under Alternative A.

4.4.8.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to special status fish species due to their implementation.

Special Status Species – Fish (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for special status fish resources (habitat improvement and conservation). Under Alternative B, stream segments important to special status fish species would be improved or enhanced and surface-disturbing restrictions would be applied within 0.25 mile of water bodies containing special status fish species. These restrictions have major beneficial effects on special status fish resources.

Physical Resources

Soil, Water Resources, and Cave and Karst Resources (major beneficial)
Alternative B would prohibit surface-disturbing activities or apply NSO stipulations to activities on badlands, rock outcrops, and slopes susceptible to mass movement, and prohibit prescribed fires on highly erodible soils; prohibit such activities as on-channel reservoirs, conversion of abandoned oil and gas wells to water supply wells, and activities within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated habitat; and prohibit activities in cave and karst areas. Under Alternative B, applying an NSO stipulation on soils with poor reclamation suitability, in badlands, on rocky outcrops, on slopes susceptible to mass movement, and on slopes equal to or greater than 25% would prevent sedimentation and have a beneficial effect on special status fish habitat. These soil types overlap greater than ten percent of the identified Yellowstone cutthroat trout habitat in the planning area. Prohibiting surface-disturbing activities for the protection of water resources under Alternative B would conserve all the identified Yellowstone cutthroat trout habitat in the planning area. Prohibiting surface-disturbing activities for the protection of cave and karst resources under Alternative B would conserve vegetation in greater than ten percent of the identified Yellowstone cutthroat trout habitat in the planning area. Overall, Alternative B management of soils, water, and cave and karst resources would result in major beneficial effects on special status fish resources.

Mineral Resources

Locatable Minerals and Leasable Minerals – Coal (minor adverse)

Under Alternative B, 2,612,920 acres would be administratively unavailable for minerals leasing; 812 acres would be subject to the standard lease terms and conditions; 124,467 acres would be subject to moderate constraints; and 642,232 acres would be subject to major constraints. These acreages do not all coincide with Yellowstone cutthroat trout habitats; however, the restrictions on surface disturbance are already in place in much of the Tongue River drainage. These restrictions would mostly benefit cold water fish (trout) and most of the recreational fisheries in the planning area. Locatable minerals and leasable coal minerals could each be permitted within one to five percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for locatable and leasable coal minerals under Alternative B would have minor adverse effects on special status fish resources.

Leasable Minerals – Fluids (no effect)
Under Alternative B, no fluid mineral exploration or development would occur in Yellowstone cutthroat trout habitats. Management actions for fluid minerals under Alternative B would have no effects on special status fish resources.

Salable Minerals (major adverse)
Alternative B limits the exploration and development of salable mineral resources by the making 620,164 acres closed or restricted to salable mineral exploration and development. Salable mineral development would be open on 129,430 acres of BLM surface that also contain greater than ten percent of identified Yellowstone cutthroat trout habitats; therefore, management actions for salable minerals under Alternative B would have major adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor beneficial)
Using full suppression in areas where fire is undesirable, monitoring fire behavior in areas where fire can be used as a management tool based on resource goals and objectives, limiting heavy equipment usage in areas, rehabilitating all fire-related damage, and use of wildland fire and other vegetative treatments to restore fire-adapted ecosystems and to reduce hazardous fuels would reduce sedimentation. This would have a minor beneficial effect on Yellowstone cutthroat trout habitats.

Biological Resources

Vegetation – Forest and Woodlands (minor adverse)
Using natural processes to manage forests and woodlands is a short-term beneficial impact to fish resources; however, managing forests and woodlands for old growth and climax vegetation communities may result in an increased risk of wildland fire which would result in unstable soil conditions and poor water quality having adverse impacts overall. Management actions for forests and woodlands under Alternative B would adversely impact over ten percent of habitat important to special status fish. Overall, the offset of benefits from reduced disturbance and the dynamic nature of wildfire would reduce impacts to minor adverse.

Vegetation – Grassland and Shrubland Communities (major beneficial)
The types of effects from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for grassland and shrubland communities (habitat improvement). Under Alternative B, native plant species would be the only type authorized for reclamation activities. This would be beneficial to Yellowstone cutthroat trout habitats as it

would promote natural reclamation and regeneration of vegetative communities in the drainages. Under Alternative B, native plant reclamation would occur within greater than ten percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for grassland and shrubland communities would have major beneficial effects on special status fish resources.

Vegetation – Riparian/Wetland Resources (major beneficial)
Prohibiting surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams would benefit Yellowstone cutthroat trout by preserving the riparian and adjacent upland communities. Identifying and managing systems capable of achieving DFC could have a beneficial effect on Yellowstone cutthroat trout habitats. Prohibitions for water would encompass all identified Yellowstone cutthroat trout habitat in the planning area. Management actions for riparian/wetland resources would have major beneficial effects on special status fish resources.

Invasive Species and Pest Management (moderate adverse)
Aerial application of pesticides and herbicides, if applied inappropriately, could expose occupied Yellowstone cutthroat trout populations to impaired water quality, this would have a moderately adverse effect. IPM, as currently practiced and when appropriately applied in the planning area, complies with restrictions on chemical labels that provide adequate buffers from fish-bearing water. Aggressive treatments of invasive plants, particularly riparian plants, could adversely affect Yellowstone cutthroat trout over the short term by increasing sedimentation and removing shade. Over the long term, these treatments would benefit the trout by replacing invasive plants with native species that generally require less water, and increasing streamflow.

Fish and Wildlife Resources – Fish (major beneficial)
Alternative B management actions for fish would benefit Yellowstone cutthroat trout by cooperating with WGFD for stocking and stream restoration, managing riparian areas to improve fisheries and reach desired functional condition. Imposing a 0.25 mile no surface disturbance buffer around all fish-bearing waters would benefit Yellowstone cutthroat trout habitat by reducing erosion from development of federal minerals in all identified Yellowstone cutthroat trout habitat. Management actions for fish under Alternative B would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
The types of effects to special status fish from Alternative B would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for wildlife. Under Alternative B, though, NSOs prohibit or restrict surface disturbance within greater than ten percent of identified Yellowstone cutthroat trout habitat; therefore, management actions for wildlife would have major beneficial effects on special status fish resources.

Special Status Species – Plants (moderate beneficial)
Management actions for special status plants that restrict grazing, herbicides and surface disturbance would benefit special status fish. Restricting fire suppression could result in larger fires that would increase sedimentation and create an adverse impact. Prohibiting disturbance within a mile of Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River would be considered a benefit to special status fish by reducing sources of sedimentation. Overall, these actions would occur within five to ten percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for special status plants under Alternative B would have moderate beneficial effect on special status fish resources.

Special Status Species – Wildlife (major beneficial)
Protections for identified raptor nests, Greater Sage-Grouse, and Threatened and Endangered species would have a beneficial effect on Yellowstone cutthroat trout. Prohibiting surface disturbance and occupancy within a biologic buffer for raptor nests would reduce erosion and subsequent sedimentation on lands over federal minerals, resulting in a beneficial impact. Prohibiting surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats, in identified 100-year floodplains, and within 500 feet of perennial waters would have a beneficial effect on Yellowstone cutthroat trout. Establishing a year round disturbance-free zone of at least 0.5 mile for bald eagles on the Tongue River would be a beneficial effect when applied to the federal mineral estate. Overall, the prohibitions or restrictions for special status wildlife species occur within greater than ten percent of the identified Yellowstone cutthroat trout habitat in the planning area. Management actions for special status wildlife species would have major beneficial effects on special status fish resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Though the majority of impacts to cultural resources are analyzed on a project-specific basis within Alternative A, adverse impacts to special status fish species would be greatly reduced by prohibition of surface-disturbing activities for cultural resource protection in Alternative B. NSOs for cultural resources under Alternative B also conserve greater than ten percent of special status fish habitats; therefore, management actions for cultural resources under Alternative B would have major beneficial effects on special status fish resources.

Paleontological Resources (no effect)
Under Alternative B, areas with high quality paleontological resources do not overlap with fish habitat and management actions would have no effect on special status fish resources.

Visual Resources (major beneficial)
Under Alternative B, management of VRM Class II areas could prohibit or limit some surface-disturbing activities and therefore protect special status fish habitats. VRM Class III and IV areas would have minor limitations. Alternative B visual resources management would benefit over ten percent of habitats important to special status fish resources; therefore, visual resource management actions under Alternative B would have major beneficial effects on special status fish resources.

Land Resources

Lands and Realty (negligible adverse)
Approximately 120,722 acres of BLM-administered lands are identified for disposal (see Map 47). These areas have priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to disposal criteria. The six BLM-administered parcels that intersect Yellowstone cutthroat trout habitats account for 164 acres. Transferring these lands out of federal control would not directly affect Yellowstone cutthroat trout. However, future management actions could be less protective than federal management in less than one percent of identified Yellowstone cutthroat trout habitat. Management actions for lands and realty under Alternative B would have negligible adverse effects on special status fish resources.

Renewable Energy (no effect)
No areas suitable for renewable energy under Alternative B contain special status fish habitats.

Rights-of-Way and Corridors (no effect)
No areas suitable for ROWs and corridors under Alternative B contain special status fish habitats.

Travel and Transportation Management (minor beneficial)
Under Alternative B, closing areas with saturated soils, on slopes equal to or greater than 25% and in habitat for special status species to motorized vehicle use, including activities related to fire suppression and geophysical exploration, would reduce sedimentation. This would have a beneficial effect on Yellowstone cutthroat trout. Limiting travel to designated routes and allowing travel off designated routes only under a special use permit would reduce sedimentation. This would also have a beneficial effect on Yellowstone cutthroat trout. Allowing travel off designated routes in areas limited to designated routes only under a special use permit would reduce sedimentation and pollution, and have a beneficial effect on special status fish. These actions would influence one to five percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for travel and transportation under Alternative B would have a minor beneficial effect on special status fish resources.

Recreation (negligible beneficial)
Increasing recreation facilities under Alternative B could increase the risk of disease or invasive species colonizing Yellowstone cutthroat trout habitats. Limiting development of additional recreation facilities to SRMAs and other high-use areas would have a beneficial effect on fish by limiting fishing pressure and reducing the risk of establishing invasive aquatic species. SRMAs proposed in Alternative B encompass less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, management actions for recreation under Alternative B would have negligible beneficial effects on special status fish resources.

Livestock Grazing Management (minor beneficial)
Authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority and livestock grazing second; locating livestock salt or mineral supplements a minimum of 0.5 mile away from water sources, riparian areas, and aspen stands; and providing a minimum of two years rest from livestock grazing following prescribed fires and other vegetative treatments would have a minor beneficial effect on Yellowstone cutthroat trout.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
An ACEC designation at Welch Ranch on the Tongue River could have a minor adverse effect on that fishery. Additional human use could occur with ACEC designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and the risk of fire in the riparian forest. These potential issues would be adequately mitigated through education. The designation would have indirect, long-term beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems and would encompass less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, management actions for ACECs under Alternative B would have negligible beneficial effects on special status fish resources.

4.4.8.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to special status fish species due to its implementation.

Special Status Species – Fish (major beneficial)
Restoring or improving important stream segments for fisheries habitat, only for special status fish species, would have a beneficial impact on them. Alternative C incorporates a smaller protective buffer, restricting surface-disturbing activities within 500 feet of any waters containing special status fish species. This would conserve habitats within all identified Yellowstone cutthroat trout habitats in the planning area. Management actions for special status fish species would have major beneficial effects on special status fish resources.

Physical Resources

Soil (major adverse)
Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, slopes equal to or greater than 25%, soils with poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement would increase sedimentation and adversely affect Yellowstone cutthroat trout if those activities take place in occupied Yellowstone cutthroat trout habitat. The approximately 260 acres (40 on South Fork Little Tongue, 180 on East and Middle Forks Pass Creek, and 40 in Red Gulch) of BLM-administered lands that drain into occupied Yellowstone cutthroat habitat are steep, with no roads or development. Allowing the use of prescribed fire on highly erodible soils could have an adverse effect if BLM-administered lands that drain into occupied Yellowstone cutthroat habitat (260 acres) were burned. Lack of soil restrictions would leave greater than ten percent of the identified Yellowstone cutthroat trout habitats vulnerable to impacts from improper soil management. Management actions for soil under Alternative C would have major adverse effects on special status fish resources.

Water Resources (major adverse)
Allowing on-channel reservoirs would inhibit fish passage and have an adverse effect on Yellowstone cutthroat trout. Allowing surface-disturbing activities, or not applying an NSO stipulation to any mineral lease within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat would increase runoff and sedimentation in Yellowstone cutthroat habitat. This alternative would permit activities within greater than ten percent of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, management actions for water under Alternative C would have major adverse effects on special status fish resources.

Cave and Karst Resources (major adverse)
Under Alternative C, there would be no restrictions on activities in or around cave and karst resources. Greater than ten percent of the identified Yellowstone cutthroat trout habitats in the planning area also contain cave and karst resources. Lack of conservation of cave and karst resources would have a major adverse effect on special status fish resources as it would increase the potential for increased runoff and sedimentation.

Mineral Resources

Locatable Minerals (minor adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for locatable mineral resources (habitat loss and degradation). Alternative C would open 3,319,535 acres to locatable minerals exploration and development and withdraw 11,373 acres from locatable mineral exploration and development. Locatable mineral development could be permitted in one to five percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for locatable minerals under Alternative C would have minor adverse effects on special status fish resources.

Leasable Minerals – Coal (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for coal resources (habitat loss and degradation). Alternative C would open the entire federal coal estate with development potential to leasing which would make 4,775,136 acres available for coal exploration and leasing. Coal exploration and development could be permitted in greater than ten percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for coal under Alternative C would have major adverse effects on special status fish resources.

Leasable Minerals – Fluids (major adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for fluid mineral resources (habitat loss and degradation). Consistent with other resources values, Alternative C would open 539,499 acres for fluid minerals leasing and exploration subject to standard lease terms and conditions; 2,472,472 acres subject to moderate constraints; and 303,601 acres subject to major constraints. Fluid mineral exploration and development could be permitted in greater than ten percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for fluid minerals under Alternative C would have major adverse effects on special status fish resources.

Salable Minerals (moderate adverse)
The types of effects from Alternative C would be the same adverse effects as described in the *Impacts Common to All Alternatives* section for salable mineral resources (habitat loss and degradation). Opening 3,290,908 acres to salable mineral exploration and development and closing 57,213 acres would cause an adverse impact where those areas open to salable minerals overlap identified Yellowstone cutthroat trout habitats. Salable mineral exploration and development could be permitted in five to ten percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for salable minerals under Alternative C would have moderate adverse effects on special status fish resources.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
Under Alternative C, use of full protection strategies and tactics, heavy equipment with few tactical constraints, and rehabilitating only suppression-related damage would increase sedimentation. This would have a minor adverse effect on Yellowstone cutthroat trout.

Biological Resources

Vegetation — Forests and Woodlands (minor adverse)
Under Alternative C, forests and woodlands which occur near streams bearing special status fish would be managed similarly to Alternative B. No overlap occurs between important special status

fish habitat and forest management areas identified under this alternative, and active management will not occur.

Vegetation – Grassland and Shrubland Communities (major adverse)
Under Alternative C, allowing non-native plant species, only if native species will not accomplish initial reclamation objectives, would provide another tool for achieving reclamation goals, but also would provide an opportunity for non-native species to cross pollinate with native species, out-compete native species for water and soil nutrients, and move outside the reclamation area and become an invasive species. Helping to achieve reclamation objectives would directly benefit surrounding plant communities. Overall, Alternative C management of grasslands and shrublands would have a major adverse effect on the riparian vegetation within the identified Yellowstone cutthroat trout habitats and, therefore, have a major adverse effect on special status fish resources.

Vegetation- Riparian/Wetland Resources (major adverse)
Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on Yellowstone cutthroat trout by increasing sedimentation and decreasing water quality. Not identifying and managing systems capable of achieving DFC could have an adverse effect on Yellowstone cutthroat trout. Riparian/wetland areas contain all of the identified Yellowstone cutthroat trout habitats in the planning area; therefore management actions under Alternative C for riparian/wetland resources would have major adverse effects on special status fish resources.

Invasive Species and Pest Management (moderate adverse)
Aerial application of insecticides, if applied inappropriately, could expose occupied Yellowstone cutthroat trout populations to impaired water quality. This would have a moderate adverse effect on the trout.

Fish and Wildlife Resources – Fish (major adverse)
Alternative C management actions for fish would result in an adverse impact to Yellowstone cutthroat trout by allowing surface disturbance within 0.25 mile of fish-bearing waters, increasing erosion from development of federal minerals in all identified Yellowstone cutthroat trout habitats. Management actions under Alternative C for fish resources would have major adverse effects on special status fish resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
Allowing surface disturbance in the Kerns and Amsden Creek big game winter ranges, and elk crucial winter range would result in an adverse impact to Yellowstone cutthroat trout by increasing erosion and sedimentation. Seasonal wildlife restrictions would not prevent erosion from federal mineral development and could result in an adverse impact. Protections for identified big game ranges, raptor nests, and elk would have beneficial effects on greater than ten percent of the identified Yellowstone cutthroat trout habitats that also support these species. Because protections for some wildlife species remain in place and would conserve identified Yellowstone cutthroat trout habitats under this alternative, overall, Alternative C wildlife management actions would still have a major beneficial effect on special status fish resources.

Special Status Species – Plants (no effect)
No areas of known special status plant species populations contain special status fish habitats; therefore, management actions for special status plant species under Alternative C would have no effect on special status fish species.

Special Status Species – Wildlife (moderate beneficial)
Establishing a year round disturbance-free zone of at least 0.5 mile around known bald eagle roosts on the Tongue River would be a beneficial effect when applied to the federal mineral estate. Allowing surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats, in identified 100-year floodplains, and within 500 feet of perennial waters would have an adverse effect on Yellowstone cutthroat trout. Because protections for some special status wildlife species remain in place and would conserve five to ten percent of identified Yellowstone cutthroat trout habitats under this alternative, overall, Alternative C special status wildlife management actions would have a moderate beneficial effect on special status fish resources.

Heritage and Visual Resources

Cultural Resources (no effect)
No areas containing historic properties occur within special status fish habitats; therefore, management actions for cultural resources under Alternative C would have no effect on special status fish species.

Paleontological Resources (no effect)
Under Alternative C, lands containing high quality paleontological resources do not overlap with fish habitat and management actions under this alternative would have no effect on special status fish resources.

Visual Resources (no effect)
Under Alternative C, managing VRM Class II areas as VRM Class III would allow more surface-disturbing activities. This would reduce the beneficial effects of visual resource management on special status fish habitat by increasing opportunities for soil and water erosion and for invasive species to become established. Active management would not occur in habitats important to special status fish species; therefore, Alternative C management of visual resources would have no effect on special status fish resources.

Land Resources

Lands and Realty (minor adverse)
Approximately 120,722 acres of BLM-administered lands are identified for disposal (see Map 47). These areas have priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to disposal criteria. The three BLM-administered parcels that intersect Yellowstone cutthroat trout occupancy account for 972 acres. Transferring these lands out of federal control would not directly affect Yellowstone cutthroat trout. However, future management actions could be less protective than federal management.

Renewable Energy (moderate adverse)
Allowing renewable-energy development anywhere in the planning area consistent with other resource values could have an adverse effect on special status fish if sedimentation occurs in identified Yellowstone cutthroat trout habitats. Renewable energy could be permitted under this alternative within five to ten percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions under Alternative C would have moderate adverse effects on special status fish resources.

Rights-of-Way and Corridors (moderate adverse)
Allowing ROW on slopes equal to or greater than 25% and on highly erodible soils would have an adverse effect on special status fish from sedimentation. ROWs could be permitted, under this alternative, within five to ten percent of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for ROWs and corridors under Alternative C would have moderate adverse effects on special status fish resources.

Travel and Transportation Management (minor adverse)
Allowing motorized vehicle use in areas with saturated soils, on slopes equal to or greater than 25%, and in habitat for special status species consistent with travel management designations for those areas could increase sedimentation. This would have an adverse effect on one to five percent of identified Yellowstone cutthroat trout habitats. Management actions for travel and transportation management under Alternative C would have minor adverse effects on special status fish resources.

Recreation (negligible beneficial)
Managing the entire planning area as the Buffalo ERMA and designating six SRMAs (totaling 30,570 acres) would have an adverse effect on fish through an increase in OHV use and resulting sedimentation. The six proposed SRMAs contain less than one percent of the identified Yellowstone cutthroat trout habitats in the planning area. The management within these areas would conserve habitats important to fish. Management actions for recreation under Alternative C, through designation of the six SRMAs, would have negligible beneficial effects on special status fish resources.

Livestock Grazing Management (minor adverse)
Authorizing permanent increases in forage allocations to livestock grazing as the first priority; locating livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands; not designating resource reserve allotments; allowing increases in livestock stocking rates as a result of vegetative treatments; and providing a minimum of two growing seasons rest from livestock grazing, prescribed fires, and vegetative treatments would have a minor adverse effect on Yellowstone cutthroat trout by degrading the habitats and increasing potential for sedimentation.

Special Designations

Areas of Critical Environmental Concern (no effect)
No ACECs are proposed under Alternative C, therefore, there would be no effect to fish resources.

4.4.8.6. Alternative D

This section describes management actions under Alternative D, the preferred alternative.

Special Status Species – Fish (major beneficial)
Alternative D impacts from special status fish management would be similar to those under Alternative B, except that Alternative D could allow activities by exception within a 0.25-mile CSU area around naturally occurring water bodies containing native and desirable non-native fish species. For the impacts to be the same as those under Alternative B, those exceptions would have to be evaluated for the presence of special status fish species or habitat suitability and would not be granted where there would be conflicts. Management actions under Alternative D would have major beneficial effects on special status fish resources.

Physical Resources

Soil (major adverse)
Alternative D would allow surface-disturbing activities on soils with a severe erosion hazard, slopes equal to or greater than 25%, soils with poor reclamation suitability, badlands, rock outcrops, and slopes susceptible to mass movement. This could increase sedimentation and adversely affect Yellowstone cutthroat trout if those activities took place in occupied Yellowstone cutthroat trout habitat without adequate reclamation plans. Alternative D would allow development within greater than ten percent of the identified Yellowstone cutthroat trout habitats in the planning area, but projects must meet specific criteria before they are approved. However, the established criteria under Alternative D would work toward ensuring projects are capable of being reclaimed before they are approved. Overall, management actions for soil under Alternative D would have major adverse effects on special status fish resources.

Water Resources (major adverse)
Alternative D would allow on-channel reservoirs in occupied Yellowstone cutthroat trout streams, which would have an adverse effect on this sensitive species because such reservoirs could impede fish passage. Impacts from discharge of produced water into Yellowstone cutthroat trout habitat would depend on water quality, which is administered by the State of Wyoming and will not be allowed to diminish the water quality of a receiving stream. Allowing surface-disturbing activities, or not applying an NSO stipulation to any mineral lease, within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams and associated riparian habitat could increase runoff and sedimentation in all Yellowstone cutthroat trout habitat. Alternative D would allow development within greater than ten percent of the identified Yellowstone cutthroat trout habitats in the planning area when resources objectives can be met. Overall, management actions for water under Alternative D would have major adverse effects on special status fish resources.

Cave and Karst Resources (no effect)
The cave and karst resource areas identified in Alternative D do not encompass any identified Yellowstone cutthroat trout habitats, therefore, management actions for cave and karst resources under Alternative D would have no effect on special status fish resources.

Mineral Resources

Locatable Minerals (minor adverse)
Alternative D effects on Yellowstone cutthroat trout from management of locatable minerals would be the same minor adverse effects as described under Alternative A.

Leasable Minerals – Coal (moderate adverse)
Alternative D impacts associated with leasable coal minerals management would be the same as under Alternative C, with 4,775,136 acres open to coal exploration. Coal exploration and development would be permitted within five to ten percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for coal minerals, under Alternative D would have moderate adverse effects on special status fish resources.

Leasable Minerals – Fluids (major adverse)
Alternative D impacts associated with leasable fluid minerals management would be the same as under Alternative C, with 138,558 acres open to oil and gas leasing. Fluid mineral exploration and development would be permitted within greater than ten percent of the identified Yellowstone

cutthroat trout habitats in the planning area. Management actions for fluid minerals, under Alternative D would have major adverse effects on special status fish resources.

Salable Minerals (no effect)
There is no identified conflict between salable mineral potential and Yellowstone cutthroat trout habitat. Yellowstone cutthroat trout habitat has been identified as closed to salable minerals exploration and development.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor beneficial)
The effects for fire and fuels management under Alternative D would be the same minor beneficial effects as those described under Alternative B.

Biological Resources

Vegetation – Forests and Woodlands (minor adverse)
Under Alternative D, effects to special status fish would be similar to those identified under Alternative C.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Alternative D effects on special status fish resources from management of grassland and shrubland communities would be similar to effects under Alternative C, although Alternative D would place slightly more emphasis on multiple resource values than Alternative C. Allowing the use of non-native species for initial reclamation could have a beneficial effect on Yellowstone cutthroat trout through reduced sedimentation after surface disturbance. Desirable non-native plant persistence could increase adverse impacts to special status fish resources if non-native proliferation causes loss of suitable riparian habitats along fish-bearing streams. Overall, management actions for grassland and shrubland communities would have major beneficial effects on special status fish species.

Vegetation – Riparian/Wetland Resources (major adverse)
Allowing surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams could have an adverse effect on special status fish by increasing sedimentation, changing hydrography, and decreasing water quality. Not identifying and managing systems capable of achieving DFC could also have an adverse effect on special status fish by allowing activities that impact riparian vegetation, resulting in increased water temperature and sedimentation. Impacts from the management of riparian/wetland resources will influence all of the identified Yellowstone cutthroat trout habitats in the planning area. Management actions for riparian/wetland resources under Alternative D would have major adverse effects on special status fish resources.

Invasive Species and Pest Management (minor beneficial)
Limiting aerial application to defined situations would protect Yellowstone cutthroat trout habitat and result in a minor beneficial effect.

Fish and Wildlife Resources – Fish (major beneficial)
Alternative D management actions would consider fish and fish habitat in reservoir, riparian and wetland systems, and perennial water management. Alternative D would apply constraints on surface-disturbing and disruptive activities providing protection of vegetation, soils, and soil

microbial activity from surface-disturbing activities within all of the identified Yellowstone cutthroat trout habitats in the planning area; therefore, the management actions for fish under Alternative D would have major beneficial effects on special status fish resources.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative D, prohibiting surface disturbance and occupancy in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges could decrease sedimentation and invasive species establishment in the Tongue River which would have a beneficial effect on special status fish. Protections for identified big game ranges and raptor nests would have a beneficial effect on fish. Overall, the protective buffers for wildlife would conserve riparian vegetation within greater than ten percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for wildlife under Alternative D would have major beneficial effects on special status fish resources.

Special Status Species – Plants (moderate beneficial)
Allowing the placement of water developments and salt or mineral supplements in habitat for special status plant species would decrease water quality and increase sedimentation where these resources overlap. Managing to comply with the ESA and BLM policy associated with special status plant species would have a moderate benefit to fisheries management as their occupied habitat occurs in five to ten percent of the identified Yellowstone cutthroat habitats in the planning area.

Special Status Species – Wildlife (major beneficial)
Under Alternative D, protections for raptor nests, Greater Sage-Grouse, and Threatened and Endangered species would have a beneficial effect on special status fish species. Establishing a year-round disturbance-free zone of at least 0.5 mile for riparian corridors (Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River) consistently used by bald eagles would have a beneficial effect on special status fish species. Prohibiting surface-disturbing and disruptive activities for the protection of special status amphibian and reptile species and their habitats in identified 100-year floodplains and within 500 feet of perennial waters would have a beneficial effect on special status fish species. Protections for bald eagle and other raptor nests (1.5-miles buffer) would have the greatest potential for reducing impacts to identified Yellowstone cutthroat habitats. Overall, protections for special status wildlife species would conserve vegetation within greater than ten percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for special status wildlife species would have major beneficial effects on special status fish resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Alternative D impacts associated with cultural resources management would be the same as those under Alternative B, except Alternative D would protect 15,382 acres through cultural resources NSO restrictions and 613,601 acres through cultural resources CSU restrictions. These areas of prohibitions or restrictions would also conserve vegetation within greater than ten percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for cultural resources would have major beneficial effects on special status fish resources.

Paleontological Resources (no effect)
Under Alternative D, lands containing high quality or important paleontological resources do

not overlap with fish habitat and management actions would have no effect to special status fish resources.

Visual Resources (major beneficial)
Under Alternative D, effects to fish resources from management actions associated with visual resource management would be the same as the effects under Alternative B.

Land Resources

Lands and Realty (negligible adverse)
Proposed land disposals that could affect Yellowstone cutthroat trout total 164 acres (less than one percent of the identified Yellowstone cutthroat habitats). Disposing of these lands could result in fewer restrictions on surface disturbances. This could increase sedimentation and pesticide applications, which would result in reduced water quality and have a negligible adverse effect on Yellowstone cutthroat trout.

Renewable Energy (negligible adverse)
Under Alternative D, excluding renewable-energy development on 413,001 acres would have a beneficial effect on special status fish by avoiding sedimentation from construction. Renewable energy would be permitted within less than one percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for renewable energy under Alternative D would have negligible adverse effects on fish resources.

Rights-of-Way and Corridors (negligible adverse)
Avoiding ROW on slopes equal to or greater than 25% and on highly erodible soils would have a beneficial effect on special status fish. ROWs would be permitted within less than one percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for ROWs and corridors under Alternative D would have negligible adverse effects on special status fish resources.

Travel and Transportation Management (minor adverse)
Alternative D impacts to special status fish from management of travel and transportation would be similar to those under Alternative C, except that one to five percent of the identified Yellowstone cutthroat habitats would be closed to motorized vehicle use. Allowing travel for dispersed camping and big-game retrieval up to 300 feet off designated routes if it would not damage resources would have an adverse effect on fisheries. Management actions for travel and transportation management would have minor adverse effects on special status fish resources.

Recreation (minor adverse)
Allowing additional recreation facilities in areas where they are supported by recreational use and are consistent with other resource values could have an adverse effect on fish through increased fishing and the potential increasing the risk of disease or invasive species colonizing Yellowstone cutthroat trout habitats. Increased education would reduce these adverse impacts. Limiting motorized vehicle travel to designated roads and trails (other than within stock driveways) consistent with other resource values would have a beneficial effect on special status fish. Recreation management would occur within one to five percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for recreation under Alternative D would have minor adverse effects on special status fish resources.

Livestock Grazing Management (minor beneficial)
Authorizing increases in forage allocations to wildlife and watersheds as the first priority; locating

livestock salt or mineral supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands; designating resource reserve allotments; allowing increases in livestock stocking rates as a result of vegetative treatments; and providing a minimum of two growing seasons rest from livestock grazing, prescribed fires, and vegetative treatments (in lieu of an approved plan) would have a minor beneficial effect on Yellowstone cutthroat trout by improving the health of the stream system.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
An ACEC designation at Welch Ranch on the Tongue River could have an adverse effect on identified Yellowstone cutthroat habitats. Additional human use could occur with designation, which would increase the potential for introduction of invasive aquatic species and illegal stocking, and increase the risk of fire in the riparian forest. These potential issues would be mitigated through education. Designation would have beneficial effects through public outreach and education regarding the rarity and value of prairie river riparian systems. The proposed ACECs would encompass less than one percent of the identified Yellowstone cutthroat habitats in the planning area. Management actions for ACECs would have negligible beneficial effects on special status fish resources.

4.4.8.7. Cumulative Impacts

Cumulative impacts to special status fish species in the planning area would come from non-federal minerals development, non-BLM fire programs, and non-BLM-regulated recreation. In general, these actions can be grouped into actions that are apart from either BLM surface estate or BLM mineral estate. Most cold-water fisheries in the planning area are on BLM or USFS lands, and actions on USFS lands would be similar to BLM actions regarding protective measures. In forested habitats of the cold-water fisheries, the greatest threat to special status fish would be catastrophic fire and the resulting sedimentation and water temperature and chemistry changes. The Bighorn National Forest Plan addresses this threat with suppression efforts and forest health projects; however, the extent of diseased timber that could burn does represent a potential major adverse effect on fish.

Wind-energy projects on non-BLM-administered lands would not impact Yellowstone cutthroat trout.

Recreation off BLM surface would likely result in the transport and introduction of diseases and invasive species, which could have a major adverse effect on special status fish species.

4.4.8.8. Conclusion

Table 4.52, “Summary of Impacts to Special Status Species – Fish” (p. 1090) summarizes impacts to special status fish species.

Table 4.52. Summary of Impacts to Special Status Species – Fish

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Major beneficial	Major beneficial	Major adverse	Major adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Water Resources	Major beneficial	Major beneficial	Major adverse	Major adverse
Cave and Karst Resources	No effect	Major beneficial	Major adverse	No effect
Mineral Resources				
Locatable Minerals	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Leasable Minerals – Coal	Major adverse	Minor adverse	Major adverse	Moderate adverse
Leasable Minerals – Fluids	Major adverse	No effect	Major adverse	Major adverse
Salable Minerals	Minor adverse	Major adverse	Moderate adverse	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Major beneficial	Minor adverse	Minor adverse	Minor adverse
Vegetation – Grassland and Shrubland Communities	No effect	Major beneficial	Major adverse	Major beneficial
Vegetation – Riparian/Wetland Resources	Major beneficial	Major beneficial	Major adverse	Major adverse
Invasive Species and Pest Management	Minor beneficial	Moderate adverse	Moderate adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Major beneficial	Major beneficial	Major beneficial
Special Status Species – Plants	No effect	Moderate beneficial	No effect	Moderate beneficial
Special Status Species – Fish	Major adverse	Major beneficial	Major beneficial	Major beneficial
Special Status Species – Wildlife	Moderate beneficial	Major beneficial	Moderate beneficial	Major beneficial
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major beneficial	No effect	Major beneficial
Paleontological Resources	Negligible beneficial	No effect	No effect	No effect
Visual Resources	Major beneficial	Major beneficial	No effect	Major beneficial
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	Minor adverse	Negligible adverse	Minor adverse	Negligible adverse
Renewable Energy	No effect	No effect	Moderate adverse	Negligible adverse
Rights-of-Way and Corridors	No effect	No effect	Moderate adverse	Negligible adverse
Travel and Transportation Management	Minor adverse	Minor beneficial	Minor adverse	Minor adverse
Recreation	Negligible beneficial	Negligible beneficial	Negligible beneficial	Minor adverse
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Livestock Grazing Management	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible beneficial	No effect	Negligible beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.4.9. Special Status Species – Wildlife

Populations of special status wildlife species fluctuate, sometimes widely, in response to natural factors such as cycles in the abundance of prey or extremes in seasonal weather such as severe winters. It is difficult to determine whether effects on special status wildlife species result from any specific management action or from population changes caused by natural factors. Changes in stressors, (e.g., increased human presence and noise) on habitat components such as vegetation, water, soil, or air are the most likely to cause direct and indirect effects on special status wildlife species.

Actions that remove, degrade, or fragment habitat for special status wildlife species are considered adverse. Beneficial effects result from actions that conserve or improve habitats, such as raptor nest sites or Greater Sage-Grouse leks.

Direct effects on special status wildlife species could result from the loss of habitats or Priority Habitat Area features such as nest site or lek area, or from the immediate loss of life. Human activities also can directly disturb special status wildlife species, potentially causing them to abandon a nest, a lek, or their home range. Disturbance during sensitive periods (e.g., winter and nesting) is known to adversely affect special status wildlife species. Human activities such as OHV use, recreation, and noise from equipment associated with development and surface-disturbing activities affect some special status wildlife species. These activities are considered to be particularly detrimental to nesting and lekking grouse and nesting raptors.

Activities such as vegetative treatments; fire and fuels management; minerals exploration and extraction; construction and maintenance of roads and trails; and development of renewable resources can fragment or cause the loss of habitats. Indirect effects on special status wildlife species can result from changes in habitat characteristics or quality. Various surface-disturbing activities and other actions that remove vegetation and disturb soil can affect habitat quality. Specific actions that change habitat in a way that would make it unsuitable for future habitation can cause indirect effects on special status wildlife. Human disturbance from vehicular travel on roads, human activity at drill sites or wellheads, or any other activity not associated with the natural environment (including noise) can indirectly affect special status wildlife species not accustomed to such disturbances.

Disturbance affects range from short-term displacement and shifts in activities to long-term abandonment of home range. For purposes of this analysis, short-term effects on special status wildlife species would result from activities to which an individual or species immediately responds, but do not affect the population viability of the species. For example, many disturbance effects are short-term because a species might temporarily abandon an area or nest but return immediately following the cessation of the disturbance, such as a passing OHV. Short-term construction can cause an animal to abandon an area or nest, but the species often is able to return to the area and successfully reproduce the following season.

Long-term effects on special status wildlife species are those that would affect the viability of the population. These effects include alteration of adequate habitats in either size or health (direct loss, fragmentation, or degradation) for any or all life requirements (e.g., seasonal habitats), and activities that would affect reproductive success (e.g., activities causing undue energy expenditure for prolonged periods, and removal of breeding grounds and nests). Human disturbance, whether intentional (e.g., harassment) or unintentional, results in increased energy cost to the alerted animals. Disturbed animals incur a physiological cost either through excitement (preparation for exertion) or locomotion. A fleeing or displaced animal incurs additional costs through loss of food intake and potential displacement to poorer (lower) quality habitat. If the disturbance becomes chronic or continuous, these costs can result in reduced animal fitness and reproductive potential. In addition, physical or psychological barriers lead to fragmentation of habitats, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot or will not cross it to access otherwise suitable habitat. These effects are especially problematic when they occur in limiting habitat components such as winter ranges and reproductive habitats (WGFD 2004).

4.4.9.1. Methods and Assumptions

This section describes the methods and assumptions used to analyze impacts to special status wildlife species. The assumptions and methods include:

- The area evaluated for possible effects on most special status wildlife species includes the entire area within the boundaries of the planning area.
- Effects on special status wildlife species are based primarily on potential effects on habitats managed by the BLM.
- The analysis of special status wildlife species in planning area watersheds focuses on changes in water quantity because that would be the primary indirect effect on watershed species from resource management actions. See the *Special Status Species – Fish* section for more detail on these analyses, and to the *Water* section for more information about effects on water quality and water quantity in the planning area.
- In areas with historic fire regimes, prescribed fire is used to manage vegetative communities and can result in short-term adverse effects and long-term beneficial effects on wildlife and wildlife habitats.
- Short- and long-term surface disturbance are assumed to occur in vegetative types, in proportion to the availability of these vegetative types, in the planning area. Affected acreages for vegetative types are not absolute, but provide a means for relative comparisons among alternatives.
- Precise quantitative estimates of effects generally are not possible because the exact locations of future actions are not known, population data for species status wildlife species are often lacking, or habitat types affected by activities cannot be predicted.

- Because of the migratory nature and relative mobility of some special status wildlife species, these species are affected by actions on non-BLM-administered land more than other species. In the case of migratory species, effects on winter and migration habitats could adversely affect 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.
- Actions that would adversely or beneficially affect one species would have similar effects to other species using the same habitats.
- In relation to buffers, "prohibit" means no activity or effects will be allowed during a specific period or in a designated habitat area unless specific biological exception conditions are met. Avoid means to follow guidance for avoidance when possible.
- For purposes of analysis, it is assumed that water use in the planning area could adversely affect surface water quantity in planning area watersheds. Water depletion analyses are based on the assumption that all water used for impoundments or drilling and completion of wells in the planning area would have contributed to the surface flows of the pertinent watershed.
- BLM-authorized activities associated with all resource and all resource use programs within Greater Sage-Grouse habitat would be subject to Greater Sage-Grouse required design features (RDFs) identified in Appendix D (p. 1603). For analysis purposes, it has been assumed that all applicable BMPs, recommended practices, conservation measures, and RDFs would be implemented during site-specific project planning where appropriate.
- Recommendations by the Northeast Wyoming Greater Sage-Grouse Working Group for improving and maintaining Greater Sage-Grouse habitats would be encouraged where appropriate.
- Management of sagebrush habitats would follow the BLM National Sage-Grouse Habitat Conservation Strategy (BLM 2005d). Using these guidelines, Greater Sage-Grouse would serve as an umbrella species for all sagebrush-dependent species. Measures to protect Greater Sage-Grouse will benefit all sagebrush-dependent species.
- The more sagebrush acreage protected, the greater the benefit to Greater Sage-Grouse and other sagebrush-dependent species.
- Prohibiting all non-beneficial ground disturbance and disruptive activities in Greater Sage-Grouse habitats would provide a higher level of protection for Greater Sage-Grouse than avoiding these activities.
- The BLM can minimize disturbance impacts to special status wildlife by limiting access to nesting, breeding, and brood-rearing sites. Surface disturbance can be controlled through three types of restrictions: (1) NSO for fluid minerals, which prohibits physical presence; (2) CSU, which limits surface use unless there is a documented plan for mitigation; and (3) TLS, which prohibits surface use during specified periods.
- Removing sagebrush habitat will have a long-term adverse effect on sagebrush-obligate species.
- Over the life of the plan, some species currently considered sensitive, or not formally included on the BLM sensitive species list, could be listed under the Endangered Species Act. Some currently listed species could be delisted during the life of the plan. Most species delisted or downgraded from federally Proposed or Candidate status will be included on the BLM sensitive species list.
- Public concern for special status species will likely increase during the planning period due to increasing concerns over growth and development on habitats containing these species.
- The USFWS could designate additional wildlife species as Threatened and Endangered as additional data are collected and evaluated. These species would be managed in accordance with the Endangered Species Act and as directed by decisions under the alternatives.

Significance Criteria

In addition to the scale of impacts listed in the beginning of this chapter, an adverse impact on special status wildlife species as a result of project actions would be considered potentially significant if there was: (1) substantial loss of the biological integrity and habitat function of ecosystems that would make species eligible for listing under the ESA; (2) decreased viability or increased removal of Threatened, Endangered, Proposed, or Candidate species, or adverse alteration of their critical habitats; and (3) substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status.

4.4.9.2. Impacts Common to All Alternatives

Special Status Species - Wildlife (major beneficial)
Management actions common to all alternatives that could affect special status wildlife species include: (1) implementing measures in USFWS Biological Opinions for Threatened and Endangered species; (2) maintaining and restoring Greater Sage-Grouse habitats; and (3) establishing a 0.5-mile year-round disturbance-free buffer zone for known bald eagle nests. These management actions would have beneficial effects on special status wildlife species resources as they conserve or improve habitats. The beneficial effects would be major as greater than ten percent of habitats important to Threatened and Endangered Species, Greater Sage-Grouse, and bald eagles would be conserved or improved.

Physical Resources

Air Quality (minor beneficial)
The types of effects on special status wildlife species from management actions associated with Impacts Common to All Alternatives for air quality resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (reduced dust emissions, thereby improving habitats). The beneficial effects would be minor as this would improve habitat mostly along roads, likely only covering one to five percent of habitats important to special status wildlife species.

Soil (moderate beneficial)
The types of effects on special status wildlife species from management actions associated with Impacts Common to All Alternatives for soil resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (impact avoidance, thereby conserving habitats). These beneficial effects would be moderate as reclamation, though beneficial, is not restoration and the adverse impacts to habitats would likely persist in large areas of disturbance.

Water Resources (moderate beneficial, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from management actions associated with Impacts Common to All Alternatives for water resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting surface water from soil erosion and/or pollutants, thus conserving habitats). The effects would be major based on protection alone, but when adding the adverse effects of increased water on a naturally arid landscape and providing additional vectors for disease (West Nile Virus [WNv]), the beneficial effects are reduced to a moderate level.

Providing an alternative or "off-source" water supply in locations where BLM-authorized uses are fenced out of water sources is of particular concern to Greater Sage-Grouse management. Without direction for construction of water containment structures (e.g., troughs, tanks, or ponds) to eliminate habitat for mosquitoes, this management action could contribute to population declines. This management action would have a significant impact on Greater Sage-Grouse.

Cave and Karst Resources (minor beneficial)
The types of effects on special status wildlife species from management actions associated with impacts common to all alternatives for cave and karst resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (cave inventories, thus identification and conservation of bat habitats). The effects would be minor as only a small portion one to five percent of all bat habitats in the planning area would be identified and conserved.

Mineral Resources

Locatable Minerals (negligible adverse)
The types of effects on special status wildlife species from locatable minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal and/or fragmentation of habitat). The adverse impacts would be negligible for special status wildlife species as locatable minerals are limited within the planning area and less than one percent of special status species habitats are likely to be impacted by locatable mineral development.

Leasable Minerals – Coal (major adverse)
The types of effects on special status wildlife species from leasable coal minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal and/or fragmentation of habitat). The adverse impacts would be major for special status wildlife species as high coal development potential occurs on greater than ten percent of habitats important to more than half of the special status wildlife species in the planning area.

Leasable Minerals – Fluids (major adverse)
The types of effects on special status wildlife species from leasable fluid minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal, degradation, and/or fragmentation of habitat). Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75% (2,544,512 acres) has been leased; the majority of which is held by production. Thus, the adverse impacts would be major for special status wildlife species as leasable fluid mineral potential exists within nearly half of all habitats for nearly every special status wildlife species (black-tailed prairie dogs, Greater Sage-Grouse, raptors, amphibians, reptiles, bats and migratory birds) in the planning area.

CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB FEIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1671)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore deep development may be more compatible with special status species. Appendix D (p. 1603) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse

conservation; which would likely benefit other special status species as well. BLM's High Plains District has also founded the Powder River Basin Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats.

Salable Minerals (major adverse)
The types of effects on special status wildlife species from salable minerals resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (removal, degradation and/or fragmentation of habitat). The adverse impacts would be major for special status wildlife species as salable minerals are likely to occur within greater than ten percent of habitats important to nearly all special status wildlife species (nine percent of habitats important to Greater Sage-Grouse) in the planning area.

Fire and Fuels Management

Planned Fire (Prescribed Fire) (major beneficial)
Prescribed fire would be implemented to meet DPC and resource management objectives and would be planned on a landscape basis with multiple land owners involved. Effects on grassland and shrubland communities would be direct and long term. Fire helps maintain a mixture of vegetative types and age classes that provide habitat for a variety of special status wildlife species. Fire alters habitats and could improve habitat components for some species while degrading habitat for others. Over time, as vegetation recovers from fire disturbance, various species of special status wildlife species would benefit from various successional stages of vegetation. Herbivores are directly affected by the changes in vegetative cover and forage associated with fire, whereas predators respond to both changes in cover and abundance of prey. Due to the size of potential prescribed fire projects in the planning area, more than ten percent of habitats important to most special status wildlife species (Greater Sage-Grouse, bald eagles, herptiles, bats and migratory birds) in the planning area, these impacts would be major. The effects overall from prescribed fire are anticipated to improve habitats and thus be beneficial.

Unplanned Fire (Wildfire) (moderate adverse)
In addition, fire near wetlands can consume dead grass and sedges, opening up dense marsh vegetation to maintain habitat. Burning also stimulates new shoots that have greater value as forage. Under the right conditions, fire can create new ponds or prevent old ponds from filling in with vegetation. Fire can have short-term adverse effects on special status wildlife species when it occurs during nesting or molting periods, or when it eliminates woody vegetative cover.

Shrub communities are maintained by periodic fires. In forested areas, fire creates openings in the forest and snags used for nesting, perching, and foraging. Fire can cause direct effects on birds when it occurs during the nesting season, killing nestlings and destroying nests. Raptors can benefit from fire due to increased populations of small mammals and birds in response to vegetative changes after fire. The timing of the benefit varies depending on the type of prey favored by the raptor. Over the short term, fires reduce cover available for prey species, making them more visible to raptors. Using fire as a habitat management tool in a sagebrush-steppe ecosystem can have adverse effects if it is improperly used, such as converting desirable shrub and perennial grass stands to annual grasses to maintaining annual grass communities. Hazardous fuels reduction and WUI projects are planned for beneficial results, and protective effects are direct and long term for the targeted vegetation. Effects from the fires also can be indirect and adverse over the short-term for non-targeted species in the same vegetative community. Due to the potential long-term degradation of large amounts of Greater Sage-Grouse habitat, but likely

scattered nature of effects to all other special status wildlife species in the planning area, the adverse effects of habitat removal from unplanned fire are likely to be moderate.

Biological Resources

Vegetation – Forests and Woodlands and Vegetation – Grassland and Shrubland Communities (major beneficial)
In addition to effects described in *Fish and Wildlife Resources – Wildlife* (reducing impacts to habitats), restoring disturbed sites, including split estate lands, in suitable habitat for special status wildlife species would increase suitable habitat and promote new and restore historic habitat. This has a major beneficial effect on special status wildlife species as greater than ten percent of Greater Sage-Grouse, raptor and migratory bird habitats would be affected.

Vegetation – Riparian/Wetland Resources (major beneficial)
Expanding and enhancing riparian/wetland systems would increase suitable habitat, promote new and restore historic habitat. This would have long-term minor to major beneficial effects on special status wildlife species that inhabit riparian and wetland ecosystems. There are 138,108 acres of suitable riparian habitat for special status wildlife species on split estate lands. Effects would typically be localized, but due to the overwhelming occurrence of riparian/wetland systems and special status wildlife species overlap, projected over the entire planning area (greater than ten percent for all special status wildlife species, except Greater Sage-Grouse), effects would be major beneficial.

Invasive Species and Pest Management (major adverse)
The types of effects on special status wildlife species from invasive species and pest management common to all alternatives would be the same adverse effects (treatment of wildlife food sources) and beneficial (improving vegetative community health) as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. The effects on special status wildlife species, though, would be major adverse as grasshopper populations, one of the food sources of Greater Sage-Grouse young, would be directly targeted and reduced through treatment.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (major beneficial)
The types of effects on special status wildlife species from fish and special status species fish management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protection and improvement of riparian habitats). This has a major effect on special status wildlife species as greater than ten percent of habitats important to each of black-tailed prairie dogs, bald eagles, herptiles and bats within the planning area would be affected.

Fish and Wildlife Resources – Wildlife (major beneficial)
The types of effects on special status wildlife species from wildlife management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (maintaining and improving wildlife habitats). The effects would be major as habitats important to wildlife overlap habitats important for special status wildlife species by greater than ten percent.

Special Status Species – Plants (moderate beneficial)
Implementation of actions set forth in recovery plans, conservation measures, terms and conditions, and appropriate and reasonable and prudent measures within biological opinions for Threatened and Endangered species at this point in time, includes surface-disturbing restrictions

for Ute ladies'-tresses orchids and their habitats, along with guidelines to prevent alteration of stream flow near known populations. Management actions common to all alternatives also include allowing treatments within habitat for special status plant species and within known populations that are proven to benefit the species. These actions, including the prohibitions/restrictions encompass and therefore improve or conserve five to ten percent of habitats important to herptiles and bats (one to five percent of habitats important to Greater Sage-Grouse and less than one percent of habitats important to all other special status wildlife species); therefore, the management actions common to all alternatives would have moderate beneficial effects on special status wildlife resources.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
The types of effects on special status wildlife species from cultural resources management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting habitats by protecting cultural sites). This would have minor effects on special status wildlife species as cultural resources overlap one to five percent of habitats important to herptiles and/or bats and less than one percent of habitats important to all other special status wildlife species.

Paleontological Resources (negligible beneficial)
The types of effects on special status wildlife species from paleontological resources management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (protecting habitats by protecting paleontological sites). This would have negligible effects on special status wildlife species as paleontological resources overlap less than one percent of habitats important to special status wildlife species.

Visual Resources (negligible beneficial)
The types of effects on special status wildlife species from visual resources management common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (prohibiting or limiting disturbance to habitats). Beneficial effects are negligible for special status wildlife species due to the minimal (less than one percent) overlap of the two resources.

Land Resources

Forest Products (negligible adverse)
The types of effects on special status wildlife species from forest products resource management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat removal). Forest products resource areas overlap less than one percent of habitats important to special status wildlife species, therefore, impacts would be negligible.

Lands and Realty (minor beneficial)
The types of effects on special status wildlife species from lands and realty management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (improved wildlife resource management ability through acquisition/exchange of lands). Lands with potential for acquisition overlap less

than five percent of habitat important to any special status wildlife species so these beneficial effects would be minor.

Renewable Energy (major adverse)
The types of effects on special status wildlife species from renewable energy resources management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat removal and fragmentation). Renewable energy potential exists in greater than ten percent of habitats important to most special status wildlife species (less than ten percent for bald eagles), therefore effects would be major.

Rights-of-Way and Corridors (major adverse)
The types of effects on special status wildlife species from ROW and corridors management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation, and fragmentation). ROW and corridors are likely to occur throughout greater than ten percent of habitats important to most special status wildlife species (less than ten percent for bald eagles), therefore effects would be major.

Travel and Transportation Management (major adverse)
The types of effects on special status wildlife species from travel and transportation management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation, and fragmentation). The effects from travel and transportation could occur on greater than ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, bald eagles, and raptors, making these major effects.

Recreation (moderate adverse)
The types of effects on special status wildlife species from recreation management actions common to all alternatives would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, alteration, and degradation, and additional stressors). Recreational activities are likely to occur on less than ten percent of habitats important to special status wildlife species, so effects should be moderate.

Lands with Wilderness Characteristics (negligible beneficial)
The types of effects on special status wildlife species from wilderness characteristics management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Less than one percent of habitats important to special status wildlife species occur within areas with wilderness characteristics, so the effects would be negligible.

Livestock Grazing Management (major adverse)
In addition to the effects described in the *Fish and Wildlife Resources – Wildlife* section (habitat degradation or habitat improvements), late-season grazing can remove residual vegetation that would provide important nesting cover for Greater Sage-Grouse the following spring. Livestock grazing also can enhance forage and brood-rearing conditions for special status wildlife species. Special status wildlife could favor regrowth areas previously used by cattle because of the resulting increase in forage palatability.

Livestock range improvements designed to alter grazing distribution and use of pastures, such as fences and water developments, would affect special status wildlife species. Placing mineral

supplements in Greater Sage-Grouse leks could degrade Greater Sage-Grouse nesting habitat. However, livestock fences create travel barriers, cause stress, and could lead to decreased reproductive success and death from entanglement.

Overall, livestock grazing management actions common to all alternatives would have major adverse effects on special status wildlife species as allotments occur on greater than ten percent of habitats important to special status wildlife species (except bats).

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
The types of effects on special status wildlife species from ACECs management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). ACECs would encompass one to five percent of habitats important to Greater Sage-Grouse, therefore minor effects would occur.

Scenic or Back Country Byways (no effect)
Scenic or BCBs do not overlap any habitats important to special status wildlife species; therefore, no effects are anticipated.

Wild and Scenic Rivers (no effect)
The types of effects on special status wildlife species from Wild and Scenic Rivers management actions common to all alternatives would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Wilderness Study Areas (negligible beneficial)
The types of effects on special status wildlife species from WSAs management actions common to all alternatives would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). The WSAs are within less than one percent of habitats important to special status wildlife species so would therefore only have negligible effects.

Socioeconomic Resources

Social and Economic Conditions (no effect)
Management actions common to all alternatives are administrative processes and will have no effect on special status wildlife resources. Impacts to social and economic resources will be quantified on a project-specific basis. Management actions that vary by alternative are also administrative; therefore, social and economic management actions will not be discussed further in this section.

Health and Safety (major beneficial)
Management actions common to all alternatives are designed to control and mitigate threats to health and human safety and to the environment. Management actions designed to prevent accidental spills of hazardous materials or environmental contamination would have beneficial impacts to special status wildlife by protecting riparian and upland areas across the resource area. Because hazardous materials (e.g., oil, oil and gas by-products, pesticides, and cleaning solvents) are being produced and transported in the planning area, there is a threat of accidents or spills. If there was a spill, mitigation and cleanup would rarely succeed in recovering a riparian

or upland area to its original condition over the short term; therefore, there would be localized long-term adverse impacts.

Management actions associated with health and safety are only identified in the *Common to All Alternatives* section; therefore, health and safety will not be discussed further in this section.

4.4.9.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. This section describes management actions and potential impacts to special status wildlife species from implementing Alternative A.

Special Status Species – Wildlife (major beneficial, significant impacts to Greater Sage-Grouse) Seasonal restrictions on land uses would benefit special status wildlife species by preventing disturbance during critical winter, breeding, and nesting periods. This would have a long-term beneficial effect. Other long-term beneficial effects would result from restricting access roads, pipelines, and powerlines to designated corridors.

Special status wildlife species also would benefit from prohibiting surface occupancy for oil and gas activities, restricting OHV activities in big-game winter ranges or elk calving areas, retaining sufficient escape and foraging habitat adjacent to timber cutting units, and exchanging or selling scattered parcels of public land so areas could be "blocked up" into manageable units. From past experience, it is estimated that restrictions on oil and gas exploration, ROW, and other surface-disturbing activities through special status wildlife species seasonal or NSO provisions are not likely. Under Alternative A, the authorized officer may waive prohibitions and restrictions without defined criteria; this has resulted in inconsistent application of management and has not been effective in protecting wildlife.

Estimated short- and long-term disturbance from BLM actions in the planning area are anticipated to result in loss, degradation, and fragmentation of sagebrush habitat. Alternative A does not provide specific guidance or management actions for the prevention of habitat loss and fragmentation. To minimize effects on sagebrush habitats and Greater Sage-Grouse, Alternative A would avoid surface disturbance or occupancy within 0.25 mile of occupied leks and avoid surface-disturbing and disruptive activities in suitable nesting and early brood-rearing habitats within 2 miles of occupied leks.

Alternative A does not include surface disturbance restrictions for Greater Sage-Grouse winter habitats, requirements to reduce noise levels of equipment, or restrictions on high-profile structures in sagebrush-obligate habitats (which could fragment habitat because Greater Sage-Grouse avoid some high-profile structures). Alternative A restrictions on surface disturbance or occupancy and disruptive activities around occupied Greater Sage-Grouse leks should provide some benefit to Greater Sage-Grouse during sensitive periods; however, these restrictions might not be sufficient to maintain or improve Greater Sage-Grouse populations over the long term. Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% (Walker et al. 2007a). Alternative A does not provide any provisions for habitat restoration, a component essential to the repopulation of degraded habitats. Over the long term, projected surface-disturbing and disruptive activities under Alternative A would have a major adverse effect on Greater Sage-Grouse in the planning area, potentially including extirpation within development areas. Current restrictions and lease stipulations, and inconsistent application of impact minimization measures have led to substantial loss of the biological integrity

and habitat function of ecosystems; decreased population viability; and substantial disruption of life history requirements of this special status species. This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area.

Nongame raptors are anticipated to be affected by surface-disturbing activities 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 2002). Constructing roads, powerlines, and other facilities can contribute to loss and fragmentation of raptor habitats and ultimately affect diversity and abundance of raptor populations (USFWS 2002). Surface disturbance would have localized adverse effects on raptor prey species by temporarily and permanently disturbing habitats for small mammals and birds. Under Alternative A, surface disturbance effects on raptors would be reduced by designated buffer zones around raptor nests. Under Alternative A, no activity or surface disturbance would be allowed within a biologic buffer from any active raptor nest from February 1 through July 31. The distances and dates for no disturbance can vary under Alternative A based on topography, species, season of use, and other pertinent factors. Under Alternative A, the BLM would protect approximately 1,195,815 acres surrounding known raptor nests.

Many neotropical migrants breed and nest on BLM-administered lands and winter in the tropics (BLM 1992b). Although effects on these species in their winter habitat are not subject to BLM management, localized effects on breeding and nesting habitats from surface-disturbing activities are anticipated for neotropical migrants. These effects could include temporary and permanent loss of breeding and nesting habitats. Surface-disturbing activities and associated development would also fragment and degrade habitats for neotropical migrants.

Similar to Greater Sage-Grouse, Brewer's sparrow, sage sparrow, and sage thrasher depend on sagebrush habitats. These species can use other shrubland types, particularly during the non-breeding season. The loggerhead shrike uses a greater diversity of shrubland types, including sagebrush. Therefore, measures to protect Greater Sage-Grouse (as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter) would benefit all sagebrush and shrubland species. Adverse effects on sagebrush habitats adversely affect these species.

Although there are no specific management actions for special status neotropical migrants that use riparian and wetland systems, these species are affected 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 effects on riparian and wetland species under Alternative A would be similar to those described for migratory game birds (waterfowl) in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Effects from surface-disturbing activities are anticipated for special status nongame mammals. Surface disturbance is anticipated to have localized adverse effects on special status nongame mammal habitats, including temporary and permanent loss of habitats. Fragmentation and degradation of habitats for special status nongame mammals is also anticipated from surface-disturbing activities and associated development. Under Alternative A, short- and long-term surface disturbance is expected for grassland habitats on BLM-administered land in the planning area. Reductions in prairie dog populations could 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 in the planning area are on private and state lands, there should be no measurable adverse effects on prairie dog populations from BLM actions under Alternative A.

Alternative A does not include specific management actions for bats, 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; therefore, effects on these two groups could be similar.

Under Alternative A, there are no specific management actions for special status neotropical migrants that utilize grassland. Short- and long-term surface disturbances to grassland habitats on BLM-administered land in the planning area are expected. Another grassland species, mountain plover, is often found in association with prairie dog towns because they tend to prefer nesting areas with sparse vegetative cover. The long-billed curlew also nests in areas with sparse vegetation. Therefore, these species would also be affected by management actions for black-tailed prairie dogs.

Although there are no specific management actions for reptiles and amphibians under Alternative A, these species would be affected by other biological resource management actions. Amphibians require riparian and wetland habitats. The effects of management actions on these habitat types are described throughout this section.

Physical Resources

Air Quality (negligible beneficial)
The types of effects from Alternative A would be the same as described in the *Impacts Common to All Alternatives* section for air quality. In Alternative A, though, these impacts would be analyzed on a project-specific basis. Without monitoring or oversight on a programmatic level, the beneficial effects can only be negligible. Air quality resource management actions under Alternative A would have negligible beneficial impacts on special status species wildlife.

Soil (minor beneficial)
The types of effects from Alternative A would be the same as described in the *Impacts Common to All Alternatives* section for soil (dust emission reduction and vegetation health improvements). In Alternative A, management actions for soil are beneficial where habitats are conserved through prohibitions of surface-disturbing activities and/or surface occupancy, both of which occur on greater than ten percent of habitats important to bald eagles, Greater Sage-Grouse, and herptiles. Within Alternative A, the impacts to soil resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Water Resources (minor beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for water (protecting, restoring, developing and improving water sources used by wildlife). Management actions for water in Alternative A are beneficial when habitats are conserved through prohibitions to surface disturbance, which occurs on greater than ten percent of habitats important to bald eagles and habitats important to herptiles, making these beneficial effects major. Within Alternative A, the impacts to water resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that the beneficial effects would be reduced by half, making the major beneficial effects only minor.

Cave and Karst Resources (negligible beneficial)
The types of effects from Alternative A would be the same beneficial effects as described in the *Impacts Common to All Alternatives* section for cave and karst resources (inventory and protection of habitats). Without monitoring or oversight on a programmatic level, the beneficial effects can only be negligible. Cave and karst resource management actions under Alternative A would have negligible beneficial impacts on special status species wildlife.

Mineral Resources

Locatable Minerals (negligible adverse)
The types of effects on special status wildlife species would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat fragmentation, degradation and loss). Less than one percent of habitats important to special status wildlife species (herptiles and bats) will be affected by locatable mineral development in Alternative A, making the effects negligible.

Leasable Minerals – Coal (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Under Alternative A, coal resources could be developed on greater than ten percent of all special status wildlife species, making the adverse effects major.

Of particular concern is the potential for coal resource development within greater than ten percent of Greater Sage-Grouse habitats. Opening all federal coal lands to exploration subject to license stipulations necessary to protect other resource values would cause a substantial loss of the biological integrity and habitat function of ecosystems. This management action, under Alternative A subjects leases to unsuitability screening and leasing is discretionary based on NEPA analysis and public interest. Without oversight on a programmatic level, inconsistent application of screening and discretionary leasing occurs. This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area.

Leasable Minerals – Fluids (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Under Alternative A, fluid resources could be developed on greater than ten percent of all special status wildlife species, making the adverse effects major.

Fluid minerals have been leased and developed and would continue to be leased and developed within fifty percent of the Greater Sage-Grouse habitat in the planning area. Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% (Walker et al. 2007a). Constraints on oil and gas leases, thus far, have not been strong enough to prevent the decline in populations of this species resulting from habitat loss, degradation and fragmentation caused by its development. Continuing to lease and allow development on this scale would cause substantial loss of the biological integrity and habitat function of ecosystems. This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area, potentially including extirpation within energy development areas.

Salable Minerals (major adverse)
The types of effects on special status wildlife species would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and

degradation). Greater than ten percent of habitats important to nearly all special status wildlife species (less for Greater Sage-Grouse) would be affected by salable mineral activities, making these adverse effects major.

Fire and Fuels Management

Unplanned Fire (Wildfire) (minor adverse) **and Planned Fire (Prescribed Fire)** (minor adverse)
The types of effects on special status wildlife species from Alternative A fire and fuels management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. In addition, Alternative A would manage wildland fire for areas where fire is not desirable or can be used as a management tool, and could implement prescribed fire to reduce hazardous fuels and meet fire and fuels management objectives. Nelle et al. (2000) concluded that burning did not benefit Greater Sage-Grouse nesting or brood-rearing habitats and adversely affected 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. Holloran et al. (2005) recommended limiting prescribed fire that could adversely affect dense sagebrush stands with adequate herbaceous vegetation. Fire and fuels management under Alternative A would promote a natural fire regime and could limit the potential for catastrophic fire, which would benefit Greater Sage-Grouse.

Overall, short-term effects from fire will be adverse based on habitat loss and degradation. Wildfires are estimated to burn 27,596 acres (3.5%) and planned fires are anticipated for 14,000 acres (1.8%) of BLM surface during the life of the plan, a minor effect.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
The types of effects on special status wildlife species from Alternative A forests and woodlands management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and also habitat improvements). Within Alternative A, the impacts from forest and woodland resource projects are analyzed on a project specific basis. Forests and woodlands are less than one percent of habitats important to special status wildlife species, so beneficial effects are negligible to special status wildlife species overall.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
The types of effects on special status wildlife species from Alternative A grassland and shrubland communities management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Due to the lack of specific management actions for grassland and shrubland communities in Alternative A, beneficial effects are likely to be only negligible.

Vegetation – Riparian/Wetland Resources (major beneficial)
The types of effects on special status wildlife species from Alternative A riparian/wetland resource management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat restoration and improvements). Greater than ten percent of habitats important to many special status wildlife species (black-tailed prairie dog colonies, bald eagles, and herptiles) occur in riparian and wetland areas, therefore, the beneficial effects should be major effects.

Invasive Species and Pest Management (moderate adverse)
Infestations of invasive species are spread sporadically throughout the planning area. Weeds contribute to the loss of rangeland productivity, increased soil erosion, reduced water quantity and quality, reduced species diversity, and loss of wildlife habitats. The BLM uses an integrated weed management program that involves grazing, fire management, and chemical, mechanical, and biological controls, and treats various weed species each year. Despite these efforts, the spread of invasive species is anticipated to degrade sagebrush habitats over the long term. Although the extent of sagebrush habitat degradation from the spread of invasive species and other weeds is not known for the planning area, there is a potential for these species to substantially affect Greater Sage-Grouse habitats in the future. Therefore, the anticipated continued expansion and spread of invasive species under Alternative A would adversely affect special status wildlife habitats. Though habitats are not likely to be entirely replaced by invasive species, all habitats would potentially be altered, and the effects are likely to be moderate.

Fish and Wildlife Resources – Fish (minor beneficial)
The types of effects on special status wildlife species from Alternative A fish management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvements). Greater than ten percent of habitats important to many special status wildlife species (black-tailed prairie dogs, bald eagles, herptiles, and bats) occur within fish habitat corridors. Within Alternative A, the impacts to fish resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that beneficial effects would be reduced by half, reducing the major beneficial effects listed above to minor.

Fish and Wildlife Resources – Wildlife (major beneficial)
The types of effects on special status wildlife species from Alternative A wildlife management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). General wildlife habitats and those important to special status species wildlife are intertwined. Greater than ten percent of habitats important to special status wildlife species would be impacted by wildlife management actions, therefore the effects would be major.

Special Status Species – Plants (moderate beneficial)
The types of effects on special status wildlife species from Alternative A special status species plant management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter. Due to the general locations of the special status plants in the planning area, the effects from them are likely to only impact herptiles and bats on a moderate scale and all other special status wildlife species by less than one percent.

Special Status Species – Fish (minor adverse)
The types of effects on special status wildlife species from Alternative A special status species fish management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation and restoration). The adverse effects would be minor for most special status species wildlife. The lack of protections under Alternative A would likely have a greater adverse effect on bald eagles due to the amount of overlap of suitable habitats for these species, greater than ten percent. Therefore, management actions for special status fish species in Alternative A would have minor adverse effects on special status wildlife species.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
The types of effects on special status wildlife species from Alternative A cultural resources management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). At most, cultural resources encompass greater than one percent, but less than five percent of habitats important to herptiles and bats and less for all other special status wildlife species, therefore, the effects from cultural management actions in Alternative A would have minor beneficial effects. Within Alternative A, the impacts to cultural resources are analyzed on a project-specific basis. Without oversight on a programmatic level, it is likely that beneficial effects would be reduced by half, reducing the minor beneficial effects negligible.

Paleontological Resources (negligible beneficial)
The types of effects on special status wildlife species from Alternative A paleontological resources management would be the same beneficial effects as described in the paleontological resources paragraph within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Paleontological resources are present in the planning area in less than one percent of habitats important to Greater Sage-Grouse (less than one percent of habitats important to migratory birds); therefore, the management actions for paleontological resources under Alternative A will have negligible beneficial effects of special status wildlife species in the planning area.

Visual Resources (negligible beneficial)
The types of effects on special status wildlife species from Alternative A visual resources management would be the same beneficial effects as described in the visual resources paragraph within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). At most, visual resource management of VRM Class I and II areas encompass less than one percent of habitats important to migratory birds only, therefore, the effects from visual resource management actions in Alternative A would have negligible beneficial effects.

Land Resources

Forest Products (negligible adverse)
The types of effects on special status wildlife species from Alternative A land resources management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation and loss). Forest products occur on less than one percent of habitats important to special status wildlife species. Therefore, the adverse effects would be negligible.

Lands and Realty (minor adverse)
The types of effects on special status wildlife species from Alternative A land resources management would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat fragmentation from land disposal or habitat improvement for land acquisition). Land tenure adjustments are identified in Alternative A within one to five percent of habitat important to all special status wildlife species in the planning area. The potential impacts from disposing of special status species habitat outweighs the benefits of potential acquisitions; therefore, the overall effect of land and realty management actions are minor adverse.

Renewable Energy (moderate adverse)
Wind-energy facilities can be a source of mortality for raptors if raptors collide with wind turbine blades. High mortality could result if wind towers are placed along a migration path or in

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 be a source of habitat loss and fragmentation, and human disturbance from construction and maintenance activities. Alternative A does not include decisions regarding wind-energy development. Large wind-energy fields also involve surface disturbance, which could permanently change the habitat structure of the special status wildlife species inhabitants.

The area of greatest potential for wind energy within the planning area is within five to ten percent of habitat important to bald eagles, making the adverse effects moderate. With a lack of decision, renewable energy would be examined on a project-specific basis. This would increase the probability that these adverse effects might occur.

Rights-of-Way and Corridors (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative A ROW and corridors management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Rights-of-way and corridors are currently proposed within greater than ten percent of habitats important to all special status wildlife species, making these adverse effects major.

Continued authorization of ROW grants and location of transmission lines and transportation facilities within corridor areas, to the extent feasible have severely impacted Greater Sage-Grouse habitats. There are currently no restrictions on the placement of these facilities. Rights-of-way and corridors have fragmented Greater Sage-Grouse habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alterative A, have had and would continue to have a significant impact on Greater Sage-Grouse.

Travel and Transportation Management (major adverse)
The types of effects on special status wildlife species from Alternative A travel and transportation management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, fragmentation and degradation). Travel and transportation is currently allowed within greater than ten percent of habitats important to almost all special status wildlife species in the planning area, though in less than one percent for herptiles and bats. Major adverse effects would occur on special status wildlife species from management actions for travel and transportation management under Alternative A.

Recreation (moderate adverse)
The types of effects on special status wildlife species from Alternative A recreation management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Designated recreation areas under Alternative A occur within five to ten percent of black-tailed prairie dog colonies, making the effects moderate.

Lands with Wilderness Characteristics (negligible adverse)
Alternative A does not include decisions for the protection of lands with wilderness characteristics, which would allow surface-disturbing activities in these areas. This would have a negligible adverse effect on wildlife.

Livestock Grazing Management (minor adverse)
By altering habitat components necessary for Greater Sage-Grouse habitats, livestock grazing can affect the suitability and extent of Greater Sage-Grouse habitats in the planning area. Holloran

et al. (2005) documented that annual grazing in Greater Sage-Grouse nesting habitats could adversely affect the next year's nesting success. Under Alternative A, the BLM manages to maintain Category M allotments. 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. The current focus of management and monitoring does not emphasize the protective cover of vegetation and litter that Greater Sage-Grouse require. Therefore, livestock grazing management under Alternative A would not improve the quality or quantity of habitat for the Greater Sage-Grouse, and will have minor adverse effects on special status wildlife resources.

Special Designations

Areas of Critical Environmental Concern (negligible adverse)
Under Alternative A, the types of impacts to special status wildlife species from management actions for special designations would be the same adverse effects as described under *Impacts Common to All Alternatives*, except that the additional 65,461 acres within the three WSAs would be open to oil and gas development. These three areas contain less than one percent of the habitats important to special status wildlife species in the planning area. Therefore, the adverse effects to special status wildlife species from management actions for ACECs in Alternative A would be negligible.

Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas (no effect)
No scenic or BCBs, Wild and Scenic Rivers, or WSAs are proposed in Alternative A. There will be no effect to special status wildlife species habitats from them in this alternative.

4.4.9.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to special status wildlife species due to their implementation.

Special Status Species – Wildlife (major beneficial)
Alternative B management actions for special status wildlife species include modifying existing fences that prevent special status wildlife species movement; applying prohibitions on surface occupancy, surface-disturbing and disruptive activities in various habitats for special status wildlife species (e.g., Greater Sage-Grouse seasonal habitats, riparian corridors consistently used by bald eagles, biologic buffers around raptor nests, and amphibian and reptile habitats); requiring burial of all new low-voltage powerlines and installation of perch-inhibiting devices on aboveground powerlines; and prohibiting surface disturbance in prairie dog colonies. This approach would allow for the greatest protective measures for special status wildlife species and their associated habitats and would greatly increase the potential for future management decisions to expand the proliferation of these species through active management where habitats important to special status wildlife species occur and BLM has the authority to actively manage them (Table 4.53, "Habitats Important to Special Status Wildlife Species on Each of the BLM-administered Land Types" (p. 1111)).

Table 4.53. Habitats Important to Special Status Wildlife Species on Each of the BLM-administered Land Types

Surface	Prairie Dog Colonies	Greater Sage-Grouse Winter Habitat	Within 0.5 Mile of Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River	Within 1.5 Miles of Special Status Species Raptor Nests	Amphibian and Reptile Habitat
BLM (acres)	6,156	289,327	12,792	113,784	176,636
Federal Mineral (acres)	47,702	2,165,107	54,439	2,023,118	1,217,959
Source: BLM 2012f BLM Bureau of Land Management					

Special status wildlife species would benefit from conscientious management of physical resources and biological resources.

Under Alternative B, the BLM would manage all riparian areas toward mid to late successional stage vegetation that would benefit riparian and wetland species. Under this alternative, there would be greater restrictions on surface disturbance in riparian and wetland areas because this type of disturbance would not be allowed within 0.25 mile of riparian and wetland areas new permanent facilities would not be allowed in these areas. Alternative B actions also would protect and enhance riparian and wetland habitats through more restrictive management of livestock by locating salt and/or mineral blocks a minimum of 0.5 mile from water sources, riparian areas, and aspens stands. These actions would ultimately result in riparian systems with increased plant species and structural diversity throughout the planning area, with benefits for riparian and wetland species. Actions pertaining to water and riparian and wetland habitats also would benefit migratory game birds. The buffer around riparian areas, wetland areas, perennial streams, and 100-year floodplains where surface disturbance cannot occur would be larger under Alternative B. These areas would be closed rather than avoided, which would benefit migratory game birds. In addition, Alternative B management would reduce channel erosion, bank erosion, and channel incision, and restore damaged wetlands.

Under Alternative B, estimated short- and long-term surface disturbance from BLM actions in the planning area would result in less loss, degradation, and fragmentation of sagebrush habitats. In addition, Alternative B includes specific management actions for protection from habitat fragmentation (including sagebrush habitats) on BLM-administered lands. To minimize effects on sagebrush habitats and the Greater Sage-Grouse, Alternative B prohibits rather than avoids surface disturbance or occupancy to protect associated nesting and early brood-rearing habitats. Alternative B would protect Greater Sage-Grouse winter habitat and implement practices to minimize the effects of continuous noise on species that rely on aural cues for breeding. In addition, Alternative B would manage sagebrush communities to enhance or maintain these communities, which would benefit Greater Sage-Grouse by reducing habitat fragmentation. Alternative B would also require that new low-voltage utility lines be buried anti-perch devices be installed on new high-voltage utility lines, which would result in relatively little increase in predation on Greater Sage-Grouse from raptors and corvids (e.g., crows and ravens).

Alternative B would prohibit surface-disturbing activities within 4 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter concentration areas, and

prohibit disruptive activities within the 4 mile area and outside the 4-mile buffer in nesting and brood-rearing habitat from March 1 to July 15 and winter habitat and concentration areas from November 15 to March 14. A CSU would be placed on all projects that would allow no more than 3% total surface disturbance per 640 acres. In addition, restoration of Greater Sage-Grouse habitat would become priority for all surface-disturbing activities on BLM surface within modeled nesting, brood-rearing, or winter habitat.

Over the long term, restricting surface disturbance or occupancy around Greater Sage-Grouse leks and within Greater Sage-Grouse habitats, combined with the proactive management action to enhance and restore large, contiguous blocks of sagebrush habitat, would protect sagebrush habitats and have beneficial effects on Greater Sage-Grouse.

Restrictions around raptor nests would be more extensive under Alternative B (1.5 miles), which would result in fewer direct effects on nesting raptors. Seasonal restrictions vary based on the species of raptor. Alternative B also would manage sagebrush, aspen, and mountain shrub communities in large, contiguous blocks and maintain connections among these communities. In addition, Alternative B would protect riparian areas, restrict placement of salt and/or mineral blocks, and increase control of invasive plant species. These actions would benefit birds and small mammals that comprise raptor prey in the planning area.

Under Alternative B, grassland habitats would be affected by short- and long-term surface disturbances. Surface disturbance and habitat fragmentation under Alternative B would affect special status nongame mammal species.

Alternative B would designate an NSO for black-tailed prairie dog colonies (approximately 47,702 acres). The goal of this NSO is to ensure a long-term, self-sustaining population of prairie dogs in the planning area. The associated potential increases in prairie dog populations under Alternative B would benefit species associated with prairie dog towns, including mountain plover, burrowing owl, swift fox, and black-footed ferret.

Potential effects on the northern leopard frog and spotted frog would be commensurate with effects on riparian and wetland habitats. The adverse effects under Alternative B would be similar to those for special status neotropical migrants that use riparian and wetland habitats.

Effects from conservative management of resources under Alternative B would, in some cases, be similar to those described for Alternative A and *Impacts Common to All Alternatives*. Where effects on special status wildlife species would vary in degree from effects described for Alternative A, further rationale is provided below.

Physical Resources

Air Quality (major beneficial)
The types of effects on special status wildlife species from Alternative B management of air quality resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Air quality resources occur throughout all habitats important to special status wildlife species, therefore, the beneficial effects would be major.

Soil (major beneficial)
The types of effects on special status wildlife species from Alternative B management of soil resources would be the same beneficial effects as described in the *Fish and Wildlife Resources –*

Wildlife section of this chapter (habitat conservation). Management actions for soil resources in Alternative B will occur within greater than ten percent of all habitats important to special status wildlife species. Beneficial effects from soil and habitat conservation would be major.

Water Resources (major beneficial, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative B management of water resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Water resources overlap greater than ten percent of habitats important to special status wildlife species, therefore beneficial effects would be major.

Under Alternative B, riparian and uplands in historically perennial systems would be managed to restore perennial flows or standing water. Restoration of areas of standing water would encourage creation of mosquito habitats. Increasing mosquito habitats increases the potential threat of WNv outbreaks in Greater Sage-Grouse. This could contribute to population declines. This management action, under Alternative B would have significant impacts to Greater Sage-Grouse.

Cave and Karst Resources (minor beneficial)
In addition to the types of effects described in the *Fish and Wildlife Resources – Wildlife* section of this chapter, bats using caves for roosting, maternity colonies, or hibernation could be affected by surface-disturbing activities near caves, cliffs, or other rock features. More cave habitats are expected to be protected under Alternative B. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in Washington Office Instruction Memorandum 2010–181, which would reduce threats to bats from WNS. Five to ten percent of habitats important to bald eagles, herptiles, and bats in the planning area occur within identified cave and karst areas. The beneficial effects of cave and karst management would be minor.

Mineral Resources

Locatable Minerals (negligible adverse)
The types of effects on special status wildlife species from Alternative B management of locatable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss degradation and fragmentation). Under Alternative B, locatable minerals will occur within less than one percent of habitats important to special status wildlife species. Adverse impacts will be negligible.

Leasable Minerals – Coal (major adverse)
The types of effects on special status wildlife species from Alternative B management of leasable coal mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Alternative B allows for coal development on greater than ten percent of habitats important to bald eagles, raptors and black-tailed prairie dog colonies (five to ten percent of habitats important to migratory birds and Greater Sage-Grouse and one to five percent of habitats important to herptiles and bats), therefore, management actions for coal would have major adverse effects on special status wildlife species' habitats.

Leasable Minerals – Fluids (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative B management of leasable

fluid mineral resources would generally be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter.

Under Alternative B, within 4 miles of Greater Sage-Grouse leks and winter concentration areas are administratively unavailable for leasing. Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75% (2,544,512 acres) has been leased; the majority of which is held by production. Thus, Greater Sage-Grouse may continue to experience population-level impacts, but there will also be areas unavailable for fluid minerals leasing, particularly southeast of Buffalo that could provide secure habitat (Map 12). Disturbed habitat on BLM surface are required to be restored to functional sagebrush ecosystems. Management actions for leasable fluid mineral resources would have a significant impact on Greater Sage-Grouse.

CBNG activity has waned in recent years with the decline in natural gas prices. To date, development is approximately half that predicted in the PRB FEIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1671)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore, deep development may be more compatible with Greater Sage-Grouse. The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNv transmission. Appendix D (p. 1603) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the Powder River Basin Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

Salable Minerals (major adverse)
The types of effects on special status wildlife species from Alternative B management of salable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative B, salable mineral extraction is permitted within greater than ten percent of habitats important to all special status wildlife species within the planning area, except raptors (one to five percent). Salable mineral management actions in Alternative B will have major adverse effects on special status wildlife species.

Fire and Fuels Management

Planned Fire (Prescribed Fire) (major adverse, significant impact to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative B planned fire management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Planned fires are anticipated within greater than ten percent of habitats important to Greater Sage-Grouse, bald eagles, herptiles, and bats (five to ten percent of habitats important to black-tailed prairie dogs, raptors, and migratory birds); therefore, the management actions for planned fire will have major adverse effects on special status wildlife species in the planning area.

Under Alternative B, wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems and reduce hazardous fuels. A fire mosaic of burned and unburned areas can be detrimental to sagebrush obligates. Wyoming big sagebrush, the dominate component of Greater Sage-Grouse habitat in the planning area, requires 50–120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed

burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Wildland fire use in Greater Sage-Grouse habitats would cause substantial loss of the biological integrity and habitat function of ecosystems. Under Alternative B, management actions for planned fire would have a significant impact on Greater Sage-Grouse.

Unplanned Fire (Wildfire) (minor adverse)
The types of effects on special status wildlife species from Alternative B unplanned fire management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Unplanned fires cannot be pinpointed for occurrence, but it is likely, given the amount, general location of habitats, and general fire history, that Greater Sage-Grouse and migratory bird habitats will be moderately and adversely affected over the life of this plan by unplanned fire ignitions. Other habitats important to special status wildlife species may also incur the adverse effects of fire, but the likelihood of occurrence makes the effects to these habitats negligible. Overall effects from unplanned fire on special status species wildlife would balance to minor adverse.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
The types of effects on special status wildlife species from Alternative B management of forests and woodlands would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Forests and woodlands overlap greater than ten percent of habitats important to migratory birds, including raptors (five to ten percent of habitats important to herptiles and bats, less than one percent of habitats important to Greater Sage-Grouse and bald eagles and no overlap of black-tailed prairie dog colonies), therefore, conservation of forest and woodlands would have overall major beneficial effects on special status wildlife species in the planning area.

Vegetation – Grassland and Shrubland Communities (major beneficial)
The types of effects on special status wildlife species from Alternative B management of grassland and shrubland communities would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Conservation of grassland and shrubland communities provide conservation of greater than ten percent of habitats important to Greater Sage-Grouse, raptors, and migratory birds (five to ten percent of habitats important to herptiles and bats, and less than one percent of habitats important to bald eagles and black-tailed prairie dogs), therefore, management actions for grassland and shrubland communities in Alternative B would have major beneficial effects on special status wildlife species in the planning area.

Vegetation – Riparian/Wetland Resources (major beneficial)
The types of effects on special status wildlife species from Alternative B management of riparian/wetland resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Riparian and wetland community improvements would affect greater than ten percent of habitats important to all special status wildlife species within the planning area, except Greater Sage-Grouse (five to ten percent). Management actions for riparian/wetland resources under Alternative B would have major beneficial effects on special status wildlife species overall.

Invasive Species and Pest Management (minor adverse)
The types of effects on special status wildlife species from Alternative B management of invasive species and pests would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Invasive species and pest management is expected to occur within five to ten percent of habitats important to Greater Sage-Grouse and black-tailed prairie dogs (one to five percent of habitats important to herptiles, bats, and migratory birds, and less than one percent of habitats important to raptors and bald eagles), therefore management actions under Alternative B for invasive species and pest management would have minor adverse effects on special status wildlife species.

Fish and Wildlife Resources – Fish (major beneficial)
The types of effects on special status wildlife species from Alternative B management of fish would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvements). Habitats for fish occur within greater than ten percent of habitats important to all special status wildlife species, except Greater Sage-Grouse. Improvements to fish habitats will have major beneficial effects on special status wildlife species in the planning area.

Fish and Wildlife Resources – Wildlife (major beneficial)
The types of effects on special status wildlife species from Alternative B management of wildlife would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation and improvement). Habitats important to general wildlife and special status wildlife species are intertwined throughout the planning area. Greater than ten percent of habitats important to special status wildlife species would experience beneficial effects from management actions related to wildlife under Alternative B, making them major.

Special Status Species – Plants (minor beneficial)
The types of effects on special status wildlife species from Alternative B management of special status species plants would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Special status species plant habitats are present within one to five percent of habitats important to Greater Sage-Grouse, herptiles, and bats (less than one percent of habitats important to black-tailed prairie dogs, bald eagles, raptors, and migratory birds), therefore, protection of habitats for special status species plant habitats in the planning area will have minor effects on special status wildlife species.

Special Status Species – Fish (major beneficial)
The types of effects on special status wildlife species from Alternative B management of special status species fish would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Special status fish species habitat occurs within greater than ten percent of habitats important to bald eagles, (less than five percent for all other special status wildlife species in the planning area) therefore, habitat improvements to special status fish species habitat would have major beneficial effects to special status wildlife species.

Heritage and Visual Resources

Cultural Resources (major beneficial)
The types of effects on special status wildlife species from Alternative B management of cultural resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Protective buffer for the cultural resources

encompass greater than ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, raptors, and migratory birds (five to ten percent of habitats important to bald eagles, herptiles, and bats), therefore, management actions for cultural resources under Alternative B would have major beneficial effects on special status wildlife species in the planning area.

Paleontological Resources (negligible beneficial)
The types of effects on special status wildlife species from Alternative B management of paleontological resources would be the same beneficial effects as described in the paleontological resources Alternative B paragraph in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitats conservation). Protective buffer for the cultural resources encompass less than one percent of habitats important to all special status wildlife species in the planning area. The beneficial effects from management actions for paleontological resources under Alternative B would be negligible.

Visual Resources (negligible beneficial)
Under Alternative B, the beneficial effects of prohibiting or limiting surface-disturbing activities in VRM Class II would occur on less than one percent of habitats important to migratory birds only. Management actions for visual resources under Alternative B would have negligible beneficial effects on special status wildlife species.

Land Resources

Forest Products (negligible adverse)
The types of effects on special status wildlife species from Alternative B management of forest products resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Adverse effects are lessened under Alternative B due to limits of acreage and wildlife-coordinated product removal, but the effects remain adverse. Forest products are harvested within less than one percent of all habitats important to special status wildlife species, making the adverse effects negligible.

Lands and Realty (minor beneficial)
The types of effects on special status wildlife species from Alternative B management of lands and realty would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands available to retention and acquisition contain less than five percent of habitats important to special status wildlife species, making the beneficial effects minor.

Renewable Energy (major beneficial)
The types of effects on special status wildlife species from Alternative B management of renewable energy resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Surface occupancy prohibitions for renewable energy under Alternative B would occur on greater than ten percent of habitats important to special status wildlife species. These prohibitions would have major beneficial effects on special status wildlife species in the planning area.

Rights-of-Way and Corridors (major beneficial)
The types of effects on special status wildlife species from Alternative B management of ROW and corridors would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Surface occupancy prohibitions for rights-of-way and corridor management under Alternative B would occur on greater than ten

percent of habitats important to special status wildlife species. These prohibitions would have major beneficial effects on special status wildlife species in the planning area.

Travel and Transportation Management (major beneficial)
The types of effects on special status wildlife species from Alternative B management of transportation and access would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Limiting motorized vehicle use to designated routes and closing areas to motorized vehicle use would decrease adverse effects special status wildlife species. Allowing any other travel in other areas limited to designated routes only under a special use permit would also decrease adverse effects on special status wildlife species and their associated habitats, because holders of Special Recreation Permits are instructed to follow all rules and regulations and should therefore, avoid locations where the BLM has identified important special status wildlife species habitats. OHV use under Alternative B would be restricted. Restrictions on OHV use under Alternative B result in fewer potential effects (disturbances) to Greater Sage-Grouse. Effects to special status wildlife species from travel and transportation management would be major.

Recreation (moderate beneficial)
The types of effects on special status wildlife species from Alternative B management of recreation would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Permit holders would be instructed to avoid locations where the BLM has identified important wildlife habitats. Recreational areas overlap five to ten percent of habitats important to black-tailed prairie dogs (one to five percent of habitats important to Greater Sage-Grouse and less than one percent of habitat important to all other special status wildlife species in the planning area); therefore, effects to special status wildlife species under Alternative B for recreation would be beneficial and moderate.

Lands with Wilderness Characteristics (negligible beneficial)
The types of effects special status wildlife species from Alternative B management of wilderness characteristics would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands with wilderness characteristics are located within less than one percent of habitats important to special status wildlife species. Management actions for wilderness characteristics would have negligible beneficial effects on special status wildlife species in the planning area.

Livestock Grazing Management (major beneficial)
The types of effects special status wildlife species from Alternative B management of livestock grazing would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Livestock grazing is permitted in greater than ten percent of habitats important to bald eagles, raptors, and herptiles (five to ten percent of habitats important to black-tailed prairie dogs and migratory birds and one to five percent of habitats important to Greater Sage-Grouse), therefore, the management actions for livestock grazing management under Alternative B would have major beneficial effect on special status wildlife species in the planning area.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Under Alternative B, designating approximately 536,304 acres as eight ACECs would provide additional protections to sensitive habitats.

Measures identified for the proposed ACECs that would directly benefit special status wildlife species and their associated habitat include (1) closing or limiting the areas to motorized vehicle use; (2) closing the areas to minerals leasing; (3) recommending withdrawal to locatable minerals entry; (4) closing the areas to salable minerals; (5) excluding ROW; and (6) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values. These seven areas contain one to five percent of habitats important to Greater Sage-Grouse (less than one percent of habitats important to all other special status wildlife species in the planning area), therefore, the management actions in Alternative B for ACECs would have minor beneficial effects on special status wildlife species in the planning area.

Scenic or Back Country Byways (no effect)
Scenic or BCBs do not occur within habitats important to special status wildlife species; therefore, there would be no effect.

Wild and Scenic Rivers (no effect)
Wild and Scenic Rivers do not occur within habitats important to special status wildlife species; therefore, there would be no effect.

Wilderness Study Areas (negligible beneficial)
Under Alternative B, altered management of the three areas proposed to Congress as WSAs would provide an additional 28,931 acres of protection for sensitive habitats.

Measures identified for the previously WSAs that would directly benefit special status wildlife species and their associated habitat include (1) closing the areas to minerals leasing; (2) recommending withdrawal to locatable minerals entry; (3) closing the areas to salable minerals; (4) excluding ROW; (5) prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the areas' values; and potentially (6) prohibiting the use of all motorized and mechanized equipment. These areas encompass less than one percent of habitats important to all special status wildlife species. Overall, the management actions in Alternative B for wilderness study areas would have negligible beneficial effects on special status wildlife species in the planning area.

4.4.9.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to special status wildlife species due to its implementation.

Special Status Species – Wildlife (major adverse, significant impact to Greater Sage-Grouse and BLM sensitive species raptors, amphibians, and bats)
Alternative C management actions for special status wildlife species would not modify existing fences that prevent special status wildlife species movement; not apply greater restrictions on surface-disturbing and disruptive activities in various special status wildlife species habitats (e.g., Greater Sage-Grouse seasonal habitats, riparian corridors consistently used by bald eagles, biologic buffers for raptor nests, and amphibian and reptile habitats); not require that low-voltage powerlines be buried or perch-inhibiting devices be installed on aboveground powerlines; and not prohibit surface disturbance in prairie dog colonies. This approach allows only for the protection of nesting raptors during incubation periods. Alternative C would not protect any special status

wildlife species and activities allowed in suitable habitat could preclude the potential for future management decisions to expand or maintain the proliferation of these species through active management.

The effects of Alternative C management would, in most cases, be similar to effects described for Alternative A and under Impacts Common to All Alternatives. Where effects on special status wildlife species would vary in degree from those under Alternative A, further rationale is provided below.

Management under Alternative C would allow disturbance to sagebrush habitats. Alternative C would manage vegetative resources to comply with the ESA. Alternative C would apply avoidance buffers to Greater Sage-Grouse leks and nesting and early brood-rearing habitat, and winter concentration areas. Alternative C protections and mitigation measures to address surface-disturbing activities would be similar to Alternative A. Overall, because surface disturbance and habitat loss, degradation, and fragmentation would be similar under Alternative C and Alternative A, the associated adverse effects on Greater Sage-Grouse also would be similar. In particular, applying standard lease terms, allowing renewable energy in Greater Sage-Grouse nesting, brood-rearing, and winter habitats, and leasing fluid minerals regardless of Greater Sage-Grouse habitat concerns are management actions for special status wildlife species that would cause substantial loss of the biological integrity and habitat function of ecosystems potentially resulting in extirpation within developed areas. Under Alternative C, the management actions for special status wildlife species would have significant impacts to Greater Sage-Grouse.

Alternative C would likely not protect raptor habitat through smaller buffers and shorter timing restrictions. Lack of protection would cause substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status. Under Alternative C, management actions for special status wildlife species would have significant impacts to raptors.

Potential effects on the northern leopard frog and spotted frog would be commensurate with effects on riparian and wetland habitats. Lack of protection would cause substantial loss of habitat function or disruption of life history requirements of special status species that would preclude improvement of their status. Under Alternative C, management actions for special status wildlife species would have significant impacts to BLM sensitive species amphibians and bats.

The adverse effects under Alternative C would be similar to those described for special status neotropical migrants that use riparian and wetland habitats.

Physical Resources

Air Quality (moderate adverse)
The types of effects on special status wildlife species from Alternative C management of air quality resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). The adverse effects of no air quality monitoring, though they will occur in every habitat important to special status wildlife species, are, in general, moderate as they cause degradation to habitat quality, but not entire vegetation loss.

Soil (major adverse)
The types of effects on special status wildlife species from Alternative C management of soil resources would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of

this chapter (habitat loss and degradation). Soil resources could be lost from greater than ten percent of habitats important to special status wildlife species under Alternative C. Management actions for soils under Alternative C would have major adverse effects on special status wildlife species in the planning area.

Water Resources (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative C management of water resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Through the lack of protection of water resources, greater than ten percent of habitats important to bald eagles, herptiles, and bats (five to ten percent of habitats important to black-tailed prairie dogs and raptors and one to five percent of habitats important to Greater Sage-Grouse and migratory birds) would be adversely impacted. Overall, management actions for water in Alternative C would have major adverse effects on special status wildlife species in the planning area.

In particular, management actions to authorize activities associated with the surface discharge of produced water from development of federal minerals and maintaining existing water supply sources and drilling new water supply wells, developing new seeps and springs, and constructing new reservoirs would increase opportunities for WNv to persist in the planning area. Without direction for construction of water containment structures to eliminate habitat for mosquitoes, this management action could contribute to population declines. This management action would have a significant impact on Greater Sage-Grouse.

Cave and Karst Resources (minor adverse)
The types of effects on special status wildlife species from Alternative C management of cave and karst resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Human activity in caves would be managed through Cave Management Plans, developed considering direction described in Washington Office Instruction Memorandum 2010-181, which would reduce threats to bats from WNS. Cave and karst resources in Alternative C would impact one to five percent of habitats important to herptiles and bats (less than one percent of habitats important to all other special status wildlife species); therefore, management actions for cave and karst resources under Alternative C would have minor adverse effects to special status wildlife species.

Mineral Resources

Locatable Minerals (negligible adverse)
The types of effects on special status wildlife species from Alternative C management of locatable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Under Alternative C, locatable resources would be permitted in less than one percent of habitats important to special status wildlife species. The adverse effects would be negligible.

Leasable Minerals – Coal (major adverse)
The types of effects on special status wildlife species from Alternative C management of leasable coal mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative C, coal resource development would be permitted in greater than ten percent of all habitats important to special status wildlife species in the planning area. The adverse effects would be major.

Leasable Minerals – Fluids (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative C management of leasable fluid mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter Under Alternative C, fluid resource development would be permitted in greater than ten percent of all habitats important to special status wildlife species in the planning area. The adverse effects would be major.

Fluid minerals could be leased and developed within one hundred percent of the Greater Sage-Grouse habitat in the planning area. Leasing fluid minerals and allowing development on this scale could cause substantial loss of the biological integrity and habitat function of ecosystems, potentially resulting in extirpation within oil and gas fields. Energy development within two miles of leks is projected to reduce the average probability of lek persistence from 87% to 5% (Walker et al. 2007a). This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area.

Salable Minerals (major adverse)
The types of effects on special status wildlife species from Alternative C management of salable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative C, salable fluid resource development could be permitted in greater than ten percent of habitats important to all special status wildlife species in the planning area, except Greater Sage-Grouse (five to ten percent). The adverse effects would be major.

Fire and Fuels Management

Planned Fire (Prescribed Fire) (major adverse, significant impacts to Greater Sage-Grouse) **and Unplanned Fire** (moderate adverse)
Alternative C management would not restore a natural fire regime to fire-adapted ecosystems in the planning area; all wildland fires would be suppressed under Alternative C. Alternative C would preclude the use of prescribed fire and wildland fire to meet fire and fuels management objectives. These actions could increase hazardous fuels, thereby increasing the risk of catastrophic fire. This management would adversely affect greater than ten percent of habitats important to Greater Sage-Grouse, bald eagles, herptiles, bats, and migratory birds (five to ten percent of habitats important to black-tailed prairie dogs and raptors); therefore, management actions for planned fire management would be major adverse. Unplanned fires cannot be pinpointed for occurrence, but it is likely, given the amount, general location of habitats, and general fire history, that Greater Sage-Grouse and migratory bird habitats will be moderately and adversely affected over the life of this plan by unplanned fire ignitions. All other habitats important to special status wildlife species may also incur the adverse effects of fire, but the likelihood of occurrence makes the effects to these habitats negligible.

Under Alternative C, wildland fire and other vegetation treatments would be used to restore fire-adapted ecosystems, enhance forage for commodity production, and reduce hazardous fuels and heavy equipment would be utilized with few constraints. A fire mosaic of burned and unburned areas can be detrimental to sagebrush obligates. Wyoming big sagebrush, the dominant component of Greater Sage-Grouse habitat in the planning area, requires 50 to 120 years or more recovery time after fire. Evidence suggests that particularly in Wyoming big sagebrush, a program of prescribed burning is unwarranted or inadvisable if maintaining and restoring sagebrush landscapes and sagebrush-dependent species is the goal (Baker 2006). Wildland fire use in Greater Sage-Grouse habitats could cause substantial loss of the biological integrity and

habitat function of ecosystems. Under Alternative C, management actions for planned fire would have a significant impact on Greater Sage-Grouse.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
The types of effects on special status wildlife species from Alternative C management of biological resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Less than one percent of habitats important to special status wildlife species would be affected by management of forest and woodland communities in Alternative C.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
The types of effects on special status wildlife species from Alternative C management of biological resources would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Though grasslands and shrublands occur throughout greater than ten percent of habitats important to special status wildlife species, the adverse impacts are likely to only occur to less than one percent of those communities; therefore, the adverse effects are likely to be negligible.

Vegetation – Riparian/Wetland Resources (major adverse)
The types of effects on special status wildlife species from Alternative C management of biological resources would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Adverse effects from management actions for riparian/wetland resources could occur in greater than ten percent of habitats important to black-tailed prairie dogs, bald eagles, herptiles, and bats (five to ten percent of habitats important to Greater Sage-Grouse and migratory birds, and less than one percent of habitats important to raptors); therefore, these adverse effects would be major.

Invasive Species and Pest Management (moderate adverse)
The types of effects on special status wildlife species from Alternative C management of biological resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Invasive species and pest management under Alternative C could occur within five to ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, herptiles, and bats (one to five percent of habitats important to migratory birds, and less than one percent of habitats important to bald eagles and raptors); therefore, management actions under Alternative C would have moderate adverse effects on special status wildlife species in the planning area.

Fish and Wildlife Resources – Fish (major adverse)
The types of effects on special status wildlife species from Alternative C management of biological resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Greater than ten percent of habitats important to black-tailed prairie dogs, bald eagles, herptiles, and bats (five to ten percent of habitats important to Greater Sage-Grouse and one to five percent of habitats important to raptors and migratory birds) occur in fish habitats that would be left unprotected under Alternative C. Overall, management actions for fish under Alternative C would have major adverse effect on special status wildlife species in the planning area.

Fish and Wildlife Resources – Wildlife (major adverse)
Under Alternative C, adverse effects on special status wildlife species would be reduced through prohibiting surface-disturbing activities for the protection of any other resource. This would have a major beneficial effect on habitats for special status wildlife species where these resources overlap. Avoidance areas for other resources would, by nature, be avoidance areas for important habitats for special status wildlife species. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. Though some protections for habitats important to special status wildlife species are present in Alternative C, the overwhelming lack of protections for most special status wildlife species in the planning area make the overall effects adverse and major.

Special Status Species – Plants (moderate beneficial) **and Fish** (major beneficial)
Under Alternative C, prohibitions on surface-disturbing activities for the protection of special status plant, fish, and wildlife species would reduce adverse impacts to all wildlife. Avoidance areas for other resources would, by nature, be NSO areas for important wildlife habitats. An NSO stipulation would not prevent all disturbances. Activities that require surface disturbance to install underground facilities would still be allowed. Surface-disturbing prohibitions for special status plant species would also conserve five to ten percent of habitats important to herptiles and bats (one to five percent of habitats important to Greater Sage-Grouse, and less than one percent of prairie dog colonies or habitats important to bald eagles and raptors); therefore, management actions for special status plant species under Alternative C would have moderate beneficial effects on special status wildlife resources. Prohibitions for special status fish species would also conserve greater than ten percent of habitats important to bald eagles (one to five percent of habitats important to Greater Sage-Grouse, herptiles and bats and less than one percent of prairie dog colonies and habitats important to migratory birds); therefore, management actions for special status fish species would have major beneficial effects on wildlife resources.

Heritage and Visual Resources

Cultural Resources (major beneficial)
The types of effects on special status wildlife species from Alternative C management of cultural resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Under Alternative C, greater than ten percent of habitats important to black-tailed prairie dogs (one to five percent of habitats important to herptiles and bats and less than one percent of habitats for all other special status wildlife species) would be protected from the much smaller protective buffers around cultural sites in Alternative C, therefore, management actions for cultural resources would have major beneficial effects on special status wildlife species in the planning area.

Paleontological Resources (negligible beneficial)
The types of effects on special status wildlife species from Alternative C management of paleontological resources would be the same beneficial effects as described in the paleontological resources Alternative C discussion within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Under Alternative C, less than one percent of all habitats important to special status species in the planning area would be protected by disturbance-free buffers around paleontological resources. This would have only negligible beneficial effects.

Visual Resources (no effect)
Visual resource management under Alternative C would have no effect on special status wildlife species as no proactive management would take place.

Land Resources

Forest Products (negligible adverse)
The types of effects on special status wildlife species from Alternative C management of forest product resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Under Alternative C, forest product harvest is permitted on less than one percent of habitats important to special status wildlife species. The adverse effects would be negligible.

Lands and Realty (minor adverse)
The types of effects on special status wildlife species from Alternative C management of lands and realty would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Disposal of lands important to natural resources could mean the disposal of one to five percent of habitats important to the majority of the special status wildlife species in the planning area, except raptors (less than one percent). Management actions for lands and realty under Alternative C would have minor adverse effects on special status wildlife species in the planning area.

Renewable Energy (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative C management of renewable-energy resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative C, renewable-energy facilities would be permitted in greater than ten percent of the majority of habitats important to special status wildlife species (five to ten percent for bald eagles and migratory birds). Management actions for renewable energy under Alternative C would have major adverse effects on special status wildlife species in the planning area. Authorization of renewable-energy projects, such as wind energy, on 134,875 acres in the planning area under Alternative C could impact one hundred percent of the Greater Sage-Grouse habitats. Renewable energy projects within Greater Sage-Grouse habitats would create substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alterative C, would have a significant impact on Greater Sage-Grouse.

Rights-of-Way and Corridors (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative C management of ROW and corridors would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Under Alternative C, ROW and corridors would be permitted in greater than ten percent of habitats important to nearly all special status wildlife species (five to ten percent for bald eagles). Management actions for ROW and corridors under Alternative C would have major adverse effects on special status wildlife species in the planning area.

Under Alternative C, 725,842 acres would be open for authorization of ROW grants and location of transmission lines and transportation facilities consistent with other resource values that would have severe impacts on Greater Sage-Grouse habitats. There would be no restrictions on the placement of these facilities. ROW and corridors would fragment Greater Sage-Grouse habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alterative C, would have a significant impact on Greater Sage-Grouse.

Travel and Transportation Management (major adverse)
The types of effects on special status wildlife species from Alternative C management of travel and transportation would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and fragmentation). Travel and transportation activities could occur in greater than ten percent of habitats important to Greater Sage-Grouse, bald eagles, raptors, and migratory birds (less than one percent of habitats important to black-tailed prairie dogs, herptiles, and bats); therefore, travel and transportation management under Alternative C would have major adverse effects on special status wildlife species.

Recreation (moderate adverse)
The types of effects on special status wildlife species from Alternative C management of recreation would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Recreation areas occur in five to ten percent of habitats important to black-tailed prairie dogs (less than one percent of habitats important to all other special status wildlife species in the planning area); therefore, management actions for recreation under Alternative C would have moderate adverse effects on special status wildlife species in the planning area.

Lands with Wilderness Characteristics (negligible beneficial)
The types of effects on special status wildlife species from Alternative C management of wilderness characteristics would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands with wilderness characteristics contain less than one percent of habitats important to special status wildlife species. Beneficial effects from management actions for lands with wilderness characteristics under Alternative C would be negligible.

Livestock Grazing Management (major adverse)
The types of effects on special status wildlife species from Alternative C management of livestock grazing would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat degradation). Grazing allotments contain greater than ten percent of all habitats important to special status wildlife species, except bats. Management actions for livestock grazing management would have major adverse effects on special status wildlife species in the planning area.

Special Designations

The effects on special status wildlife species from Alternative C management of special designations would be the same as Alternative A.

4.4.9.6. Alternative D

This section describes management actions and potential impacts to special status wildlife species under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Special Status Species – Wildlife (moderate beneficial, significant impacts to Greater Sage-Grouse)
Alternative D management actions for special status wildlife species would have

effects similar to those described for Alternative B; however, Alternative D would allow the following by exception:

- Surface-disturbing and disruptive activities within active black-tailed prairie dog colonies.
- Surface-disturbing and disruptive activities in areas where there are special status amphibian, reptile, and bat species.

Under Alternative D, the types of effects on special status wildlife species associated with prohibiting commercial renewable-energy projects would be the same as under Alternative B. However, Alternative D would prohibit development on fewer acres than Alternative B because under Alternative D the prohibition would apply only to designated priority habitat (Core Population Areas and Connectivity Corridors).

The Governor of Wyoming issued an EO on August 1, 2008, mandating special management for all state lands in Greater Sage-Grouse Core Population Areas. Core Population Areas are important breeding areas for Greater Sage-Grouse in Wyoming, as identified by the Wyoming Governor's Sage-Grouse Implementation Team. In addition to identifying Core Population Area, the team also recommended placing stipulations on development activities to ensure that existing habitat function is maintained within those areas. Accordingly, the EO prescribes special consideration for Greater Sage-Grouse, including authorization of new activities only when the project proponent can identify that the activity will not cause declines in Greater Sage-Grouse populations in the Core Population Area. These protections would apply to approximately 80% of the total estimated Greater Sage-Grouse breeding population in the state. In February 2010, the Wyoming State Legislature adopted a joint resolution endorsing Wyoming's Core Area Strategy as outlined in Governor's EO 2008-2 (USFWS 2010). The Governor signed EO 2010-4 on August 18, 2010 to replace 2008-2. On June 2, 2011, Governor Matthew Mead issued Governor's EO 2011-5 to continue consideration of Greater Sage-Grouse conservation needs in the State of Wyoming. BLM Wyoming has adopted Wyoming's approach for projects under its authority.

Alternative D includes this strategy for the planning area. These protections will apply to less than 15% of all Greater Sage-Grouse nesting habitats, and accounts for less than 29% of the total estimated Greater Sage-Grouse breeding population in the planning area. Due to the size, shapes, and locations of these areas in the planning area, the influence of development has already adversely impacted the 103 remaining active leks inside Core Population Areas (Taylor et al. 2012). Fluid minerals would be leased dependent upon lease location and habitat suitability. Disturbed habitats would be restored on BLM surface within priority habitat and recommended for BLM surface within general habitat.

Current activities have created substantial loss of the biological integrity and habitat function of ecosystems. Loss of population viability of Greater Sage-Grouse could occur within the planning area, though the continued existence of the species range-wide will not be in jeopardy. Absent a WNv outbreak year, the lower 95% confidence limit on the population count is 3,147 males, suggesting that immediate extirpation of the northeast Wyoming population is unlikely if all environmental conditions for Greater Sage-Grouse other than energy development, remain favorable (Taylor et al. 2012). Management actions under Alternative D for special status wildlife species would have significant impacts to Greater Sage-Grouse.

CBNG activity has waned in recent years with the decline in natural gas prices. To date development is approximately half that predicted in the PRB FEIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1671)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with

CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore deep development may be more compatible with Greater Sage-Grouse. The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNv transmission. Appendix D (p. 1603) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the Powder River Basin Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

Physical Resources

Air Quality (major beneficial)
The types of effects on special status wildlife species from Alternative D management of air quality would be the same as the effects under Alternative B.

Soil (major beneficial)
Effects on special status wildlife species from Alternative D management of soils would be similar to those under Alternative B. However, Alternative D could allow activities by exception on 215,496 acres of highly erosive soils, 170,590 acres on slopes equal to or greater than 25%, 455,090 acres of soils with poor reclamation suitability, and, although on a limited basis, on 218,928 acres of badlands, rock outcrops, and slopes susceptible to mass movement. In addition, Alternative D would apply a CSU stipulation to oil and gas leases; this could have adverse effects on special status wildlife species on an additional 669,739 acres of highly erosive soils, 412,145 acres on slopes equal to or greater than 25%, 1,514,445 acres of soils with poor reclamation suitability, and, although on a limited basis, on 685,950 acres of badlands, rock outcrops, and slopes susceptible to mass movement that could be associated with a federal mineral leases. For the impacts to be the same as those under Alternative B, these exceptions would have to be evaluated for site-specific effects on special status wildlife species and would not be granted where there would be conflicts. This is especially important and could have the greatest effect on special status amphibian, reptile, and bat species. The CSU would have beneficial effects on greater than ten percent of habitats important to black-tailed prairie dog colonies, Greater Sage-Grouse, bald eagles, special status raptor species, and where special status amphibian, reptile, and bat species could occur. The management actions under Alternative D for soil would have major beneficial effects on special status wildlife species.

Water Resources (major beneficial, significant impacts to Greater Sage-Grouse)
Alternative D could allow activities by exception within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams, including applying a CSU stipulation to oil and gas leases and evaluating unneeded reservoirs. The CSU would have beneficial effects on the following areas currently identified as important to special status wildlife species: greater than ten percent of habitats important to bald eagles, special status raptor species, and areas where special status amphibian, reptile, and bat species could occur (ten percent of habitats important to black-tailed prairie dogs and one to five percent of habitats important to Greater Sage-Grouse); therefore, management actions under Alternative D for water will have major beneficial effects on special status wildlife species.

Under Alternative D, riparian and uplands would be managed to restore perennial flows or standing water. Restoration of areas of standing water would encourage creation of mosquito habitats. Increasing mosquito habitats increases the potential threat of WNv outbreaks in Greater

Sage-Grouse. This could contribute to population declines. This management action, under Alternative D would have significant impacts to Greater Sage-Grouse.

Cave and Karst Resources (minor beneficial)
Alternative D effects on special status wildlife species from management of cave and karst resources would, in general, be the same as effects under Alternative A. In addition, implementing a Cave Management Plan for the entire planning area under Alternative D would increase potential beneficial effects on special status wildlife species wildlife where these resources overlap. This is especially important and could have the greatest beneficial effect on special status amphibian, reptile, and bat species. Human activity in caves would be managed through Cave Management Plans, developed considering direction described in Washington Office Instruction Memorandum 2010-181, which would reduce threats to bats from WNS. Cave and karst resources in the planning area would have beneficial effects on one to five percent of habitats important to bald eagles and where special status amphibian, reptile, and bat species could occur (less than one percent of habitats important to Greater Sage-Grouse and special status raptor species); therefore, management actions under Alternative D will be minor.

Mineral Resources

Locatable Minerals (negligible adverse)
The types of effects on special status wildlife species from Alternative D management of locatable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative D, locatable resources would be permitted in less than one percent of habitats important to special status wildlife species. The adverse effects would be negligible.

Leasable Minerals – Coal (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative D management of leasable coal mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss). Under Alternative D, leasable coal resources would be permitted in greater than ten percent of habitats important to black-tailed prairie dogs, bald eagles, raptors, and migratory birds (five to ten percent of habitats important to Greater Sage-Grouse, and one percent of habitats where special status amphibian, reptile, and bat species could occur); therefore, the adverse effects would be major.

Of particular concern is the potential for coal resource development within greater than ten percent of Greater Sage-Grouse habitats. Opening all federal coal lands to exploration subject to license stipulations necessary to protect other resource values (4,775,136 acres) would cause a substantial loss of the biological integrity and habitat function of ecosystems. This management action, under Alternative D subjects leases to unsuitability screening and leasing is discretionary based on NEPA analysis and public interest. Without oversight on a programmatic level, inconsistent application of screening and discretionary leasing occurs. This management has had and would continue to have significant impacts on Greater Sage-Grouse in the planning area.

Leasable Minerals – Fluids (major adverse, significant impacts to Greater Sage-Grouse)
The types of effects on special status wildlife species from Alternative D management of leasable fluid mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation, and fragmentation). Under Alternative D, leasable fluid resources would be permitted in greater than ten percent of habitats important to black-tailed prairie dogs, Greater Sage-Grouse, raptors, herptiles, bats, and migratory

birds; and five to ten percent of habitats important to bald eagles. Overall, the adverse effects would be major.

Forty-six percent (3,386,530 acres) of the planning area is BLM-administered fluid minerals of which 75% (2,544,512 acres) has been leased; the majority of which is held by production. The amount of leasable fluid minerals extraction that could occur under this alternative would result in greater loss and degradation of habitats that support various special status wildlife species, in particular, those that require continuous habitat on a landscape scale, such as Greater Sage-Grouse. Fluid minerals could be developed within one hundred percent of the Greater Sage-Grouse habitat in the planning area. Leasing fluid minerals and allowing development on this scale would cause substantial loss of the biological integrity and habitat function of ecosystems. Absent a WNv outbreak year, the lower 95% confidence limit on the population count is 3,147 males, suggesting that immediate extirpation of the northeast Wyoming population is unlikely if all environmental conditions for Greater Sage-Grouse other than energy development, remain favorable (Taylor et al. 2012). This management has had and would continue to have, significant impacts on Greater Sage-Grouse in the planning area.

CBNG activity has waned in recent years with the decline in natural gas prices. To date, development is approximately half that predicted in the PRB FEIS (BLM 2003c) and the forecasted CBNG development is much less (Appendix G (p. 1671)). Interest in deep oil and gas resources within the planning area is increasing, with the anticipated spacing being less than with CBNG, one location per square mile (or less) versus eight locations per square mile. Therefore, deep development may be more compatible with Greater Sage-Grouse. The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNv transmission. Appendix D (p. 1603) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the Powder River Basin Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

Salable Minerals (major adverse)
The types of effects on special status wildlife species from Alternative D management of salable mineral resources would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Under Alternative D, salable mineral resources would be permitted in greater than ten percent of habitats important to all special status wildlife species. The adverse effects would be major. The amount of salable minerals extraction that could occur under this alternative would create a substantial increase in land use intensity, and would result in greater potential for loss or degradation of habitats that support bald eagles and migratory birds.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
The types of effects on special status wildlife species from Alternative D planned fire management would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and degradation). Wildfires are estimated to burn 27,596 acres (3.5%) and planned fires are anticipated for 14,000 acres (1.8%) of BLM surface during the life of the plan, a minor effect.

Biological Resources

Vegetation – Forests and Woodlands (moderate beneficial)
The types of effects on special status wildlife species from Alternative D management of forests and woodlands resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Beneficial effects from management actions for forest and woodland resources could occur in five to ten percent of habitats important to herptiles and bats (less than one percent of habitats important to black-tailed prairie dogs, bald eagles, raptors, Greater Sage-Grouse and migratory birds); therefore, these beneficial effects would be moderate.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
The types of effects on special status wildlife species from Alternative D management of grassland and shrubland communities would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Beneficial effects from management actions for grassland and shrubland communities would occur in less than one percent of habitats important to all special status wildlife species. Overall these beneficial effects would be negligible.

Vegetation – Riparian/Wetland Resources (major beneficial)
The types of effects on special status wildlife species from Alternative D management of grassland and shrubland communities would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvement). Within 500 feet of riparian/wetland systems and aquatic habitats occurs greater than ten percent of habitats important to black-tailed prairie dogs, within 0.25 mile of Greater Sage-Grouse leks outside Priority Habitat Area, bald eagles, special status raptor species, and areas where special status amphibian, reptile, and bat species could occur (one to five percent of nesting habitat in Core Population Area and Connectivity Corridor, winter habitat in Core Population Area and Connectivity Corridor, and within 0.6 mile of leks inside Core Population Area and Connectivity Corridor), therefore, the management actions for riparian/wetland resources would have major beneficial effects on special status wildlife species in the planning area.

Invasive Species and Pest Management (moderate adverse)
The effects on special status wildlife species from Alternative D management of invasive species and pests would be the same as Alternative A.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (major beneficial)
The effects on special status wildlife species from Alternative D management of special status fish species would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter, although to a varying degree. The 0.25-mile CSU areas for naturally occurring water bodies that contain native and desirable non-native fish species contains greater than ten percent of areas within 0.25 mile of Greater Sage-Grouse leks outside Core Population Area and Connectivity Corridor, habitats important to bald eagles, and areas where special status amphibian, reptile, and bat species could occur (five to ten percent of habitats important to Greater Sage-Grouse (nesting habitat in Core Population Area and Connectivity Corridor and winter habitat in Core Population Area and Connectivity Corridor), one to five percent of areas within 0.6 mile of Greater Sage-Grouse leks inside Core Population Area and Connectivity Corridor and habitat important to special status raptor species, and less than one percent of black-tailed prairie dog colonies); therefore the management actions under Alternative D would have major beneficial effects on special status wildlife species.

Fish and Wildlife Resources – Wildlife (major beneficial)
Under Alternative D, effects on special status wildlife species from wildlife management would be similar to those under Alternative B. However, Alternative D could allow aboveground facilities by exception on the 75,175 acres of elk crucial winter range and calving areas, and could allow disturbance by exception on 1,195,815 acres of biological buffer zones around nests of raptor species of conservation concern. For the impacts to be the same as those under Alternative B, these exceptions would have to be evaluated for the presence of special status wildlife species or suitable habitat, and would not be granted where there would be conflicts. Alternative D also would allow the following by exception:

- Surface disturbance and disruptive activities throughout the entire life of the project during seasons important to wildlife.
- Aboveground distribution powerlines
- Fluid minerals production and not piping by-products out of crucial elk winter range and calving areas
- Aboveground facility development in elk crucial winter range and calving areas
- Surface disturbance and occupancy within USFWS-recommended biologic buffer zones around active nests of raptor species of conservation concern.

In addition, activities in elk seasonal ranges would be limited to removing or altering no more than 15% of the existing security habitat. Alternative D includes 15,559 acres of travel corridor avoidance; Alternative D would retain only identified priority travel corridors. Alternative D would increase surface-disturbing prohibitions around plains sharp-tailed grouse leks, 3,601 acres, because the alternative would increase the size of protective buffers to 0.25 mile of the perimeter of these leks. Table 4.54, "Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Areas Important To Wildlife" (p. 1132) lists the amount of overlap between areas important to wildlife and areas currently identified as important to special status wildlife species wildlife.

Table 4.54. Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Areas Important To Wildlife

Important Wildlife Areas	Special Status Species Habitat							
	Black-tailed prairie dog colonies	Nesting habitat within Greater Sage-Grouse Priority Habitat Area	Winter habitat within Greater Sage-Grouse Priority Habitat Area	Within 0.6 mile of leks within Greater Sage-Grouse Priority Habitat Area	Within 0.25 mile of leks within Greater Sage-Grouse general habitat	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within USFWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
WGFD big game HMAs	0	433 / 0.06%	35 / 0.004%	0	0	740 / 0.3%	0	12,692 / 0.4%
Crucial big game ranges	328 / 0.3%	14,213 / 2%	3,119 / 0.4%	1,514 / 2%	0	3,410 / 1%	1,409 / 0.4%	204,820 / 6%
Priority travel corridors for big game	0	94 / 0.01%	238 / 0.03%	142 / 0.2%	0	2,918 / 1%	22 / 0.006%	68,935 / 2%

Important Wildlife Areas	Special Status Species Habitat							
	Black-tailed prairie dog colonies	Nesting habitat within Greater Sage-Grouse Priority Habitat Area	Winter habitat within Greater Sage-Grouse Priority Habitat Area	Within 0.6 mile of leks within Greater Sage-Grouse Priority Habitat Area	Within 0.25 mile of leks within Greater Sage-Grouse general habitat	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within USFWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
Elk security habitat	1,257 / 1%	3,650 / 0.5%	2,908 / 0.4%	18 / 0.02%	260 / 0.9%	5,982 / 3%	3,772 / 1%	446,467 / 13%
Proposed Fortification Creek elk WHMA	0	0	0	0	0	200 / 0.08%	0	13,393 / 0.4%
0.25 mile of plains sharp-tailed grouse leks	262 / 0.3%	2,382 / 0.3%	3,077 / 0.4%	1,126 / 1%	24 / 0.04%	90 / 0.04%	911 / 0.2%	4,540 / 0.1%
USFWS recommended biologic buffer zones for raptor nests	54,902 / 53%	132,783 / 19%	163,770 / 20%	16,871 / 21%	10,893 / 37%	127,722 / 54%	852,022 / 100%	984,893 / 28%

Source: BLM 2012f

Note: Percentages in table represent the percent of the special status species habitat (columns) that overlaps important wildlife areas (rows).

HMA Habitat Management Area
USFWS U.S. Fish and Wildlife Service
WGFD Wyoming Game and Fish Department
WHMA Wilderness Habitat Management Area

Special Status Species – Plants (minor beneficial)
Under Alternative D, effects on special status wildlife species from management of special status plant species would be the same as those under Alternative C, although Alternative D would place a CSU stipulation on mineral leases to require surveys before disturbance activities could be allowed.

Heritage and Visual Resources

Cultural Resources (major beneficial)
The types of effects on special status wildlife species from Alternative D management of cultural resources would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Table 4.55, "Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Cultural and Paleontological Resource Restrictions" (p. 1134) lists cultural and paleontological resources restrictions overlap of areas currently identified as important to special status wildlife species. Overall, the beneficial effects would be major.

Paleontological Resources (negligible beneficial)
The types of effects on special status wildlife species from Alternative D management of paleontological resources would be the same beneficial effects as described in the cultural resources Alternative D discussion within the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation).Table 4.55, "Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Cultural and Paleontological Resource Restrictions" (p. 1134) lists cultural and paleontological resources restrictions overlap of areas currently identified as important to special status wildlife species.

Table 4.55. Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Cultural and Paleontological Resource Restrictions

Cultural and Paleontological Restriction Areas	Special Status Species Habitat							
	Black-tailed prairie dog colonies	Greater Sage-Grouse nesting habitat within Priority Habitat Area	Greater Sage-Grouse winter habitat within Priority Habitat Area	Within 0.6 mile of Priority Habitat Area Greater Sage-Grouse leks	Within 0.25 mile of Greater Sage-Grouse leks within general habitat	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within USFWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
Cultural NSOs	1,286 / 1%	2,602 / 0.4%	5,729 / 0.7%	18 / 0.02%	82 / 0.3%	1,247 / 0.5%	2,959 / 0.8%	16,081 / 0.5%
Cultural CSUs	15,934 / 15%	103,730 / 15%	118,183 / 14%	7,751 / 10%	3,121 / 11%	11,741 / 5%	66,423 / 17%	347,290 / 10%
Paleontological NSOs	0	357 / 0.05%	622 / 0.08%	0	0	0	0	427 / 0.01%

Source: BLM 2012f

Note: Percentages in table represent the percent of the special status species habitat (columns) that overlaps cultural and paleontological restriction areas (rows).

CSU Controlled Surface Use
NSO No Surface Occupancy
USFWS U.S. Fish and Wildlife Service

Visual Resources (no effect)
Under Alternative D, effects to special status wildlife resources from management actions associated with visual resource management would be the same as the effects under Alternative B.

Land Resources

Forest Products (negligible adverse and beneficial)
The effects on special status wildlife species from Alternative D management of forest products would be the same adverse and beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss and habitat improvements), although to a varying degree. Under Alternative D, conflicts between the harvest of forest products and management of suitable habitat for special status wildlife species could occur in less than one percent of habitats important to all special status wildlife species in the planning area.

Lands and Realty (minor beneficial)
The effects on special status wildlife species from Alternative D management of lands and realty would be the same as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat improvements). Lands available for tenure adjustments occur in one percent to five percent of all special status wildlife species, except raptors (less than one percent). The beneficial effects would be minor.

Renewable Energy and Rights-of-Way and Corridors (major adverse, significant impacts to Greater Sage-Grouse)
The effects on special status wildlife species from Alternative D management of renewable energy and ROW corridors would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation and fragmentation), although to a varying degree. Renewable-energy development and ROW exclusion or avoidance areas contain greater than ten percent of black-tailed prairie dog colonies, Greater Sage-Grouse nesting and wintering habitat in Core Population Area and Connectivity Corridor, within 0.6 mile of Greater Sage-Grouse leks inside Core Population Area and Connectivity Corridor, within 0.25 mile of Greater Sage-Grouse leks outside Core Population Area and Connectivity Corridor and habitats important to special status raptor species and where special status amphibian, reptile, and bat species could occur (five to ten percent of habitats important to bald eagles); therefore, management actions under Alternative D for renewable energy and for ROW and corridors would have major adverse effects on special status wildlife species.

Authorization of renewable-energy projects, such as wind energy, on 75,240 acres in the planning area under Alternative C could impact twenty percent of the Greater Sage-Grouse habitats. Renewable-energy projects within Greater Sage-Grouse habitats would create substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alterative D, would have a significant impact on Greater Sage-Grouse.

Under Alternative D, 390,685 acres would be open for authorization of ROW grants and location of transmission lines and transportation facilities within corridors when resource objectives can be met, would have impacts on twenty percent of Greater Sage-Grouse habitats in the planning area. ROW and corridors would fragment Greater Sage-Grouse habitats within the planning area to the point of substantial loss of the biological integrity and habitat function of ecosystems. These management actions, under Alterative D, would have a significant impact on Greater Sage-Grouse.

Travel and Transportation Management (major adverse)
The effects on special status wildlife species from Alternative D management of transportation and access would be the same adverse effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat loss, degradation and fragmentation), although to a varying degree. Areas closed to motorized vehicle use under Alternative D include less than one percent of habitats important to all special status wildlife species in the planning area. This means that travel and transportation access would be permitted in greater than ten percent of habitats important to all special status wildlife species in the planning area. The adverse effects would be major.

Recreation (moderate beneficial)
The effects on special status wildlife species from Alternative D recreation management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter, although to a varying degree. Table 4.56, "Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Special Designations and Controlled Surface Use Areas" (p. 1136) lists the areas of overlap of special

designations and CSU with areas currently identified as important to special status wildlife species. Management actions under Alternative D for recreation would have moderate beneficial effects on special status wildlife species in the planning area.

Table 4.56. Acres within the Planning Area that are Important to Special Status Wildlife Species and Overlap with Special Designations and Controlled Surface Use Areas

Special Designations and CSU Areas	Special Status Species Habitat						
	Black-tailed prairie dog colonies	Greater Sage-Grouse Nesting habitat in Priority Habitat Area	Greater Sage-Grouse Winter habitat in Priority Habitat Area	Within 0.6 mile of Greater Sage-Grouse leks in Priority Habitat Area	Within 0.5 mile of riparian corridors consistently used by bald eagles	Within US-FWS recommended buffers around nests of special status species raptors	Within areas where special status amphibian, reptile, and bat species may occur
Burnt Hollow	0	4,008 / 0.6%	4,193 / 0.5%	196 / 0.2%	0	0	2,702 / 0.08%
Dry Creek Petrified Tree	0	2,120 / 0.3%	1,611 / 0.2%	565 / 0.7%	0	0	681 / 0.02%
Middle Fork Canyon	0	93,162 / 0.4%	315 / 0.04%	21 / 0.03%	0	0	2,310 / 0.07%
Mosier Gulch	0	0	0	0	535 / 0.2%	0	768 / 0.02%
Welch Ranch	37 / 0.04%	669 / 0.09%	900 / 0.1%		750 / 0.3%	48 / 0.01%	758 / 0.02%
Weston Hills	0	170 / 0.02%	184 / 0.02%	0	0	0	1,734 / 0.05%
Hole-in-the-Wall	0	7,048 / 1%	4,301 / 0.5%	3,034 / 4%	0	0	1,648 / 0.05%

Source: BLM 2012f

Note: Percentages in table represent the percent of the special status species habitat (columns) that overlaps special designations and CSUs (rows).

CSU Controlled Surface Use
USFWS U.S. Fish and Wildlife Service

Lands with Wilderness Characteristics (negligible beneficial)
The effects on special status wildlife species from Alternative D lands with wilderness characteristics management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation). Lands with wilderness characteristics contain less than one percent of habitats important to special status wildlife species. Beneficial effects from management actions for lands with wilderness characteristics under Alternative D would be negligible.

Livestock Grazing Management (major beneficial)
The effects on special status wildlife species from Alternative D livestock grazing management would be the same beneficial effects as described in the *Fish and Wildlife Resources – Wildlife* section of this chapter (habitat conservation), although to a varying degree. Under Alternative D, areas have been identified as incompatible with livestock grazing due to recreation designation, steep slopes, etc. These areas contain less than one percent of all habitats important to special status wildlife species.

In addition, Alternative D would prohibit the placement of salt or mineral supplements in greater than ten percent of habitats important to bald eagles, special status raptor species, and areas where special status amphibian, reptile, and bat species could occur (five to ten percent of black-tailed prairie dog colonies and areas within 0.25 mile of Greater Sage-Grouse leks outside Core Population Area and Connectivity Corridor and one to five percent of habitats important to Greater Sage-Grouse (nesting habitat in Core Population Area and Connectivity Corridor, winter habitat in Core Population Area and Connectivity Corridor, and areas within 0.6 mile of Greater Sage-Grouse leks inside Core Population Area and Connectivity Corridor); thereby avoiding trampling damage to habitat. Overall, the management actions for livestock grazing in Alternative D will have major beneficial effects on special status wildlife species in the planning area.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
The effects on special status wildlife species from Alternative D ACEC management would be the same beneficial effects as Alternative B except that only the Fortification Creek Elk Area (32,602 acres), Pumpkin Buttes (1,733 acres) and Welch Ranch (1,116 acres) would be designated as ACECs.

Scenic or Back Country Byways and Wild and Scenic Rivers (no effect)
Management actions for scenic and BCBs and for Wild and Scenic Rivers would have no effect on special status wildlife species in the planning area.

Wilderness Study Areas (negligible beneficial)
The effects on special status wildlife species from Alternative D management of wilderness study areas would be the same as Alternative B.

4.4.9.7. Cumulative Impacts

Cumulative impacts result from actions on adjoining ownerships that affect habitat availability and levels of disturbance. The greatest factor influencing special status wildlife species in the planning area is scattered land ownership. Because most of the species of concern are wide ranging, activities on adjoining ownerships could compromise or enhance management efforts on public lands.

Although only minor amounts of sagebrush treatment are proposed on public lands, continued modification of sagebrush on other ownerships would cumulatively reduce the availability and quality of that habitat. Cumulative effects on riparian habitats are much more localized and site-specific due to the scattered land ownership on most streams, although livestock grazing and upland vegetative treatments on all ownerships could lead to riparian habitat concerns. Management changes implemented on BLM-administered lands to improve riparian conditions also could improve conditions on lands of other ownerships if the same management is applied to those lands. If some uses are restricted or eliminated on BLM-administered lands, it could cause increased use on adjacent ownerships, which would lead to degradation of the riparian conditions on those lands.

Implementing any of the alternatives would contribute to cumulative adverse effects to the Threatened, Endangered, Proposed, Candidate, and sensitive species in the planning area. Cumulative short- and long-term disturbances to these species are many and stem from several sources. Included in the cumulative effects evaluated are the direct effects of oil and gas (CBNG

and non-CBNG) extraction, and development of new oil and gas wells on adjacent lands. Oil and gas development would occur on a mix of federal, state, private, and split estate lands. Additional activities that contribute to cumulative effects in the planning area include coal mining; uranium mining; sand, gravel, and scoria mining; ranching; agriculture; construction of roads and railroads; and development of rural and urban housing.

In particular, the cumulative effects on Greater Sage-Grouse from current, proposed, and future activities such as gas and minerals exploration and development, agriculture, and urban development could include increased mortality, especially from collisions with vehicles and powerlines and increased raptor predation; displacement and harassment; physical degradation or destruction of leks and reproduction areas (nesting and brood-rearing areas); and habitat fragmentation. Surface coal mining and sagebrush treatment have reduced the availability of sagebrush habitats in the planning area. Conversion of native habitats to agriculture has decreased in recent years, but has already permanently reduced availability of Greater Sage-Grouse habitat.

Garton et al. (2011) reported a minimum male count for the Powder River Basin population at 3,042 and projected a high probability (86.2%) of falling below 200 males by 2107. The BFO contracted the USGS to analyze the Greater Sage-Grouse population viability within the Buffalo planning area implementing Wyoming EO 2011-5 and WYSO IM 2012-019, Wyoming's Core Population Area strategy. The USGS concluded that the potential may still exist to maintain a population inside the BFO's Core Population Area, but further development in and around them will compromise their remaining value (USGS 2012). The remaining population would be vulnerable to extirpation by catastrophic events such as a WNv outbreak. The expanding threat of energy development across the Powder River Basin, along with it's associated risk of WNv transmission, have resulted in a downward population trend and make this overall an at risk population (USFWS 2013).

The BFO has incorporated multiple conservation measures to reduce the population's vulnerability, such as habitat restoration to promote the recovery of disturbed habitats and water management measures to reduce WNv transmission. Appendix D (p. 1603) contains lists of RDFs and discretionary BMPs to promote Greater Sage-Grouse conservation. BLM's High Plains District has also founded the Powder River Basin Restoration program, a partnership which promotes reclamation practices and habitat enhancement projects aimed at restoration of sagebrush habitats for the Greater Sage-Grouse.

The Wyoming strategy is a statewide strategy, designed to conserve Greater Sage-Grouse viability at the state scale. Although the Buffalo planning area Greater Sage-Grouse population viability remains vulnerable, the application of the Wyoming strategy to federal (BLM, USFS) and state actions assures long-term population viability within Wyoming. The Wyoming Basin population is considered to be at low risk, as state-designated Core Population Areas adequately capture redundancy and representation for this large population (USFWS 2013). Similarly, the BLM's management commitments throughout Management Zone 1 assure long-term population viability along the eastern edge of Greater Sage-Grouse range. Garton et al. (2011) predicted an 11.1% chance that Management Zone I will fall below 200 males by 2037, and a 24.0% chance it would fall below 200 males by 2107. After Management Zones II and IV, this zone contains some of the highest connected network of Greater Sage-Grouse leks in the range (Knick and Hanser 2011).

4.4.9.8. Conclusion

Table 4.57, "Summary of Impacts to Special Status Wildlife Species" (p. 1139) summarizes effects on special status wildlife species.

Table 4.57. Summary of Impacts to Special Status Wildlife Species

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible beneficial	Major beneficial	Moderate adverse	Major beneficial
Soil	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Water Resources	Minor beneficial[1]	Major beneficial	Major adverse[1]	Major beneficial[1]
Cave and Karst Resources	Negligible beneficial	Minor beneficial	Minor adverse	Minor beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	Major adverse[1]	Major adverse	Major adverse	Major adverse[1]
Leasable Minerals – Fluids	Major adverse[1]	Major adverse[1]	Major adverse[1]	Major adverse[1]
Salable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor adverse	Minor adverse	Moderate adverse	Major adverse
Planned Fire (Prescribed Fire)	Minor adverse	Major adverse[1]	Major adverse[1]	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Negligible beneficial	Major beneficial	Negligible adverse	Moderate beneficial
Vegetation – Grassland and Shrubland Communities	Negligible beneficial	Major beneficial	Negligible adverse	Negligible beneficial
Vegetation – Riparian/Wetland Resources	Major adverse	Major adverse	Major adverse	Major adverse
Invasive Species and Pest Management	Moderate adverse	Minor adverse	Moderate adverse	Moderate adverse
Fish and Wildlife Resources – Fish	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Fish and Wildlife Resources – Wildlife	Major beneficial	Major beneficial	Major adverse	Major beneficial
Special Status Species – Plants	Moderate beneficial	Minor beneficial	Moderate beneficial	Minor beneficial
Special Status Species – Fish	Minor adverse	Major beneficial	Major beneficial	Major beneficial
Special Status Species – Wildlife	Major beneficial[1]	Major beneficial	Major adverse[1, 2, 3]	Moderate beneficial[1]
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major beneficial	Major beneficial	Major beneficial
Paleontological Resources	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Visual Resources	Negligible beneficial	Negligible beneficial	No effect	No effect
Land Resources				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Forest Products	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse and beneficial
Lands and Realty	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Renewable Energy	Moderate adverse	Major beneficial	Major adverse[1]	Major adverse[1]
Rights-of-Way and Corridors	Major adverse[1]	Major beneficial	Major adverse[1]	Major adverse[1]
Travel and Transportation Management	Major adverse	Major beneficial	Major adverse	Major adverse
Recreation	Moderate adverse	Moderate beneficial	Moderate adverse	Moderate beneficial
Lands with Wilderness Characteristics	Negligible adverse	Negligible beneficial	Negligible beneficial	Negligible beneficial
Livestock Grazing Management	Minor adverse	Major beneficial	Major adverse	Major beneficial
Special Designations				
Areas of Critical Environmental Concern	Negligible adverse	Minor beneficial	Negligible adverse	Negligible beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	Negligible beneficial	No effect	Negligible beneficial
Socioeconomic Resources				
Social and Economic Conditions	Moderate adverse	Minor adverse	Moderate adverse	Moderate adverse
Health and Safety	No effect	No effect	No effect	No effect

[1]Significant impacts to Greater Sage-Grouse
[2]Significant impacts to raptors
[3]Significant impacts to herptiles

4.5. Heritage and Visual Resources

4.5.1. Cultural Resources

Any action that reduces a threat to any of the characteristics which make a cultural resource significant will have a beneficial effect. Any action that results in surface disturbance has the potential to adversely affect cultural resources. Physical effects on cultural resources are typically long term and cannot be reversed. Inventory is required before the BFO authorizes most surface-disturbing activities, regardless of surface ownership. Inventory associated with Section 106 compliance can contribute data relating to site locations, but does not necessarily advance archeological and historic knowledge due to the reactionary nature of the investigations. The BFO is required to mitigate adverse effects on historic properties that result from authorized uses with methods such as project redesign or data recovery. Effects on the setting of historic properties can be mitigated by project redesign with the goal of reducing the visual contrast created by the project. Effects on the settings of historic properties are typically long term due to the time necessary to revegetate disturbed surfaces. Some adverse effects on cultural resources such as TCPs cannot be mitigated, resulting in the inability to authorize certain uses. Cultural resources will deteriorate through natural agents, unauthorized collection, and vandalism. A risk

of unauthorized collection or vandalism of cultural resources results from casual use activities (such as dispersed recreational activity or OHV use).

4.5.1.1. Methods and Assumptions

The following methods were used to analyze effects on cultural resources:

- The area of analysis is the entire planning area.
- The analysis focuses on data available in 2009, which is assumed to accurately represent the types of resources in the planning area in the future.
- The analysis is primarily qualitative. Most quantitative analysis is statistical, because only 13.8% of the planning area is inventoried for cultural resources.

Assumptions

The following analytical assumptions were made, based on available inventory data:

- All surface-disturbing activities must involve inventory with avoidance or mitigation of historic properties.
- Any alternative that results in surface disturbance could lead to inadvertent effects on cultural resources.
- Some cultural resources, especially buried cultural resources, are difficult to locate during inventory and could be inadvertently affected by surface-disturbing activities.
- Throughout the planning area, there is a predicted cultural resource density of 1 site per 172 acres.
- Throughout the planning area, typically 12.6% of all cultural resources are historic properties (sites eligible for or listed on the *National Register of Historic Places* [NRHP]).
- The southern Big Horn Mountains have a higher density of cultural resources and unique historic properties, such as rock art and rock shelters.

The following terms are used to define the extent of the environmental consequences:

- Major beneficial – The action would make the protection, preservation, or enhancement of a cultural resource(s) a priority.
- Moderate beneficial – The action would benefit cultural resources by eliminating immediate threats to historic properties, sacred sites, and TCPs from federal authorizations, deterioration through natural agents, unauthorized collection, and vandalism.
- Minor beneficial – The action would benefit cultural resources by reducing immediate threats to historic properties, sacred sites, and TCPs from federal authorizations, deterioration through natural agents, unauthorized collection, and vandalism.
- Negligible beneficial – The effect on the resource would be beneficial, but barely detectable. No historic properties would be affected.
- Negligible adverse – The effect on the resource would be adverse, but barely detectable. No historic properties would be adversely affected.
- Minor adverse – The effect on the resource would be slight but detectable; there would be a small change in the resource. Some cultural resources could be affected, but fewer than 10 historic properties would be adversely affected and effects would be mitigated. There would be a slight chance for unanticipated adverse effects on historic properties.
- Moderate adverse – The effect on the resource would be readily apparent; there would be a measurable change in the resource. Between 11 and 25 historic properties would be adversely affected, although most effects would be mitigated. There would be a moderate chance for unanticipated adverse effects to historic properties.

- Major adverse – The effect on the resource would be obvious; there would be a highly noticeable, long-term, or permanent measurable change in the resource. More than 26 historic properties would be adversely affected, although most effects would be mitigated. TCPs or sacred sites would be adversely affected without adequate mitigation. There would be a high likelihood of unanticipated adverse effects to historic properties.

Significance Criteria

The following are significance criteria for effects on cultural resources:

- Resource management actions would reduce or eliminate the opportunity to avoid or mitigate adverse effects to historic properties.
- Resource management actions would increase the likelihood of natural or man-made effects on cultural resources.
- Resource management actions would reduce or eliminate the opportunity for Native Americans to access sacred sites or TCPs.

4.5.1.2. Impacts Common to All Alternatives

Cultural (moderate beneficial)
Site stabilization and long-term protections would eliminate immediate threats resulting in a benefit cultural resources. Government-to-government relationships with Native American tribes should benefit cultural resources as sites important to tribes are identified and protected.

Physical Resources

Surface disturbance associated with physical resources management actions has the potential to impact cultural resources.

Air Quality (minor beneficial)
Managing to prevent or restrict particulate air pollution (especially suppressing dust) would reduce immediate threats to the integrity of the setting of certain historic properties such as TCPs or historic trails. Maintaining good air quality could help preserve rock art, which can be adversely affected by atmospheric pollutants.

Soil (minor beneficial)
Mitigation or stabilization of erosive soils could result in inadvertent adverse effects on buried cultural resources during implementation, but when completed, would preserve intact buried cultural resources by preventing or reducing the immediate threat of erosion.

Water Resources (minor beneficial)
Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, including reducing channel and bank erosion, and managing water to meet Wyoming Standards for Healthy Rangeland. This would be applied across the entire planning area and would have a minor beneficial effect on cultural resources as the immediate threat of erosion is reduced.

Cave and Karst Resources (minor beneficial)
Performing cave inventories and significance determinations can identify significant cultural resources. The presence of significant archeological resources must be considered when

determining the significance of cave resources. This would have a beneficial effect on cultural resources as immediate threats to historic properties would be eliminated through cave protection measures. The level of effect would be minor as significant caves are likely to be limited to the Big Horn Mountains portion of the planning area.

Mineral Resources

Minerals development that would involve surface-disturbing activities has the potential to adversely affect cultural resources. Inventories in response to proposals for development, and avoidance or mitigation, can minimize impacts to historic properties. Inventory could adversely affect sites if a discovery inadvertently results in unauthorized collection or vandalism. There can be inadvertent effects if buried sites are not identified through a surface inventory. Effects on historic properties can take place through data recovery. However, when data recovery is completed, aside from destroying part of the site, it limits or diminishes potential opportunities for future research and interpretation. In some cases it may be difficult to mitigate effects on historic properties especially when considering Native American religious or traditional use sites. It is difficult or impossible to mitigate direct adverse effects on traditional cultural properties such as Pumpkin Buttes.

Locatable Minerals (major adverse)
BLM surface overlaying federal mineral estate is available for potential locatable minerals exploration and development (777,310 acres) unless it is formally withdrawn. Foreseeable locatable minerals development is anticipated to affect a maximum of 1,455 acres, with potential effects to one historic property. However, uranium development is foreseeable on or near the Pumpkin Buttes TCP, which could result in adverse physical effects and effects on setting that may be impossible to mitigate. This would be a major adverse effect.

Leasable Minerals – Coal (major adverse)
Similar to locatable minerals, the potential acreage available for coal leasing is extensive (4,775,136 acres), but foreseeable activity is confined to central Campbell County and north-central Sheridan County, and is anticipated to affect a maximum of 195,700 acres. The potential adverse effect on historic properties (approximately 130) would be major.

Leasable Minerals – Fluids (moderate adverse)
Most of the surface overlaying federal mineral estate would be available for leasable fluid minerals exploration and development (3,386,530 acres). Foreseeable leasable fluid minerals development is anticipated to affect a maximum of 22,255 acres. Therefore, the potential adverse effect on historic properties (approximately 20) would be moderate.

Salable Minerals (minor adverse)
Most BLM surface overlaying federal mineral estate would be available for salable minerals exploration and development (777,310 acres). Foreseeable salable minerals development is anticipated to affect a maximum of 2,090 acres. Therefore, the potential adverse effect on historic properties (approximately 1) would be minor.

Fire and Fuels Management

Surface disturbing activities associated with fire and fuels management can have an impact on historic properties.

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (minor adverse)
Cultural resources can be inadvertently damaged or destroyed by any fire suppression efforts. Digging hand lines, constructing fire lines using heavy equipment, and fire-retardant drops can result in adverse effects. Fire rehabilitation can increase the protection of buried cultural resources by preventing or reducing erosion through rapid revegetation of denuded surfaces. Effects from rehabilitation activities (such as seeding and water barring) would be mitigated.

Biological Resources

The following programs do not have any management actions common to all alternatives that would affect cultural resources: **Fish and Wildlife Resources, Special Status Species – Plants and Fish and Invasive Species and Pest Management.**

Special Status Species – Wildlife (minor beneficial)
Any application of NSO stipulations as a result of wildlife management would benefit cultural resources as immediate threats to cultural resources would be reduced as surface disturbance is prohibited.

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, and Riparian/Wetland Resources (minor beneficial)
Vegetation surveys could identify plants or plant communities that are important to Native American tribes for traditional uses. Reducing adverse effects on vegetative resources would help stabilize soil and help preserve buried cultural resources.

Heritage and Visual Resources

The **Paleontological Resources** program does not have any management actions common to all alternatives that would affect cultural resources.

Visual (minor beneficial)
Managing any area as VRM Class I or II and screening, painting, and designing facilities to blend with the surrounding landscape would preserve the integrity of the settings of historic properties such as TCPs or historic trails. This would have a minor beneficial effect on cultural resources as the areas managed as VRM Class I or II within the planning area are limited.

Land Resources

Management of **Lands with Wilderness Characteristics** and management of **Renewable-Energy** development would not include actions common to all alternatives that would directly affect surface-disturbing activities. Therefore, management of those resources would not affect cultural resources.

Forest Products (minor beneficial)
Management actions common to all alternatives include a prohibition of timber harvest within 200 feet of surface waters. This would protect cultural resources in those areas. The amount of plants harvested for personal use would be very small and not considered to affect cultural resources unless the collection includes species that are significant to tribes. Overall, management actions for forest products common to all alternatives would have a minor beneficial effect on cultural resources.

Lands and Realty (negligible adverse)
Land exchanges can result in adverse effects if historic properties leave public ownership. Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on traditional cultural properties such as Pumpkin Buttes. The BFO would be responsible for managing any cultural resources on new lands the BLM might acquire. Overall, these management actions would have a negligible adverse effect on cultural resources.

Rights-of-Way and Corridors (minor adverse)
Issuing ROW that result in surface-disturbing activities has the potential to adversely affect cultural resources. Inventories in response to proposals for development, and avoidance or mitigation, can minimize effects on historic properties. Inventories could adversely affect sites if discoveries inadvertently resulted in unauthorized collection or vandalism. There can be inadvertent effects if buried sites are not identified through a surface inventory. Effects on historic properties can take place through data recovery. However, when data recovery is completed, aside from destroying part of the site, it limits or diminishes potential opportunities for future research and interpretation. In some cases it may be difficult to mitigate effects on historic properties especially when considering Native American religious or traditional use sites. It is difficult or impossible to mitigate direct adverse effects on traditional cultural properties such as Pumpkin Buttes.

Travel and Transportation Management (negligible adverse)
Acquiring new access to public lands could result in adverse effects on cultural resources from unauthorized collection and vandalism. Unimproved roads designated for use through sites could cause erosion that could damage buried cultural resources. New access routes also could provide or improve tribal access to sacred sites or TCPs. Overall, management of travel and transportation common to all alternatives would have a negligible adverse effect on cultural resources.

Recreation (negligible adverse)
Effects from dispersed recreational activities are difficult to assess because such activities could affect cultural resources that have yet to be identified. Indirect and inadvertent effects on cultural resources can result from attracting attention or visitation to certain areas such as SRMAs and ACECs. Increased visitation and recreational use can lead to unauthorized collection and vandalism of cultural resources. Providing recreational or public interpretation of cultural and historic resources can enhance appreciation and understanding of the fragile and finite nature of cultural resources. Disturbance would be the greatest in areas of concentrated use, such as hiking trails, developed facilities, and dispersed camping sites. Improving and maintaining recreation sites localizes possible disturbances. Overall, recreation management actions common to all alternatives would have a negligible adverse effect on cultural resources.

Livestock Grazing Management (negligible adverse)
While direct effects on cultural resources associated with range improvement projects would be mitigated, there could be other effects as a result of livestock grazing. Livestock congregating and trailing at or across locations of cultural resources can damage artifacts and their contexts. Cattle shading and rubbing can damage standing historic structures and prehistoric rock art panels. Excessive trampling at spring sources and along stream banks, cattle trailing, and overgrazing can lead to removal of vegetative cover and affect cultural resources through erosion. These types of effects would generally be localized at particular sites, and could range from short term to irreversible.

Special Designations

There are no management actions for **Scenic or Back Country Byways**, **WSA**s, and **WSR**s common to all alternatives or that vary by alternative that would directly affect surface-disturbing activities. Management of these resources would have no effect on cultural resources; therefore, these resources are not further addressed in the cultural resources section.

Areas of Critical Environmental Concern and Wilderness Study Areas (moderate beneficial)
Managing areas as ACECs and WSAs would preserve cultural resources because surface-disturbing activities would not be allowed in these areas and public access is typically limited. This management would have a moderate beneficial effect on cultural resources as the immediate threat of surface disturbance is eliminated. WSAs would be managed as such in all alternatives and therefore are not discussed further in this section. If Congress were to release a WSA, then BLM would complete an RMP amendment for any changes in management.

Socioeconomic Resources (no effect)

There are no social, economic, or health and safety management actions common to all alternatives or specific to individual alternatives that would have a measurable effect on cultural resources. Therefore, these subjects are not further addressed in this section.

4.5.1.3. Alternative A

Cultural Resources (minor beneficial)
Under Alternative A, establishing site stewardship opportunities on a project-specific basis would likely result in the BFO reacting to external requests. Other priorities would take precedence and the BFO could forego proactive opportunities for public outreach and site preservation. Even though implementation of site stewardship may not be actively promoted by BFO, this management would have a beneficial effect on cultural resources.

Creating Cultural Resource Management Plans (CRMPs) for existing sites and any additional sites that could be eligible for listing on the National Register is intended to more effectively preserve those resources. The existing CRMPs are out of date and need to be updated; developing new CRMPs would benefit cultural resources. Any site listed on the National Register also would warrant a specific management plan, although no sites in the planning area have been listed since the 1970s. There are other sites that likely will never be listed that require management plans to ensure adequate preservation. This management would have a beneficial effect on cultural resources.

Applying an NSO stipulation to mineral leases within 0.25 mile of the Bozeman Trail and Crazy Woman Battle Site is intended to preserve the setting of the sites, although practical application of the NSO stipulation is problematic. Many National Register eligible or significant segments of the Bozeman Trail do not retain their historic settings, and applying an NSO stipulation to all such areas would not be practical. Alternatively, in many cases it is necessary to consider impacts beyond 0.25 mile from the trail to preserve setting. In addition, Alternative A does not adequately address the complexity of preserving the setting of the Bozeman Trail or the Crazy Woman Battle Site, or the numerous other significant sites in the planning area such as the Pumpkin Buttes TCP or Cantonment Reno. Applying NSO stipulations on mineral leases under Alternative A would have a beneficial effect on cultural resources.

Under Alternative A, mitigating impacts to historic properties or their settings on a project-specific basis would adequately address effects at that level. However, it is difficult to assess cumulative effects on the setting of a specific site if each project is addressed in a separate document. Multiple projects that result in weak or moderate contrast to the setting of a site can result in a cumulative strong contrast. If projects that affect the setting of a site are analyzed on a project-specific basis, the lack of a cumulative impacts analysis could allow for adverse effects. In addition, Alternative A does not consider minerals withdrawals or close to leasing areas with historic properties. This would preclude an opportunity to protect historic properties. This alternative could result in an adverse effect on cultural resources.

Requiring archeological monitors for construction on a project-specific basis could address unanticipated impacts to sites not identified during inventory. Requiring an archeological monitor is based on contractor recommendations, the BFO cultural resources specialists' analysis, and the application of a regional model. Using this strategy, archeological monitors have identified very few sites in the planning area. The lack of discoveries could be due to unusual depositional characteristics in the planning area or inconsistent observations by various monitors. Although not quantifiable, it is likely that there would be a benefit to cultural resources as a result of project-specific archeological monitoring.

Creating programmatic agreements with tribes on a project-specific basis would likely result in the BFO reacting to external requests. Other priorities would take precedence and the BFO might forego such proactive opportunities for effective government-to-government consultations with tribes. Although any agreement would be beneficial, if BFO misses a pro active opportunity to coordinate with tribes, this management could have an adverse effect on cultural resources.

Establishing agreements that provide tribal access to TCPs and sacred sites on BLM surface on a project-specific basis would likely result in the BFO reacting to external requests. Other priorities would take precedence and the BFO might forego such proactive opportunities for effective government-to-government consultations with tribes. Although any agreement would be beneficial, if BFO misses a pro active opportunity to coordinate with tribes, this management could have an adverse effect on cultural resources.

Under Alternative A, mitigating impacts to TCPs and sacred sites on a project-specific basis would adequately address effects at that level. However, it is difficult to assess cumulative effects on the setting of a specific site if each project is addressed in a separate document. Multiple projects that result in weak or moderate contrast to the setting of a site can result in a cumulative strong contrast. If projects that affect the setting of a site are analyzed on a project-specific basis, the lack of a cumulative impacts analysis could allow for major adverse effects. In addition, Alternative A does not consider minerals withdrawals or close to leasing areas containing TCPs or sacred sites. This would preclude an opportunity to protect those properties. This alternative could have an adverse effect on cultural resources.

Requiring Native American monitors for construction on a project-specific basis could address unanticipated impacts to sacred sites or TCPs not identified during inventory. Any requirement for Native American monitors on a project under this alternative would be the result of the BFO reacting to external requests. Other priorities would take precedence and the BFO might forego such proactive opportunities for effective government-to-government consultation with tribes. This alternative could have an adverse effect on cultural resources.

Overall, management actions for cultural resources under Alternative A would have minor beneficial effects on cultural resources in the planning area as immediate threats would be reduced.

Physical Resources

Air Quality (no effect)
Alternative A air quality management actions would have no effect on cultural resources.

Soil (minor beneficial)
Any prohibition on surface disturbances or the application of NSO stipulations as a result of soil resources management would benefit cultural resources. Buried cultural resources are essentially a part of soil resources, and any measure to protect soil stability should protect cultural resources. Prohibiting surface disturbance on rock outcrops would protect rock art and rock shelters. Alternative A soils management actions would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Water Resources (minor beneficial)
Prohibiting surface disturbance near springs and perennial streams would benefit cultural resources. Buried cultural resources are often located near water sources, especially around springs. Alternative A water management actions would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Cave and Karst Resources (minor beneficial)
Prohibiting surface disturbance near caves would benefit cultural resources. Buried cultural resources are often located in or near cave entrances. Alternative A cave management actions would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Mineral Resources

Locatable Minerals (major adverse)
Under Alternative A, withdrawing areas from minerals location would have a major beneficial effect on cultural resources. Minerals withdrawals in the existing game ranges and WSAs would benefit cultural resources, especially considering that some of those areas are in the southern Big Horn Mountains and have a higher density of historic properties than the rest of the planning area. Any surface disturbance, including activities associated with exploration and extraction of locatable minerals, could result in a negligible to major adverse effect on cultural resources. Foreseeable locatable minerals development is anticipated to affect a maximum of 554 acres, which would affect less than one historic property. However, uranium development is foreseeable on or near the Pumpkin Buttes TCP, which could result in adverse effects on the physical characteristics of the site. Since Pumpkin Buttes is significant to multiple tribes and impacts cannot be mitigated, this would be a major adverse affect.

Leasable Minerals – Coal (major adverse)
Under Alternative A, opening all federal coal lands to exploration and leasing on a project-specific basis could result in major adverse effects on cultural resources. Although potential damage to many historic properties could be mitigated through data recovery before mining, mitigation might not be possible for certain types of sites, including historic properties that retain setting, sacred sites, and TCPs. The surface disturbance prediction of 195,700 acres of coal development could affect more than 195 historic properties.

Leasable Minerals – Fluids (moderate adverse)
Under Alternative A, allowing minerals leasing on all federal mineral estate on a project-specific

basis could result in a moderate adverse effect on cultural resources. Many historic properties can be avoided or potential damage mitigated before surface-disturbing activities. Mitigation might not be possible for certain types of sites, including historic properties that retain setting, sacred sites, and TCPs, which would lead to a major adverse effect. The estimated total acres disturbed associated with construction of well sites, access roads, and pipelines would be approximately 10,575 acres over the total federal fluid mineral estate of 3,386,530 acres. This could result in physical effects on 18 historic properties, although there would be a much larger number of sites, such as the Bozeman Trail and the Pumpkin Buttes TCP, that would experience effects on setting. Overall, Alternative A management of leasable fluid minerals would have a moderate adverse effect on cultural resources.

Salable Minerals (negligible adverse)
Under Alternative A, prohibiting mineral materials activities in WSAs would have a beneficial effect on cultural resources, especially considering that some of those areas have a higher density of historic properties than the rest of the planning area. Under this alternative, 530 acres would be disturbed, with the potential to affect less than one historic property. This would have a negligible adverse effect on cultural resources.

Fire and Fuels Management (minor adverse)

Under Alternative A, fire suppression techniques that result in surface disturbance or retardant drops could have a minor adverse effect on cultural resources. Wildland fire suppression strategies are designed to avoid known historic properties whenever possible.

Biological Resources

Vegetation – Forests and Woodlands, Vegetation – Grassland and Shrubland Communities, and Special Status Species – Plants (no effect)
Under Alternative A, management of forests and woodlands, grasslands and shrublands, and special status plants would have no effect on cultural resources.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Any prohibition on surface disturbances or the application of NSO stipulations as a result of riparian and wetlands management would benefit cultural resources. Any measure to protect the stability of vegetation should protect cultural resources. Under Alternative A, these management actions would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Invasive Species and Pest Management (minor beneficial)
Under Alternative A, controlling invasive species could protect plant communities important to Native American tribes for traditional uses. This would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (minor beneficial)
Any prohibitions on surface disturbances or the application of NSO stipulations as a result of fish habitat management would benefit cultural resources. Any measure to protect bank stability should protect cultural resources. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor beneficial)
Any prohibitions on surface disturbances or the application of NSO stipulations as a result of wildlife habitat management would benefit cultural resources. Any measure to protect habitat stability should protect cultural resources. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Heritage and Visual Resources

Paleontological Resources (no effect)
Alternative A management of paleontological resources would have no effect on cultural resources.

Visual Resources (minor beneficial)
Any action that protects visual resources would help preserve the setting of historic properties. Any measure to preserve visual integrity would result in minor beneficial effects on cultural resources.

Land Resources

The alternatives for **Lands with Wilderness Characteristics** will have no effect on cultural resources.

Lands and Realty (negligible adverse)
Land exchanges can result in adverse effects if historic properties leave public ownership and Alternative A identifies 117,427 acres of BLM-administered lands as available for disposal. Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on traditional cultural properties such as Pumpkin Buttes. Overall, these management actions would have a negligible adverse effect on cultural resources due to the potential of historic properties leaving federal control as it is difficult to predict the actual number of acres that will be exchanged or sold.

Forest Products (minor adverse)
Under Alternative A, a maximum of 6,000 acres of forest-product related activity is predicted on BLM surface. This could affect six historic properties, which would be a minor adverse effect on cultural resources.

Renewable Energy (major adverse)
Although there have been no renewable-energy projects to date on BLM surface in the planning area, wind-energy projects resulting in 20,000 acres of disturbance are predicted in the future. Renewable-energy development at this scale could have adverse effects on the physical characteristics of 20 historic properties. Lacking specific restrictions, under Alternative A, there would be major adverse effects on the settings of numerous historic properties because wind-energy facilities can create a high visual contrast.

Rights-of-Way and Corridors (major adverse)
Under Alternative A, fully utilizing South Middle Butte as a location for communications towers would result in a major adverse effect on a specific cultural resource. Numerous tribes have stated that allowing any surface disturbance or construction on the Pumpkin Buttes TCP would result in

an adverse effect that is impossible to mitigate. Previous decisions have allowed such uses on the buttes and there are existing roads and structures. However, there would likely be cumulative adverse effects from allowing further uses. The predicted disturbance from ROW actions is 38,762 acres of BLM surface, which could adversely affect 39 historic properties.

Travel and Transportation Management (negligible adverse)
Under Alternative A, acquiring new access routes to public lands could adversely affect cultural resources through unauthorized collection and vandalism. New access routes also could provide or improve tribal access to sacred sites or TCPs, which would be a beneficial effect. Overall under Alternative A, there would be a negligible adverse effect as sites may be adversely impacted, but it would be difficult to detect the change.

Recreation (minor beneficial)
Under Alternative A, any prohibition of surface disturbance would beneficially affect cultural resources. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through prohibiting surface disturbance.

Lands with Wilderness Characteristics (no effect)
The alternatives for lands with wilderness characteristics would have no effect on cultural resources.

Livestock Grazing Management (minor beneficial)
Restricting livestock grazing under Alternative A would have an indirect beneficial effect on cultural resources. Any management action that restricts the removal of vegetation would indirectly preserve buried cultural resources if soils were stabilized. This management under Alternative A would have a minor beneficial effect on cultural resources by reducing immediate threats through restricting surface disturbance.

Special Designations

Areas of Critical Environmental Concern (major adverse)
Under Alternative A, failure to manage Pumpkin Buttes as an ACEC could have a major adverse effect to cultural resources. Without any surface use restrictions, there could be major, long term impacts to the Pumpkin Buttes TCP.

4.5.1.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to cultural resources from implementation of Alternative B.

Cultural Resources (major beneficial)
Under Alternative B, establishing site stewardship opportunities with the State Historic Preservation Office (SHPO) and other stakeholders would have a beneficial effect on cultural resources. Site stewardship results in increased monitoring of sensitive sites, allowing the BFO to efficiently react to any threats to those sites. Providing site stewardship opportunities would allow the public to participate in preserving and protecting cultural resources sites with little cost to the BLM.

Although natural and human-caused effects on cultural resources are inevitable, CRMPs can be developed and implemented for specific sites to help prevent such effects through active

management. Protective measures can include site condition monitoring, site stabilization, road closures, and signage. Early identification of natural or human-caused effects would allow for successful protective measures. Implementing CRMPs for specific sensitive sites or regions would have a beneficial effect on cultural resources in those areas.

Withdrawing lands from minerals exploration and development and closing to leasing areas with historic properties that retain their historic settings would have a beneficial effect on cultural resources. There are relatively few historic properties in the planning area that retain their historic settings (examples include the Bozeman Trail, Pumpkin Buttes, and certain historic homesteads). It is difficult to avoid or mitigate adverse effects on settings if adjacent federal minerals are leased. If these areas were not leasable or not open to minerals entry, settings would essentially be protected. Prohibiting surface disturbance within five miles of historic properties that retain their historic settings also would have a beneficial effect on cultural resources. However, there are undoubtedly unidentified historic properties in the planning area that retain integrity of setting.

Requiring archeological monitors for all surface-disturbing activities would have a beneficial effect on cultural resources. Archeological monitoring is intended to identify cultural resources not identified before surface-disturbing activities. Cultural resources discovered during archeological monitoring could be avoided or adverse effects on those resources mitigated.

Establishing programmatic agreements with each tribe with which the BFO consults would have a beneficial effect on cultural resources. Such agreements provide a process for consultation and can lead to improved government-to-government relationships. Establishing agreements that provide tribal access to known TCPs also would have a beneficial effect on cultural resources.

Withdrawing lands from minerals exploration and development and closing to leasing in areas with TCPs or sacred sites would have a beneficial effect on cultural resources. It is difficult to avoid or mitigate effects on cultural resources under federal mineral estate when it is leased. If these areas were not leasable or not open to minerals entry, cultural resources sites would essentially be protected. Prohibiting surface disturbance within the settings of TCPs or sacred sites also would also have a moderate to major beneficial effect on cultural resources.

Requiring Native American monitors for all surface-disturbing activities would have a beneficial effect on cultural resources. Native American monitoring is intended to identify cultural resources not identified before surface-disturbing activities. Cultural resources discovered during Native American monitoring could be avoided or adverse effects on those resources mitigated.

Overall, management actions for cultural resources under Alternative B would have major beneficial effects on cultural resources in the planning area as immediate threats would be reduced.

Physical Resources

Air Quality (no effect)
Alternative B air quality management actions would have no effect on cultural resources.

Soil (minor beneficial)
The frequent application of NSO stipulations and prohibitions on surface disturbance related to soils under Alternative B would benefit cultural resources. The most restrictive soils protections under this alternative would prohibit surface disturbance on 455,090 acres (58%) of BLM surface and 1,514,445 acres (45%) of federal fluid mineral estate. This management would

have a minor beneficial effect as immediate threats to cultural resources are reduced through surface disturbance prohibitions.

Water Resources (minor beneficial)
Under Alternative B, increased prohibitions on surface disturbance and the application of NSO stipulations for management of water resources would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Cave and Karst Resources (minor beneficial)
Under Alternative B, developing and implementing CRMPs would benefit cultural resources where historic properties are present in caves. Increased prohibitions on surface disturbance and the application of NSO stipulations for management of cave and karst resources would also have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Mineral Resources

Impacts Common to All Alternatives describes how minerals activities affect soil resources. In general, Alternative B substantially reduces the amount of area available for minerals exploration and development; however, predicted development under Alternative B is not substantially less than predicted for other alternatives.

Locatable Minerals (major adverse)
There are 277 acres predicted to be disturbed (less than one historic property) by locatable minerals development under Alternative B. Alternative B withdrawals from locatable minerals entry would have a major beneficial effect on cultural resources. However, it is likely there would be uranium development on Pumpkin Buttes, which would have a major adverse effect on cultural resources.

Leasable Minerals – Coal (major adverse)
Under Alternative B, closing coal lands to exploration or leasing would benefit cultural resources. However, the surface disturbance prediction of 186,600 acres of coal development could affect 186 historic properties. This would be a major adverse effect.

Leasable Minerals – Fluids (negligible adverse)
Restricting fluid minerals and other leasable minerals exploration and leasing identified within this alternative related to fluid minerals would benefit cultural resources. This alternative would allow for leasing and development of the federal fluid mineral estate with increased protections cultural resources. The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines are 286 acres, potentially impacting one historic property, a negligible adverse effect.

Salable Minerals (negligible adverse)
Closure areas for salable exploration or development in this alternative would be a benefit to cultural resources. Under this alternative, 114 acres (less than one historic property) are forecasted to be disturbed by salable mineral development.

Fire and Fuels Management (minor beneficial)

Under Alternative B, limiting the use of heavy equipment during fire suppression efforts would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
Alternative B management actions for forests and woodlands would have no effect on cultural resources.

Vegetation – Grassland and Shrubland Communities (minor beneficial)
Under Alternative B, authorizing only native plant species for reclamation projects would benefit cultural resources through the preservation of setting for historic properties. This would have a minor beneficial effect on cultural resources as an immediate threat of potential impacts to setting would be reduced.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Prohibition of surface disturbance and application of NSOs under the riparian/wetland alternatives would have a beneficial effect on cultural resources. A buffer around riparian areas would prohibit surface disturbance on 23,831 acres of BLM surface and 144,045 acres overlying federal fluid minerals in areas that contain a high likelihood of buried cultural deposits.

Invasive Species and Pest Management (no effect)
Alternative B management actions for invasive species and pest management would have no effect on cultural resources.

Fish and Wildlife Resources – Fish and Wildlife, Special Status Species – Plants, Fish, and Wildlife (minor beneficial)
Under Alternative B, increased prohibitions on surface disturbance and the application of NSO stipulations for management of all fish and wildlife and special status species would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Heritage and Visual Resources

Paleontological Resources (minor beneficial)
Under Alternative B, paleontological resources management actions that prohibit surface disturbance, closes areas to leasing, and withdraw lands from minerals exploration and development would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Visual Resources (minor beneficial)
Under Alternative B, managing specific areas as VRM Class II and III could have minor beneficial effects on cultural resources by protecting the settings of historic properties. This would have a minor beneficial effect on cultural resources as an immediate threat of potential impacts to setting would be reduced.

Land Resources

Forest Products (no effect)
Alternative B management of forest products would have no effect on cultural resources.

Lands and Realty (negligible adverse)
Land exchanges can result in adverse effects if historic properties leave public ownership and Alternative B identifies 120,722 acres of BLM-administered lands as available for disposal. Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on traditional cultural properties such as Pumpkin Buttes. Overall, these management actions would have a negligible adverse effect on cultural resources due to the potential of historic properties leaving federal control as it is difficult to predict the actual number of acres that will be exchanged or sold.

Renewable Energy (minor adverse)
Excluding or avoiding wind-energy development within the settings of historic properties would benefit cultural resources. Management under Alternative B would excludes renewable-energy projects wherever minerals development and other surface-disturbing activities are prohibited, but would not necessarily protect the settings of specific sites. In addition, 5,000 acres of disturbance on BLM surface are predicted. Development at this scale could adversely affect the physical characteristics of five historic properties.

Rights-of-Way and Corridors (moderate beneficial)
Under Alternative B, restricting authorizations for communications sites in the Pumpkin Buttes area and maintaining existing land use authorizations until they expire would have a major beneficial effect on the Pumpkin Buttes TCP. Restricting facilities to protect visual integrity would have a beneficial effect on the setting of historic properties. Retaining BLM-administered lands that have important natural resource values would have a beneficial effect on cultural resources. Management under this alternative would exclude ROW activity from 370,088 acres of BLM surface and restrict communications sites on the Pumpkin Buttes TCP, which would have a beneficial effect on cultural resources. The predicted disturbance from ROW actions is 18,011 acres of BLM surface; this could adversely affect 18 historic properties. Overall the management actions would have a moderate beneficial effect as immediate threats to certain sites are eliminated.

Travel and Transportation Management (minor beneficial)
Under Alternative B, prohibiting OHV use and limiting vehicle travel would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Recreation (minor beneficial)
Under Alternative B, prohibition of surface disturbance would beneficially affect cultural resources by reducing an immediate threat of surface disturbance.

Lands with Wilderness Characteristics (no effect)
Alternative B management of lands with wilderness characteristics would have no effect on cultural resources.

Livestock Grazing Management (minor beneficial)
Under Alternative B, locating mineral supplements away from sensitive resources (including historic properties) would benefit cultural resources. Restricting livestock grazing would have an indirect beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Special Designations

Areas of Critical Environmental Concern (major beneficial)
Under Alternative B, determining that Cantonment Reno and Pumpkin Buttes are ACECs would benefit those cultural resources as site specific protective measures are implemented. There also would be a benefit to cultural resources in all other ACECs as surface disturbance would be restricted. Overall, this management would have a major beneficial effect on cultural resources as protection, preservation and enhancement of cultural resources would be a priority.

4.5.1.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to cultural resources due to its implementation.

Cultural Resources (minor beneficial)
Unless specifically noted below, Alternative C management actions and effects would be the same as management and effects under Alternative A.

Not establishing site stewardship opportunities could result in adverse effects on cultural resources. Site stewardship provides opportunities for site condition monitoring the BLM cannot normally perform. Monitoring site condition is the best way to identify and prevent natural and human-caused degradation of cultural resources.

Not developing and implementing CRMPs for specific sensitive sites or regions could result in adverse effects on cultural resources. Absent definite plans or process for monitoring and stabilizing cultural resources, historic properties could experience inadvertent neglect.

Applying NSO stipulations to leases to protect the setting of historic properties would have a beneficial effect on cultural resources. However, applying an NSO stipulation to a concept as broad as the setting of a historic property without a well- defined extent might preclude the opportunity to develop a lease.

Not pursuing programmatic agreements with tribes could have an indirect adverse effect on cultural resources. A large part of determining significance for certain cultural resources includes consultations with Native American tribes, and precluding an opportunity to facilitate consultation is counter intuitive. Absent programmatic agreements, tribes could decline to fully consult with BFO, inadvertently leading to adverse effects on cultural resources as a result of federal authorizations.

Applying NSO stipulations to leases to protect sacred sites and TCPs would have a beneficial effect on cultural resources. However, applying an NSO stipulation to a particular site type could preclude the opportunity to develop a lease.

Not involving Native American monitors in any surface-disturbing activity could have an indirect adverse effect on cultural resources. Archeological monitors might not be qualified to perform the same types of monitoring as Native American monitors, and there could be inadvertent adverse effects on cultural resources.

Physical Resources

Air Quality (no effect)
Alternative C air quality management would have no effect on cultural resources.

Soil (negligible adverse)
Under Alternative C, allowing surface disturbance in areas with severe erosion hazard could result in inadvertent adverse effects on cultural resources through increased erosion. Allowing surface occupancy on rock outcrops could lead to adverse effects through the destruction of rock art sites or Native American burial sites. Overall, soils management under Alternative C could have a negligible adverse effect on cultural resources since activities would be allowed in areas that may contain sensitive sites.

Water Resources (minor beneficial)
Management actions for and effects on water resources would be the same as actions and effects under Alternative A.

Cave and Karst Resources (minor beneficial)
All restrictions on activities around and in cave and karst resources would have an indirect beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Mineral Resources

Locatable Minerals (major adverse)
Under this alternative, 1,455 acres of soils are predicted to be disturbed, with potential adverse effects on one historic property. Uranium development would likely occur on Pumpkin Buttes, which would have a major adverse effect.

Leasable Minerals – Coal (major adverse)
The surface disturbance prediction of 195,700 acres of coal development under Alternative C would affect 195 historic properties. This would have a major adverse affect on cultural resources.

Leasable Minerals – Fluids (moderate adverse)
Under Alternative C, approximately 22,255 of the 3,386,530 acres of federal fluid mineral estate are predicted to be disturbed from construction of well sites, access roads, and pipelines. This could result in physical impacts to 22 historic properties, although there would be a much larger number of sites, such as sites along the Bozeman Trail and the Pumpkin Buttes TCP that would experience impacts to setting.

Salable Minerals (negligible adverse)
Under Alternative C, 2,090 acres of soils are predicted to be disturbed, with potential effects on one historic property. This would have a negligible adverse effect on cultural resources.

Fire and Fuels Management (minor adverse)

Fire and fuels management would be analyzed on a project-specific basis under Alternative C and would not result in an effect to cultural resources. Alternative C fire and fuels management and effects therefrom would be the same as management and effects under Alternative A.

Biological Resources

Under Alternative C, effects on **Forests and Woodlands**, **Invasive Species and Pest Management**, and **Grassland and Shrubland Communities** would be analyzed on a project-specific basis and would not result in any inadvertent benefits to cultural resources. Alternative C management of these resources and effects on cultural resources would be the same as management and effects under Alternative A.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Under Alternative C, allowing surface disturbance within 500 feet of riparian and wetland areas could lead to inadvertent negligible adverse effects on cultural resources since buried cultural resources can occur in alluvial deposits and activities would be allowed in areas that may contain sensitive sites.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (minor beneficial)
Under Alternative C, any prohibitions on surface disturbance and the application of NSO stipulations for management of fish and wildlife resources and special status species would have a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Heritage and Visual Resources

Paleontological Resources (no effect)
Alternative C management of paleontological resources would have no effect on cultural resources as proposals would be analyzed on a project-specific basis and mitigated where necessary to not result in any effects to cultural resources.

Visual Resources (minor beneficial)
Any action to protect visual resources would help preserve the setting of historic properties and visual integrity which would result in minor beneficial effects on cultural resources.

Land Resources

Under Alternative C, effects from **Forest Products, Lands and Realty, Renewable Energy, Travel and Transportation Management, Recreation, Lands with Wilderness Characteristics, and Livestock Grazing Management** would be analyzed on a project-specific basis and would not result in any inadvertent benefits to cultural resources. Alternative C management of these resources and resulting effects on cultural resources would be essentially the same as management and effects under Alternative A.

Rights-of-Way and Corridors (major adverse)
Under Alternative C, allowing unrestricted development of communications towers on Pumpkin Buttes would have a major adverse effect on the Pumpkin Buttes TCP.

Special Designations

Areas of Critical Environmental Concern (major adverse)
Under Alternative A, failure to manage Pumpkin Buttes as an ACEC could have a major adverse effect to cultural resources. Without any surface use restrictions, there could be major, long term impacts to the Pumpkin Buttes TCP.

4.5.1.6. Alternative D

This section describes management actions and potential impacts to cultural resources under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Cultural Resources (major beneficial)
Establishing sites stewardship opportunities with SHPO and other stakeholders would be a benefit to cultural resources. Site stewardship results in increased monitoring of sensitive sites, allowing to efficiently react to any threats to those sites. Providing these opportunities allows the public to participate in site preservation and protection with little cost to BLM.

Implementing CRMPs for the sites and regions identified under Alternative D would have a beneficial effect on cultural resources in those areas.

Applying NSO stipulations to the sites identified under Alternative D would have a beneficial effect on cultural resources in those areas. Surface disturbance associated with mineral leases would not be allowed in these areas. Projects within 3 miles of the sites might need to be modified to create a weak contrast to the setting of specific historic properties. Some proposals that involve large or conspicuous infrastructure (such as compressor stations or tall storage tanks) might not be allowed within 3 miles of the sites if adverse effects could not be mitigated to the point where they create a weak (or less) contrast.

Restricting surface disturbance on the sites identified under Alternative D would have a beneficial effect on cultural resources. Allowing undertakings only if they would result in a weak (or less) contrast to the setting of the sites also would have a beneficial effect on cultural resources. Projects within three miles of the sites may need to be modified in order to create a weak contrast to the setting of specific historic properties. Some proposals that contain large or conspicuous infrastructure (such as powerlines or wind turbines) may not be permitted within three miles of the sites listed in the alternative if the impacts cannot be mitigated to the point where they create a weak contrast or less.

Requiring archeological monitors in accordance with the developed strategy would have a beneficial effect on cultural resources. Requiring archeologists to monitor projects would be in accordance with a strategy based on the best available geomorphologic and archeological data. Proper treatment of cultural resources discovered during archeological monitoring would be outlined in the strategy. Adopting a strategy for archeological monitoring would result in consistency between consultations with the SHPO and tribes, and would improve working relationships.

Establishing agreements to provide tribal access to the Pumpkin Buttes and other TCPs or sacred sites on BLM surface would result in improved working relationships with tribes and ensure that the field office meets its responsibilities under various statutes and EOs. Establishing agreements to provide tribal access to known TCPs and sacred sites also would have a beneficial effect.

There is currently one documented TCP (Pumpkin Buttes) in the planning area, which would be protected through management actions Cultural 5005, 5006, and 5007. Any other TCPs which may be identified in the future and sacred sites would not be withdrawn from minerals entry or leasing. Impacts to these sites would be mitigated on a project-specific basis. Mitigation might

not be possible for certain sacred sites and TCPs, which would require that projects be modified or denied. This management would have a negligible to moderate beneficial effect on cultural resources.

Requiring Native American monitors on a project-specific basis or based on agreements with tribes would have a beneficial effect on cultural resources. Monitoring would likely be required only for large or high-profile projects if it were applied on a project-specific basis. Determining Native American monitoring based on agreements with tribes would result in consistency in government-to-government consultations and improved working relationships.

Overall, Alternative D management of cultural resources would have a major beneficial effect as protection, preservation and enhancement of certain cultural resources is a priority.

Physical Resources

Air Quality (no effect)
Alternative D air quality management actions would have no effect on cultural resources.

Soil (minor beneficial)
Under Alternative D, the application of any NSO stipulations and prohibiting surface disturbance would benefit cultural resources. This alternative would protect soils by prohibiting surface disturbance on more than 1.5 million acres, which would protect buried cultural resources. Prohibiting surface occupancy on rock outcrops would protect rock art, rock shelters, and Native American burials would reduce an immediate threat of surface disturbance.

Water Resources (minor beneficial)
Under Alternative D water management, prohibiting surface disturbance and applying NSO stipulations would have a beneficial effect on cultural resources. The stream buffer would protect cultural resources in alluvial deposits on 19,861 acres of BLM surface and 95,172 acres over federal fluid mineral estate.

Cave and Karst Resources (minor beneficial)
Developing and implementing CRMPs would benefit cultural resources where historic properties are present in caves. Prohibiting surface disturbance and applying CSU stipulations would have a beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Mineral Resources

In general, the amount of area available for minerals exploration and development under Alternative D is comparable to that available under Alternative A, as is predicted development. Alternative D incorporates similar levels of resource protections as Alternative A, but with defined exception criteria.

Locatable Minerals (major adverse)
Under this alternative, 1,252 acres of soils are predicted to be disturbed by locatable minerals activities, with the potential to affect one historic property. Uranium development would likely occur on Pumpkin Buttes, which would have a major adverse effect on cultural resources.

Leasable Minerals – Coal (major adverse)
Opening all federal lands to coal exploration or leasing under Alternative D would have an adverse effect on cultural resources. Although mitigation of historic properties would be required

prior to coal mining, all archeological sites in mining areas would be destroyed. Although scientific data would be gained through site mitigation, sites that could include data important to future researchers would be destroyed. It is difficult to locate sites that are completely buried and have no expression on the surface or in a cutbank. It is very likely that undiscovered significant buried sites would be destroyed during mining operations. In addition, there might not be mitigation related to the destruction of TCPs or sacred sites. The surface disturbance prediction of 195,700 acres of coal development could adversely affect 195 historic properties.

Leasable Minerals – Fluids (moderate adverse)
The approximate total acres disturbed associated with the construction of well sites, access roads, and pipelines are 14,869 acres. This could result in physical impacts to 14 historic properties, although there would be a much larger number of sites such as the Bozeman Trail and the Pumpkin Buttes TCP that would experience impacts to setting.

Salable Minerals (negligible adverse)
Under Alternative D, a predicted 1,193 acres of soils would be disturbed from salable minerals activities, with the potential to affect one historic property.

Fire and Fuels Management (minor beneficial)

Under Alternative D, restricting the use of heavy equipment for fire suppression within historic properties would benefit cultural resources by reducing an immediate threat of surface disturbance.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
Alternative D management of forests and woodlands would have no effect on cultural resources.

Vegetation – Grassland and Shrubland Communities (minor beneficial)
Only authorizing native plant species for reclamation would benefit cultural resources as immediate threats to the setting of sites would be reduced.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Prohibiting surface disturbance and applying NSO stipulations for riparian and wetland areas would have a beneficial effect on cultural resources. A buffer around riparian and wetland areas would prohibit surface disturbance on 23,831 acres of BLM surface and 144,045 acres overlying federal fluid minerals in areas with a high likelihood to have buried cultural deposits.

Invasive Species and Pests (no effect)
Alternative D management of invasive species and pests would have no effect on cultural resources.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (minor beneficial)
Increasing prohibitions on surface disturbance and applying NSO stipulations for the protection of fish and wildlife resources and special status species would have a beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Heritage and Visual Resources

Paleontological Resources (minor beneficial)
Prohibiting surface disturbance, closing to leasing, and withdrawing lands from minerals activities would have a beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Visual (minor beneficial)
Managing specific areas as VRM Class II and III could have a minor beneficial effect on cultural resources as immediate threats to the setting of sites would be reduced.

Land Resources

Alternative D management of **Forest Products, Recreation, and Lands with Wilderness Characteristics** would have no effect on cultural resources.

Lands and Realty (negligible adverse)
Land exchanges can result in adverse effects if historic properties leave public ownership. Inventory and associated mitigation of historic properties must be completed before exchanges. However, when considering Native American religious or traditional use of certain sites, it is difficult or impossible to mitigate direct effects on traditional cultural properties such as Pumpkin Buttes. The BFO would be responsible for managing any cultural resources on new lands the BLM might acquire. Overall, these management actions would have a negligible adverse effect on cultural resources.

Renewable Energy (minor adverse)
Excluding renewable-energy development within 3 miles of historic properties that retain their settings would have a beneficial effect on cultural resources. Restricting renewable-energy development more than 3 miles from historic properties but still visible to the properties that retain their settings would have a beneficial effect on cultural resources. Almost the entire planning area is within sight of at least one historic property that retains its setting. It is likely that any renewable-energy development authorized by the BLM would be required to mitigate impacts to the setting of at least one historic property. However, due to the scattered and interspersed land ownership pattern, there would likely be very few cases in which the BLM would be the lead agency authorizing this type of development. Overall the effect of renewable energy management actions on cultural resources would be minor adverse as there would be a slight but detectable change.

Rights-of-Ways and Corridors (moderate adverse)
Restricting authorizations for communications sites in South Middle Pumpkin Butte to existing towers and prohibiting towers on North Middle Pumpkin Butte would benefit cultural resources. Restricting facilities to protect visual integrity would have a beneficial effect on the settings of historic properties. The predicted disturbance from ROW actions is 38,762 acres of BLM surface, which would adversely affect 38 historic properties. Overall, due to the amount of disturbance, these management actions would have moderate adverse effects on cultural resources.

Travel and Transportation Management (minor beneficial)
Under Alternative D, prohibiting OHV use and limiting vehicle travel in the transportation alternatives would result in a minor beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Livestock Grazing Management (minor beneficial)
Any restriction of livestock grazing would have an indirect beneficial effect on cultural resources by reducing an immediate threat of surface disturbance.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
Under Alternative D, designating Pumpkin Buttes an ACEC would greatly benefit this TCP by making protection, preservation and enhancement of the Pumpkin Buttes TCP a priority. The cultural resource protections given to Cantonment Reno under this alternative negate the justification for determining the area an ACEC. Overall, ACEC management actions would have a moderate beneficial effect on cultural resources.

4.5.1.7. Cumulative Impacts

Actions outside of the scope of BLM authority have the potential to significantly impact cultural resources on and off federal lands. Because of the high visual contrast created by wind-energy projects, they can completely compromise the settings of historic properties, even if they are several miles away. Certain BLM actions intended to preserve the setting of any historic property could be negated by construction wind-energy projects on non-BLM-administered lands. For example, construction of a 200 turbine wind-energy project within 2 miles of the Pumpkin Buttes TCP would compromise the integrity of setting for part of the site. If this happens, the BLM might stop considering impacts to the setting of the TCP from federal undertakings.

Fee actions constructed in support of federal actions can result in impacts to historic properties. Large CBNG developments often include associated infrastructure that is not permitted through the BLM. Project applicants could connect wells to drain fee minerals, or use previously constructed pipelines on fee surface with a federal plan of development. The BLM has no authority over such private development, which can adversely affect historic properties. For example, the BLM approved several CBNG plans of development containing hundreds of individual wells near the Pumpkin Buttes TCP that were designed to blend into the natural environment to reduce impacts to the setting of the site. The operator also constructed a fee action pipeline with a large storage tank to dispose of water from federal and fee wells. The storage tank created a strong visual contrast to the setting of the TCP. Although the project resulted in an adverse effect, the BLM did not have any regulatory authority over the project.

The nature of split estate minerals development is complex. The BLM has the authority to modify or deny federal undertakings on private surface. However, that authority is limited to the extent of the federal approval. Historic properties on private surface are the property of the surface owner. A surface owner is not obligated to preserve or protect any historic properties they own. The BLM might go to great lengths to protect a site on private surface from a federal undertaking, but the same site can be legally affected by the landowner at any time.

The cumulative effect of numerous federal approvals can adversely affect historic properties. Archeological inventories reveal the locations of sites, and although the BLM goes to great lengths to protect site location data, that information can get into the wrong hands. BLM authorizations that result in new access can inadvertently lead to impacts to sites from increased visitation by the public. In addition, any time the BLM identifies a site to the public in an interpretive context, there is increased potential for vandalism or looting of the site.

4.5.1.8. Conclusion

Beneficial and adverse effects on cultural resources are typically a reflection of the amount of surface disturbance caused by an authorized activity. Therefore, Alternative B would provide the greatest protections for cultural resources, followed by Alternative D, Alternative A, and Alternative C. Table 4.58, "Summary of Impacts to Cultural Resources" (p. 1164)summarizes impacts to cultural resources.

Table 4.58. Summary of Impacts to Cultural Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Minor beneficial	Minor beneficial	Negligible adverse	Minor beneficial
Water Resources	Minor beneficial	Minor beneficial	No effect	Minor beneficial
Cave and Karst Resources	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Mineral Resources				
Locatable Minerals	Major adverse	Major adverse	Major adverse	Major adverse
Leasable Minerals – Coal	Major adverse	Major adverse	Major adverse	Major adverse
Leasable Minerals – Fluids	Moderate adverse	Negligible adverse	Moderate adverse	Moderate adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Planned Fire (Prescribed Fire)	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	Minor beneficial	No effect	Minor beneficial
Vegetation – Riparian/Wetland Resources	Minor beneficial	Minor beneficial	Negligible adverse	Minor beneficial
Invasive Species and Pest Management	Minor beneficial	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Special Status Species – Plants	No effect	Minor beneficial	Minor beneficial	Minor beneficial
Special Status Species – Fish	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Special Status Species – Wildlife	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Heritage and Visual Resources				
Cultural Resources	Minor beneficial	Major beneficial	Minor beneficial	Major beneficial
Paleontological Resources	No effect	Minor beneficial	No effect	Minor beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Visual Resources	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Land Resources				
Forest Products	Minor adverse	No effect	No effect	No effect
Lands and Realty	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Renewable Energy	Major adverse	Minor adverse	Major adverse	Minor adverse
Rights-of-Way and Corridors	Major adverse	Moderate beneficial	Major adverse	Moderate adverse
Travel and Transportation Management	Negligible adverse	Minor beneficial	No effect	Minor beneficial
Recreation	Minor beneficial	Minor beneficial	No effect	No effect
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	Minor beneficial	Minor beneficial	No effect	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	Major adverse	Major beneficial	Major adverse	Moderate beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.5.2. Paleontological Resources

Significant paleontological resources are almost always contained in the bedrock rather than in well-developed soil horizons or more recent alluvial material. Many BLM-administered lands in the planning area exhibit exposed or thinly covered bedrock or badlands topography, which results in a higher potential for the discovery of important fossil localities. Alternatives that include actions that would affect the bedrock could directly affect paleontological resources by physically altering, damaging, or destroying significant paleontological resources or their contextual settings. Alternatives that would increase or make access easier also could have indirect effects, including vandalism, theft of materials, and inadvertent physical damage to significant paleontological resources or their settings. Finally, disposing of lands containing paleontological resources would remove those resources from public ownership, which would mean the loss of any legal protections for those resources and the loss of opportunities for public collecting or education. Conversely, actions that result in data collection and preservation of paleontological resources through research or applied mitigation efforts can be considered beneficial. Acquiring lands with paleontological resources also would be beneficial to the public by providing important protections for significant paleontological resources and increasing opportunities for education and casual collecting.

Surface disturbance would be expected to result in short- and long-term adverse effects to paleontological resources. Short-term effects would occur at the time of disturbance and up to 5

years following disturbance, before full revegetation and soil stabilization. Long-term effects could occur beyond 5 years as a result of erosion that might be associated with altered drainage patterns or reclamation efforts that are not 100% effective in soil and landscape stabilization. This erosion could lead to accelerated exposure and subsequent damage to or loss of fossils and their contexts.

4.5.2.1. Methods and Assumptions

Methods and assumptions used in this impact analysis are:

- The management actions and allowable uses with the greatest potential to impact paleontological resources are surface-disturbing activities associated with all resources, changes in land ownership, public accessibility, and OHV use.
- Proactive paleontological resources management can lead to better knowledge, increased protections of those resources, and increased public benefits. Actions such as BLM-initiated studies, identification of hobby collecting areas, and public education and interpretation efforts can lead to better management and use of paleontological resources under all the alternatives. Inventories required before surface disturbance in high-probability areas would result in the identification and evaluation of previously undiscovered resources, which the BLM would then manage accordingly. Surface-disturbing and disruptive activities could dislocate or damage paleontological resources not discovered before surface disturbance (unanticipated discoveries). Destruction of these resources would result in a loss of scientific information and preclude interpretation of the resource values to the public.
- Significant paleontological resources will continue to be found in the planning area, either from the effects of natural erosion and exposure or through mitigation of surface-disturbing activities, as well as research activities.
- Adverse effects on paleontological resources from surface-disturbing activities occur primarily at the time of initial surface disturbance. Therefore, the projected acreage or mileage numbers for short-term surface disturbance are used to quantify impacts to paleontological resources. Erosion resulting from long-term surface disturbance also can adversely affect paleontological resources, but to much less extent because most reclamation efforts will be successful.
- BLM Washington Office Instruction Memorandum No. 2009-011 Assessment and Mitigation of Potential Impacts to Paleontological Resources, describe mitigation procedures for paleontological resources. All surface-disturbing activities and land tenure adjustments will follow the procedures in that memorandum.
- Proper application of standard paleontological mitigation practices will identify and recover many significant paleontological resources during disturbance actions.
- Locations of known paleontological resources will be protected either by avoiding the location or full recovery of significant fossils and all related data. Avoidance is the preferred approach in all cases. New locations discovered during mitigation actions will be avoided as much as possible, or full recovery of significant fossils and data will be completed before disturbance activities will be authorized to begin or to resume.
- It is likely that a some significant paleontological resources will be destroyed during surface-disturbing activities because they will not be seen or recovered. This will primarily be a function of the large size of machinery being used, the larger volume of material being disturbed or removed, and the relatively small size of many significant fossils.
- Paleontological resources are considered a part of the surface resource.

Significance Criteria

Adverse effects on paleontological resources would be significant if an action or development causes substantial direct or indirect damage to or destroys important paleontological resources.

4.5.2.2. Impacts Common to All Alternatives

Paleontological Resources (major beneficial)
The types of projected impacts to paleontological resources under the alternatives are similar – primarily physical damage, destruction, or other loss of significant fossils, or alteration or loss of contextual information. However, the intensity of these effects would vary by alternative. Implementing paleontological resource mitigation procedures would protect most paleontological resources and add to the overall public knowledge through recovery of significant fossils and their associated contextual data. However, mitigation measures also can adversely affect development of other resources or implementation of other actions by preventing or otherwise altering project locations or the degree of development. These adverse effects are anticipated to be relatively rare and minor in scope.

Management actions associated with paleontological resources would directly protect paleontological sites through restrictions on surface-disturbing and disruptive activities. These protective measures are required by law before any surface-disturbing or disruptive activity and include measures such as paleontological resource inventory and mitigation of potential effects, generally through avoidance. In areas where inventory, evaluation, and avoidance are not considered adequate to preserve paleontological resources, mitigation measures would be prescribed on a case-by-case basis, depending on the nature of the action and the type of paleontological resource involved. Mitigation measures would ensure that a proposed action would not significantly affect known paleontological sites. These management actions would apply to any proposed actions that have the potential to affect paleontological resources. Paleontological resource inventory, recordation, evaluation, and data recovery excavation would increase the site database and further our understanding of fauna and flora from geologic times. This increased knowledge would allow for the implementation of revised and more appropriate practices to manage future undertakings. Data recovery excavations would remove all or a portion of paleontological materials at sites, but would require an approved research design to minimize future data loss if new data-recovery and analysis techniques were developed.

Physical Resources (minor beneficial)

Management actions common to all alternatives for air quality and cave and karst resources would have a negligible effect on paleontological resources. Surface disturbance from management of soil resources would be evaluated on a project-specific basis. The effects of surface disturbance for actions associated with water resources would be managed. Overall, physical resources management actions common to all alternatives would have a minor beneficial effect on paleontological resources.

Mineral Resources (minor adverse)

Under all alternatives, most lands in the planning area would be open for minerals exploration and development. Mineral development with it's associated mitigation would have both adverse and beneficial impacts. Mitigation of paleontological resources associated with mineral development will have a beneficial impact as surface fossils will be documented. Surface resources will be identified, collected, and mitigated as the result of predisturbance activity. However, the

actual disturbance has the potential of adversely affecting unknown subsurface material. Thus, paleontological resources in the subsurface could be adversely impacted if operators do not recognize the fossils that may be inadvertently uncovered.

Locatable minerals activities shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains, such activities may require mitigation plans be in effect before and during surface-disturbing activities. Impacts to paleontological resources from activities associated with leasable coal and fluid minerals management would have the potential to directly and indirectly affect paleontological resources because of the amount of surface disturbance involved in those actions. Management actions for other leasable minerals would be minimal, since there is limited potential in the planning area. Overall the level of effect from mineral actions would be minor adverse.

Fire and Fuels Management (minor adverse)

Wildland fire suppression activities (e.g., constructing of fire lines, bulldozing access roads, and general movement of heavy equipment) and post-fire rehabilitation activities would have an adverse effect on paleontological resources. Displacing paleontological resources adversely affects the potential to understand the context of the site and limits the ability to extrapolate data. Because of the unplanned nature of wildland fires, effects on paleontological resources from wildland fires and suppression activities are generally assessed and mitigated subsequent to the fire.

Biological Resources (minor beneficial)

Actions designed to maintain vegetative resources and manage wildlife habitat would indirectly protect paleontological resources by managing surface disturbance and minimizing soil erosion. This would help prevent the degradation of soils that might contain paleontological resources.

Heritage and Visual Resources (negligible beneficial)

Cultural resources management actions common to all alternatives would have a negligible beneficial effect on paleontological resources. Visual Resources management actions common to all alternatives would have no effect on paleontological resources.

Land Resources

Lands and Realty (moderate beneficial)
Disposing of BLM surface with known or previously undocumented paleontological resources would have an adverse effect on paleontological resources because of the lack of protective measures when lands are under private ownership. However, before disposal, lands would be examined for significant resource values, including paleontological resource values. If significant values are present, the parcels with those values could be removed from the disposal or considered for other protective actions. Conversely, acquiring lands in the planning area would have a beneficial effect on paleontological resources because of the protective measures offered under federal ownership. Lands could be acquired through direct purchase, legislative mandates, donations, condemnations, or exchanges. Resource values could be included in the identification of desired parcels, so important paleontological resources could be targeted for acquisition. At present, there are no acquisitions pending specifically for paleontological values.

Rights-of-Way and Corridors (minor beneficial)
ROW management actions affect paleontological resources. Requiring paleontological resources inventory, recordation, and mitigation procedures in conjunction with ROW actions would help protect most paleontological resources from significant damage and increase the database of known paleontological resource sites.

Travel and Transportation Management (major adverse)
Any road creation or substantial improvement or maintenance work, or any increase in OHV use would result in increased access to public lands that might not presently be readily accessible. Road construction or new surface disturbance during maintenance also could adversely affect paleontological resources (see the discussion above on surface-disturbing activities). Therefore, adverse effects, such as looting, vandalism, and inadvertent physical damage, on previously remote paleontological resources could increase from an increase in use or development. Most use in Open areas is casual one-time use, so there would be very little increase in erosion, which typically is a result of repeated travel. If a vehicle drives directly on fragile fossils, significant paleontological resources could be damaged or destroyed, but this would be an extremely rare occurrence. Many of the existing roads and trails have not been examined for the presence of significant paleontological resources; therefore there would be a potential for loss of these resources on the acres presently in use. This would represent a major adverse effect on paleontological resources. OHV use on improved roads would have a negligible effect on paleontological resources. However, most unimproved two-track roads and vehicle routes in the planning area have not been inventoried for paleontological resources, which would increase the potential for unmitigated impacts. OHV use of these roads and vehicle routes would disturb or displace paleontological resources within the roadways. Inappropriate use of unimproved roads and vehicle routes by OHVs would accelerate erosion and indirectly disturb deposits that contain paleontological resources. Where effects on paleontological resources from OHV use are identified, there could be closures to motorized vehicle use to protect sensitive paleontological resources. Adverse effects on paleontological resources from OHV use off of roads and vehicle routes for necessary tasks would be negligible.

Recreation (moderate adverse)
Promoting recreation throughout the planning area could increase the amount of incidental or purposeful disturbance of paleontological resources. Unauthorized disturbance would result in displacement or loss (either complete or partial) of the paleontological resource involved. Displacement of paleontological resources adversely affects the potential to understand the context of the site and limits the ability to extrapolate data. Recreation management would affect paleontological resources by pursuing new access areas and consolidating public lands to increase recreational opportunities in these new areas, which would increase the potential for incidental or purposeful disturbance of paleontological resources. Facilitating use of these areas would result in increased surface-disturbing and disruptive recreational activity and the loss of vegetative cover, which would increase the potential to expose and destroy paleontological resources. The area of greatest overlap between paleontological resources and recreation is at the Dry Creek Petrified Tree site (2,567 acres).

Special Designations (minor beneficial)

Surface-use restrictions associated with management of special designation areas (ACECs, Scenic or BCBs, WSRs, and WSAs) would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological

information. Management could restrict the amount and size of surface disturbance, indirectly decreasing the potential to disturb buried paleontological deposits in special designation areas. Management of special designation areas would encourage recreation and development of facilities, which could result in direct damage to paleontological resources through surface-disturbing activities and indirect affect those resources through the greater presence of human activity. Paleontological resource surveys and appropriate mitigation would be completed before any new facilities were constructed in high-fossil-yield formations. Protections afforded to special designation areas (i.e., intensive management of surface-disturbing and disruptive activities) would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of data. ROW exclusion requirements and stipulations in special designation areas would provide the greatest level of protection by prohibiting surface-disturbing activities.

Socioeconomic Resources (negligible beneficial)

Management actions for socioeconomic resources would have a negligible beneficial effect on paleontological resources.

4.5.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to paleontological resources from management actions for those and other resources under Alternative A.

Paleontological Resources (major beneficial)
See Impacts Common to All Alternatives above.

Physical Resources (minor beneficial)

Alternative A management actions for air quality and cave and karst resources would have a negligible effect on paleontological resources. Surface disturbance from management of soil resources would be evaluated on a project-specific basis. Limited surface disturbance for management actions for Soil with NSO stipulations is allowed. The effects of surface disturbance for actions associated with water resources would be managed on a project-specific basis. Overall, Alternative A physical resources management actions would have a minor beneficial effect on paleontological resources.

Mineral Resources (minor adverse)

Under Alternative A, withdrawals and restrictions in specific areas would close these areas to locatable minerals entry and future land disposal actions. This would provide additional protections to paleontological resources in these areas by reducing surface-disturbing and disruptive activities and eliminating the possibility of placing undiscovered paleontological resources outside federal jurisdiction.

Mineral development with it's associated mitigation would have both adverse and beneficial impacts. Mitigation of paleontological resources associated with mineral development will have a beneficial impact as surface fossils will be documented. Surface resources will be identified, collected, and mitigated as the result of predisturbance activity. However, the actual disturbance

has the potential of adversely affecting unknown subsurface material. Thus, paleontological resources in the subsurface could be adversely impacted if operators do not recognize the fossils that may be inadvertently uncovered. Overall the level of effect would be minor adverse.

Fire and Fuels Management (minor beneficial)

Under Alternative A, wildland fire suppression activities would be limited, which could protect natural and cultural resources. This would help reduce damage to paleontological resources from suppression activities by considering these resources when determining the degree and locations of suppression activities.

Biological Resources (minor beneficial)

Alternative A would allow project-specific effects from biological resources management actions, and would prohibit surface-disturbing activities, occupancy, and disruptive activities in specific areas. Protections afforded for species and habitat would indirectly protect paleontological resources by restricting the amounts and sizes of disturbances that could adversely affect paleontological resources through displacement or loss. Surface-use restrictions associated with management of wildlife and fisheries would indirectly protect paleontological resources in specific areas by reducing the potential for unanticipated discoveries and subsequent loss of information about paleontological resources. Surface-disturbing and disruptive activities would be managed, and could restrict the amounts and sizes of surface disturbance, indirectly decreasing the potential to adversely affect paleontological deposits in these areas.

Heritage and Visual Resources (minor beneficial)

Cultural resources management actions common to all alternatives would have a minor beneficial effect on paleontological resources. Visual resources management actions would have no effect on paleontological resources.

Land Resources

No effects from management of **Forest Products, Renewable Energy, ROW and Corridors, or Lands with Wilderness Characteristics** are anticipated to occur to paleontological resources and will not be addressed further in this section.

Lands and Realty (minor beneficial)
Development activities associated with lands and realty actions could affect paleontological resources. Because of the large-scale nature of these types of developments, there would be a potential to adversely affect paleontological sites. Areas with important resource values such as significant paleontological resources would be avoided where possible to reduce the effects of these types of developments. Where it becomes necessary to place developments in the avoidance areas, effects would be intensively managed. In addition, oil and gas leasing, locatable minerals entry, and mineral materials disposals would be managed. This management could restrict the amounts and sizes of surface disturbance, decreasing the potential for adverse effects on paleontological deposits in these areas.

Under Alternative A, 117,427 acres of BLM surface are identified for disposal through sales or exchange due to small parcel size or other management considerations. This could have a major

adverse effect on paleontological resources. However, before disposal, these lands would be examined for significant resource values, including paleontological values. If significant values are present, the parcels with those values might be removed from the disposal or considered for other protective actions. Conversely, acquiring lands in the planning area would have a beneficial effect on paleontological resources due to the protective measures offered under federal ownership.

Travel and Transportation Management (major adverse)
Alternative A would seasonally open 29,011 acres to motorized travel, would designate motorized travel on 150,070 acres of existing roads and trails, and close 3,704 acres to motorized travel. Most use in Open areas would be casual one-time use, so there would be very little increase in erosion, which typically is a result of repeated travel. If a vehicle drove directly on fragile fossils, significant paleontological resources could be damaged or destroyed. However, this would be an extremely rare occurrence. Many of the existing roads and trails have not been examined for the presence of significant paleontological resources; therefore, there would be a potential for loss of these resources on the acres where motorized travel would be Open or Limited. This would have a major adverse effect on paleontological resources.

Recreation (minor beneficial)
Although there could be impacts to paleontological resources from recreation activities, Alternative A would manage certain recreation areas to limit surface disturbance. Applying an NSO stipulation for development activities in developed and undeveloped recreation sites and intensively managing such activity would limit surface disturbance and thereby help prevent damage to paleontological resources in these areas. Closing developed recreation sites to locatable minerals entry and mineral materials disposal would provide further protection from surface-disturbing and disruptive activities.

Livestock Grazing Management (minor beneficial)
Constructing livestock range improvements could damage or dislocate paleontological resources in these areas not discovered before surface disturbance. Standard inventory and mitigation procedures in high-fossil-yield areas in conjunction with range improvement actions would protect most paleontological resources from significant damage and would increase the database of known paleontological sites. A small but proportional number of these sites would be adversely affected as a result of unanticipated discoveries, but the effects would be mitigated through standard treatment measures. Designing livestock grazing systems to improve or maintain desired range conditions would maintain vegetative cover and soil stability, and thereby prevent the indirect exposure and deterioration of paleontological resources.

Special Designations (negligible adverse)

Alternative A would not designate ACECs and would continue current management of areas proposed for ACEC designation under other alternatives. If not designated wilderness, specific WSAs could be opened for oil and gas development. Alternative A management of special designations would have a negligible adverse effect on paleontological resources.

Socioeconomic Resources (negligible beneficial)

Alternative A effects on paleontological resources from management actions related to socioeconomic resources would be beneficial but negligible.

4.5.2.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to paleontological resources from management of those and other resources from implementation of Alternative B.

Paleontological Resources (major beneficial)
Alternative B would require paleontological surveys on all PFYC Class 3, 4, and 5 formations potentially affected by proposed activities, and would require monitoring of surface-disturbing activities on Class 4 and 5 formations and on Class 3 formations as needed. Alternative B would not specify areas for casual collecting; could designate special management areas for paleontological resources; could withdraw or close areas to locatable minerals leasing in areas of important paleontological resources; and could prohibit salable minerals exploration and development in areas of important paleontological resources. Assessments of paleontological resources would be actively solicited and cooperative agreements proactively supported under Alternative B. These management actions would have a major beneficial effect on paleontological resources.

Physical Resources (moderate beneficial)

Alternative B management of air quality and cave and karst resources would have a negligible effect on paleontological resources. Prohibited surface disturbance associated with management actions for soil and water would have a beneficial effect on paleontological resources.

Mineral Resources (minor adverse)

Alternative B effects on paleontological resources from minerals management would be similar to effects under Alternative A, but Alternative B would include more withdrawals and restrictions. However, there is always the opportunity with subsurface activities that paleontological resources will be damaged; therefore, the level of effect is minor adverse.

Fire and Fuels Management (minor adverse)

Under Alternative B, limiting the use of heavy equipment during fire suppression efforts would have a minor beneficial effect on paleontological resources. However, Alternative B includes full suppression of wildfires, which would allow fuels to build up and increase the intensity of wildfires. If wildfires increased in intensity, the result would be increased soil erosion, greater loss of vegetation, slower recovery of plant communities, and the consequential indirect deterioration of paleontological properties. The potential for damage to paleontological resources from fire suppression activities decreases when there are fewer surface-disturbing suppression activities.

Biological Resources (minor beneficial)

Alternative B would prohibit surface-disturbing activities, occupancy, and disruptive activities in specific areas, and apply NSO, CSU, and TLS stipulations in certain areas. Alternative B protections for fish, wildlife, and plant species and their habitats would indirectly protect paleontological resources by restricting the amounts and sizes of disturbances that could adversely affect paleontological resources through displacement or loss. Surface-use restrictions associated with management of wildlife and fisheries would indirectly protect paleontological resources in

specific areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information. Surface-disturbing and disruptive activities would be managed, which could restrict the amounts and sizes of surface disturbances, indirectly decreasing the potential to adversely affect paleontological deposits in these areas. Alternative B effects on paleontological resources from management of biological resources would be similar to effects under Alternative A, but Alternative B would include more restrictions on surface disturbance.

Heritage and Visual Resources (minor beneficial)

Alternative B cultural resources management actions, such as site stewardship, withdrawals from minerals exploration and development, closures to minerals leasing, and prohibitions on surface disturbance would have a minor beneficial effect on paleontological resources. Visual resources management actions would have no effect on paleontological resources.

Land Resources

Lands and Realty (moderate beneficial)
The BLM surface acreage identified for possible disposal under Alternative B is 120,722 acres and would represent a major adverse effect on paleontological resources. Consideration of resource values would affect the actual number of acres disposed of, and parcels with important resource values would be retained. Under this alternative, more restrictions would be applied during consideration of approvals, so resource values present in the tracts would more often result in retention of parcels. Disposing of BLM surface acres would adversely affect paleontological resources as described under Alternative A, but under Alternative B, fewer acres would be transferred to public ownership.

Travel and Transportation Management (major adverse)
The types of impacts anticipated to occur from road development and OHV use under Alternative B are the same as described for Alternative A, but less intense. Alternative B would include the least amount of development and the most restrictions (as represented by acres of surface disturbance listed in Appendix G (p. 1671)), and limit use of roads and trails or close roads and trails to use on 30% more acres than Alternative A. These actions would have an indirect, major adverse effect on paleontological resources, but the adverse effects would be less intense under Alternative B than under Alternative A.

Recreation (minor beneficial)
Alternative B management actions for recreation promote protection of paleontological resources. It is feasible that increased education could potentially reduce the level of vandalism or unauthorized removal of specimens.

Special Designations (moderate beneficial)

Alternative B would designate seven ACECs, including Dry Creek Petrified Tree and Pumpkin Buttes, both known to contain significant paleontological resources, and would prohibit surface-disturbing activities in those special designations. Motorized and mechanized equipment use would be prohibited in WSAs. Surface-use restrictions associated with management of special designation areas would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information. The Dry Creek Petrified Tree area would require intensive management of surface-disturbing

and disruptive activities. Intensive management could restrict the amounts and sizes of surface disturbance, indirectly decreasing the potential to disturb buried paleontological deposits.

Socioeconomic Resources (negligible beneficial)

Alternative B management of socioeconomic resources would have a negligible beneficial effect on paleontological resources.

4.5.2.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to paleontological resources due management of those and other resources from its implementation.

Paleontological Resources (moderate beneficial)
Alternative C would require paleontological resource surveys on all PFYC Class 4 and 5 formations potentially affected by proposed activities, could require monitoring on a project-specific basis, and could specify areas for casual collecting. Areas of important paleontological resources would not be designated under this alternative. Alternative C would not withdraw areas of important paleontological resources from locatable minerals entry, and would allow minerals leasing and salable minerals exploration in those areas. Partnerships to assess paleontological resources would be evaluated and established as appropriate.

Physical Resources (moderate adverse)

Under Alternative C, there would be negligible effects on paleontological resources from management actions associated with air quality and cave and karst resources. Soils management actions would allow surface-disturbing activities and water management actions would allow surface occupancy. There would be no NSO stipulations under Alternative C. Overall, Alternative C management of physical resources would have a moderate adverse effect on paleontological resources.

Mineral Resources (moderate adverse)

Under Alternative C, there would be no new locatable minerals withdrawals and all areas would be open to locatable minerals entry. This would provide fewer protections for paleontological resources by increasing surface-disturbing and disruptive activities.

Fire and Fuels Management (major adverse)

Alternative C would allow the use of heavy equipment for fire suppression and include full fire protection strategies and tactics. This would have a major adverse effect on paleontological resources because more wildland fires would be suppressed. Increasing suppression would increase the potential for catastrophic fires over the long term through the buildup of flammable materials that would damage a wider range of paleontological resource types.

Biological Resources (minor adverse)

Alternative C biological resources management would allow or include limited restrictions on surface-disturbing activities, surface occupancy, and disruptive activities in specific areas, and would not apply NSO, CSU, and TLS stipulations or would apply those stipulations in a limited manner in certain areas. This management would have a minor adverse effect on paleontological resources

Heritage and Visual Resources (minor beneficial)

Effects on paleontological resources from Alternative C management actions for cultural resources would be minor beneficial. Alternative C cultural resources management would not include site stewardship, minerals withdrawals, closures to minerals leasing, or prohibitions on surface disturbance. Visual resources management actions would have no effect on paleontological resources.

Land Resources

Lands and Realty (major adverse)
The BLM surface acreages identified for disposal under Alternative C is 120,722 acres, which would represent a major adverse effect. Considering resource values would affect the actual number of acres disposed of, and parcels with high resource values would be retained. Retention criteria under Alternative C would be at a lower level than under Alternative B, which would result in less acreage retained for resource values.

Travel and Transportation Management (major adverse)
The types of effects anticipated under Alternative C from road development and motorized vehicle use would be the same as those under Alternative A; however, there would be more acres under Alternative C where vehicle restrictions or closures would be applied than under Alternative A. Alternative C management would decrease development compared to Alternative A (as represented by surface disturbance numbers in Appendix G (p. 1671)), but would increase development and use compared to Alternative B. Alternative C would designate fewer acres for travel Limited to existing roads and trails or where travel is Closed than Alternative A.

Recreation (minor adverse)
Impacts from Alternative C for Recreation would generally be the same as those from Impacts Common to All as there would not be strict protective measures limiting surface disturbance in SRMAs.

Special Designations (negligible beneficial)

Alternative C would not designate ACECs, but would prohibit motorized and mechanized equipment in WSAs.

Socioeconomic Resources (negligible adverse)

Effects on paleontological resources from Alternative C management of socioeconomic resources would be negligible.

4.5.2.6. Alternative D

This section describes management actions and potential impacts to paleontological resources under Alternative D, which generally allows resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Paleontological Resources (major beneficial)
Under Alternative D, paleontological resource surveys would be required on PFYC Class 4 and 5 formations and Class 3 formations (as needed) potentially affected by proposed activities, and monitoring would be required for surface-disturbing activities based on survey results. Areas for casual collecting would not be specified; special management areas for paleontological resources could be designated; areas of important paleontological resources would be avoided during locatable and salable minerals development; NSO stipulations could be applied to minerals leases in areas of important paleontological resources; locatable minerals withdrawals and closures to minerals leasing in areas of important paleontological resources could be initiated; and salable minerals exploration and development in areas of important paleontological resources could be prohibited. Under Alternative D, partnerships to assess paleontological resources would be evaluated and established as appropriate, and cooperative agreements proactively supported. Alternative D management of paleontological resources would have a major beneficial effect on those resources.

Physical Resources (minor adverse)

Under Alternative D, there would be negligible effects on paleontological resources from management actions for air quality and caves and karst resources. The alternative would allow surface disturbances for management of soils and water, which would have a major adverse effect on paleontological resources.

Mineral Resources (minor adverse)

Alternative D effects on paleontological resources from locatable minerals and mineral materials management would be similar to effects under Alternative B.

Fire and Fuels Management (minor adverse)

Alternative D effects on paleontological resources from fire and fuels management would be similar to effects under Alternative B.

Biological Resources (minor beneficial)

Alternative D would prohibit surface-disturbing activities, surface occupancy, and disruptive activities in specific areas and would apply NSO, CSU, and TLS stipulations in certain areas. Effects on paleontological resources from Alternative D management of biological resources would be similar to effects under Alternative B.

Heritage and Visual Resources (minor beneficial)

Minor beneficial effects would occur for paleontological resources from Alternative D management actions for cultural resources that would include site stewardship, minerals withdrawals, closures to minerals leasing, prohibitions on surface disturbance, and NSO and CSU stipulations, and would allow surface disturbance in certain areas. Visual resources management actions would have no effect on paleontological resources.

Land Resources

Lands and Realty (major adverse)

The BLM surface acreages identified for possible disposal under Alternative D is 120,722 acres and therefore would represent a major adverse effect on paleontological resources. Considering resource values would affect the actual number of acres disposed of, and parcels containing important resource values would be retained. Under this Alternative D, restrictions would be applied during consideration of approvals, so resource values present in the parcels would more often result in the parcels being retained. Disposing of BLM surface acres would have an adverse effect on paleontological resources as described for alternatives A and B; however, under Alternative D, acres transferred out of public ownership would be appropriately assessed for paleontological resources before disposal.

Travel and Transportation Management (moderate beneficial)
The types of effects from road development and OHV use under Alternative D would be the same as under alternatives A, B, and C, but the intensity of effects would vary. In relation to the other alternatives, Alternative D includes determinable amounts of assessment and mitigation. These actions would have an indirect adverse effect on paleontological resources. Alternative D largely limits vehicle use to designated routes, while alternatives A and C would Open areas to such use. Keeping vehicles to defined routes under Alternative D should help protect paleontological resources better than alternatives A and C.

Recreation (minor beneficial)
Alternative D management actions for recreation seeks to balance recreational opportunities with protection of paleontological resources. It is feasible that increased education could potentially reduce the level of vandalism or unauthorized removal of specimens.

Special Designations (moderate beneficial)

The ACEC with the greatest overlap of paleontological resources (Dry Creek Petrified Tree) would not be designated. However, Pumpkin Buttes TCP would protect some paleontological resources. Alternative D would prohibit motorized and mechanized equipment use in WSAs. Surface-use restrictions associated with management of special designations would indirectly protect paleontological resources in these areas by reducing the potential for unanticipated discoveries and subsequent loss of paleontological information.

Socioeconomic Resources (negligible beneficial)

Effects on paleontological resources from management actions for socioeconomic resources be negligible beneficial.

4.5.2.7. Cumulative Impacts

Effects on paleontological resources from past and present actions (federal and non-federal) are part of the affected environment and are described in Chapter 3. Effects from foreseeable federal actions are described by alternative above. The primary non-BLM-authorized activities in the planning area relate to energy development, including ROW and livestock grazing. Non-federal actions will affect paleontological resources similar to federal actions; however the extent of disturbances and mitigation measures would vary. Paleontological resources belong to the surface estate and, except for leasable minerals, typically are not mitigated unless the surface estate is federal. Adverse effects to paleontological resources would likely be greater on non-federal surface, because there would be fewer federal mitigation measures implemented.

4.5.2.8. Conclusion

Allowable uses and management actions described for the alternatives were used to determine potential effects on paleontological resources. Meaningful differences in surface-disturbing activities; land disposal and acquisition; transportation and access; and proactive management form the basis for the following conclusion: Effects on paleontological resources under the alternatives would be similar, but the intensity of effects would vary by alternative. Proactive paleontological resource management actions would result in beneficial effects under all alternatives. Potential effects on paleontological resources under Alternative A would be the most adverse, whereas potential effects under alternatives B and D would be the least adverse. Potential adverse effects on paleontological resources under Alternative C would be approximately intermediate in intensity.

Table 4.59, “Summary of Impacts to Paleontological Resources” (p. 1179) summarizes impacts to paleontological resources.

Table 4.59. Summary of Impacts to Paleontological Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible adverse
Soil	Minor beneficial	Moderate beneficial	Moderate adverse	Minor adverse
Water Resources	Minor beneficial	Moderate beneficial	Moderate adverse	Minor adverse
Cave and Karst Resources	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Leasable Minerals – Coal	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Leasable Minerals – Fluids	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Salable Minerals	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor beneficial	Minor adverse	Major adverse	Minor adverse
Planned Fire (Prescribed Fire)	Minor beneficial	Minor adverse	Major adverse	Minor adverse
Biological Resources				
Vegetation – Forests and Woodlands	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Grassland and Shrubland Communities	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Vegetation – Riparian/Wetland Resources	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Invasive Species and Pest Management	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Special Status Species – Plants	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Special Status Species – Fish	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Special Status Species – Wildlife	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Heritage and Visual Resources				
Cultural Resources	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Paleontological Resources	Major beneficial	Major beneficial	Moderate beneficial	Major beneficial
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	Minor beneficial	Moderate beneficial	Major adverse	Major adverse
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	Major adverse	Major adverse	Major adverse	Moderate beneficial
Recreation	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	Minor beneficial	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	Negligible adverse	Moderate beneficial	Negligible beneficial	Moderate beneficial
Scenic or Back Country Byways	Negligible adverse	Moderate beneficial	Negligible beneficial	Moderate beneficial
Wild and Scenic Rivers	Negligible adverse	Moderate beneficial	Negligible beneficial	Moderate beneficial
Wilderness Study Areas	Negligible adverse	Moderate beneficial	Negligible beneficial	Moderate beneficial
Socioeconomic Resources				
Social and Economic Conditions	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Health and Safety	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial

4.5.3. Visual Resources

BLM-administered public lands contain many outstanding scenic landscapes. While these lands provide a place to enjoy the beauty of nature, they also are used for a multitude of other activities. Any activities on these lands, such as recreation, mining, timber harvesting, grazing, or road development have the potential to disturb the surface of the landscape and adversely affect scenic values. VRM is a system for minimizing the visual effects of surface-disturbing activities and maintaining scenic values for the future. Disturbances that draw the viewer's attention or contrast with the basic elements (form, line, color, or texture) of a given landscape affect the viewer's perceptions.

Adverse effects include the addition of visual intrusions such as roads and facilities, or the removal of natural materials such as soil and vegetation). Beneficial are normally a direct result of post-disturbance reclamation efforts. Allowable uses and management actions that could affect visual resources primarily include surface development and vegetation management.

4.5.3.1. Methods and Assumptions

The BFO completed a Visual Resources Inventory in 2009 (BLM 2009b). This visual resources impacts analysis and its conclusions include a review of the VRI for the planning area, coordination with BLM specialists and information provided by cooperating agencies.

This section describes the methods and assumptions used in the impact analysis for visual resources. The assumptions and methods include, but are not limited to:

- VRM class objectives are not discretionary; all BLM-administered lands will be managed to meet the VRM objectives established during the RMP revision, and all subsequent management actions will be held to that objective. VRM class objectives provide for varying degrees of change to (effect on) the visual quality of the landscape and vary by alternative.
- Projects located on BLM surface or minerals should be designed or mitigated to meet the established VRM objectives of a given location. A management action will have a significant effect on visual resources if that action does not conform to the corresponding VRM class for each alternative.
- If VRM objectives are not incorporated into project design or able to be mitigated in a site-specific analysis, either the application must be denied, an EIS must be prepared or the land use plan must be amended to assign the appropriate VRM Class that would accommodate approval of a permit or action.
- The VRI was created using quantifiable and consistent methods to classify the planning area based on the visual attributes and the visual sensitivity of the area.
- For site-specific projects, the visual resource analysis will focus on the individual visual values (Scenic Quality, Sensitivity and Distance Zones) in context of aesthetic elements and their relative frequency in the landscape rather than the aggregated values assigned through a VRI class.
- Scenic resources will remain in demand from local residents who want to maintain scenic quality, local businesses that depend on tourism, and increasing numbers of recreationists in the planning area.
- Temporary structures, defined as present on BLM-administered lands or as part of approved development of BLM-administered minerals for less than 90 days, are not subject to visual effects mitigation.

- Future development and other land use activities described under each alternative are compared to recommended VRM classes, existing visual conditions, and the degree of measurable contrast to the natural environment to determine potential effects.
- To adequately describe the potential effects under each alternative in the context of the capacity for differing landscapes to absorb visual intrusions, actions potentially affecting visual resources are divided into general categories, as follows: high-profile developments, low-profile or short-term projects, and resource management prescriptions.
- A contrast rating evaluation will be performed for all surface-disturbing activities in VRM Class I, II, and III areas to determine effects on visual resources. Effects on visual resources that would not meet VRM class objectives will require mitigation in accordance with the VRM objectives. Contrast rating evaluations may or may not be required for high visual impact activities and projects in VRM Class IV areas. All projects within VRM Class IV will be required to minimize and mitigate effects to visual resources.
- Trends in visual change can be quantified using the scoring for Cultural Modification in the VRI in comparison to implementation of a proposed action.
- The USDA Forest Service manages approximately 720,000 acres of surface within the planning area. This analysis does not include those lands and includes no determination on visual resources management of lands outside of BLM jurisdiction. However, the objectives outlined for visual resources on lands manage by USDA Forest Service (or other federal agancies, as appropriate) will be taken into consideration and consultation will take place for compatible visual/scenic resource management across jurisdictional boundaries where applicable.
- Management decisions that limit the amount of surface disturbance or that encourage the placement of projects away from the viewshed of publicly accessible areas and routes (roads, trails, and navigable waterways) will benefit visual resources, but must be weighed against impacts to other resources (soil, wildlife, etc.).
- Most oil and gas development is expected to occur in the PRB.
- Coal mining operations would be most likely to occur in Campbell County (PRB).
- Disposal of public lands would remove all VRM designations and accompanying objectives for protection of their scenic values.

The following terms are used to define the extent of environmental consequences:

- Negligible – The effect on the visual resource would be barely detectable; general stipulations would be sufficient to mitigate adverse effects on the visual resource. This term would also be used to describe impacts from prescription of a particular VRM class for less than 1% of the BLM-administered land in the planning area.
- Minor – The effect on the visual resource would be slight but detectable; there would be a small change in the visual resource. General stipulations would not be sufficient to mitigate adverse effects on the visual resource; additional review or simulations might be necessary. This level of impact is considered to be out of conformance with VRM Class I, II, and III management objectives, which may require additional mitigation of proposed actions, serve as the basis for denying the proposed action, or require a land use plan amendment to alter the VRM Class to one compatible with proposed action. This term would also be used to describe impacts from prescription of a particular VRM class for 1-5% of the BLM-administered land in the planning area.
- Moderate – The effect on the visual resource would be readily apparent; there would be a measurable change in the visual resource. General stipulations would not be sufficient to mitigate adverse effects on the visual resource; alternative sites or a change in project design might be necessary. This level of impact is considered to be out of conformance with

VRM Class I, II and areas of visual sensitivity, which may require additional mitigation of proposed actions, serve as the basis for denying the proposed action, or require a land use plan amendment to alter the VRM Class to one compatible with proposed action. This term would also be used to describe impacts from prescription of a particular VRM class for 5–10% of the BLM-administered land in the planning area.

- Major – The effect on the visual resource would great; there would be a highly noticeable, long-term, or permanent measurable change at the project site. Administrative stipulations would not be sufficient to mitigate adverse effects on the visual resource; alternative sites or a change in project design would be necessary. This level of impact is considered to be out of conformance with VRM Class I, II and III, which may require additional mitigation of proposed actions, serve as the basis for denying the proposed action, or require a land use plan amendment to alter the VRM Class to one compatible with proposed action. This term would also be used to describe impacts from prescription of a particular VRM class for 10% of the BLM-administered land in the planning area.
- An adverse effect on the visual quality of the landscape occurs when a management action creates noticeable surface disturbance that contrasts with the form, line, color, or texture of the landscape. The intensity of such effects would vary by alternative and by project based on the scale of development and the designated VRM class.
- Activities that require substantial road building, clearing of vegetation, or other activities that introduce noticeable visual contrast to the landscape have the greatest potential to affect visual resources. Even when such activities meet the established VRM objectives, their adverse effects should be mitigated when possible. Low-profile, dispersed developments (e.g., range improvements) have less effect due to the increased ability to blend this development with natural landscapes. High-profile developments (such as transmission lines and wind turbines) have more effect on the visual environment due to increased visibility and less ability to mimic natural elements.
- Visual resources would be degraded primarily by surface-disturbing activities, such as those associated with ROW construction (e.g., pipelines, transmission lines, and communications lines) and oil and gas facilities (e.g., well pads, reserve pits, and roads). The development of permanent structures would result in long-term degradation of scenic quality and in some cases could become the dominant feature on the landscape. The degree of effect would depend on the projected amount of development and the effectiveness of mitigation measures (design strategies such as siting, painting, and screening). Other activities, such as vegetation manipulation (e.g., prescribed fire) and OHV use, would affect scenic quality by removing soil and vegetation and creating temporary, short-term intrusions on the landscape.
- Project development would affect all landscape character elements, as follows:
  - **Form** – By introducing forms such as clearings in the vegetation or structures that contrast with natural forms of the landscape.
  - **Line** – By introducing lines such as roads or ROW that contrast with natural lines.
  - **Color** – By causing changes in color such as exposing soil or introducing structures with colors that contrast with the natural colors in the landscape.
  - **Texture** – By changing the texture of the land or structures; for example, by placing a smooth structure against a coarse background of vegetation.

Significance Criteria

In addition to the scale of effects described above, an adverse effect on visual resources as a result of project actions would be considered potentially significant if:

- An action would violate objectives associated with VRM and its magnitude would be such that it cannot be mitigated at the site-specific analysis level.
- An proposed action would be inconsistent with the objectives for the VRM class in the project area and a land use plan amendment would be necessary to accommodate the action.

4.5.3.2. Impacts Common to All Alternatives

This section describes specific management actions and resulting impacts to visual resources common to all alternatives. The generic changes to the basic visual elements from a typical action is discussed where applicable, however, only the impact from the "common to all" alternatives are considered when discussing the scale of impacts. There would be no impacts from **Cave and Karst Resources, Lands and Realty, Social and Economic Conditions, and Health and Safety**, and these resources will not be discussed further in the Visual Resources section.

Visual Resources (minor beneficial)
Managing WSAs under VRM Class I objectives is mandated through WO-IM-2000-096 (BLM 2000b) and helps to meet WSA management goals and objectives per BLM Manual 6330 – Management of Wilderness Study Areas (BLM 2012c). The visual quality of WSAs will be protected under both Manual 6330 (BLM 2012c) and the VRM Class I objectives, which would retain visual quality until Congress provides alternative direction for their management. WSRs generally are managed as VRM Class I areas. In total 30,101 acres would be managed as VRM Class I. Providing for automatic alteration of the VRM class of a designated WSR (Middle Fork Powder River is suitable, eligible and recommended) would eliminate the need for an RMP amendment when Congress acts. The objectives for VRM Class I management allow virtually no change to the visual character of the landscape. In Class II areas, projects may be seen but may not create enough effect (i.e., contrast with the surrounding landscape) to attract the attention of the casual observer. Therefore, there would be no effect on the visual quality of the landscape in Class I areas, and effects in Class II areas would be negligible. However, ongoing resource use and development in Class III and Class IV areas would have the potential to adversely affect visual resources. This is particularly true in areas that are currently natural in appearance.

Although resource development activities may meet VRM Class III and Class IV objectives, the fact that projects are seen and attract attention (Class III) or may dominate the view of the casual observer (Class IV) means they would affect visual resources (the scenic quality or character of the landscape). For Class III and Class IV areas that currently have ongoing development activities, additional development would add to the cumulative effects from development in those areas. In other words, more surface disturbance or structures would add to the cumulative effects of resource development on the visual quality of the landscape. Requiring permanent facilities and structures to blend with the surrounding landscape (except where safety dictates otherwise) would help protect visual resources in the planning area.

Physical Resources

Air Quality (minor beneficial)
Working with stakeholders to reduce dust emissions would improve visibility and would have a slight but detectable beneficial effect on visual resources. Air quality monitors consist of an aluminum frame equipped with monitoring systems that collect air quality and weather data. Currently, there are two monitors on BLM-administered land in the planning area, and agency partners have requested several additional monitors in the planning area. If

properly mitigated through site placement and painting with standard environmental colors, the small number of additional monitors would have a slight adverse effect. Overall, the air quality management actions have a minor beneficial effect on visual resources management.

Soil and Water Resources (moderate beneficial)
Actions protecting soil or water resources would generally benefit visual resources by maintaining the natural character of the landscape. Requiring an approved reclamation plan for surface-disturbing activities would have a readily apparent and moderate beneficial effect on visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals (minor adverse)
Effects on visual resources from the extraction of solid minerals depend on the methods used and the size of operation. Materials stockpiles and reserve pits also would create color contrast between the greens of vegetation and the browns of soils. Support structures from any aboveground support facilities also would affect line, form, color, and texture by introducing vertical lines from buildings into a predominately horizontal landscape. Colors would contrast between the greens of vegetation and the building colors. Buildings introduce a smooth texture into a more coarse texture of the vegetation, and a more geometric square or rectangular form into the more random and irregular form of the landscape. Depending on the sizes and geographic extents of operations, minerals activities could attract the attention of the casual observer.

Leasable Minerals - Coal (major adverse)
Large-scale surface mining is highly noticeable, nearly impossible to mitigate visually, and would have a major adverse effect on visual resources during the life of the mine. The line, form, color, and texture of mined areas would be affected through the removal of vegetative cover and stockpiled materials, which would create form contrast between the mined areas and the stockpiled materials and the background landforms. Materials stockpiles and reserve pits also would create color contrast between the greens of vegetation and the browns of soils. Texture would change from a natural medium, subtle texture of vegetation to a course, rough contrast of disrupted soils and organic materials. There could be changes in line from the irregular, weak line of the natural landscape to a regular, strong line between natural vegetation and disturbed landscape. The impact would affect only the portions of the planning area that are within the viewshed of the mine and would generally be limited to southern and central Campbell county.

Leasable Minerals - Fluids (major adverse)
Opening all oil and gas mineral estate to leasing except where specifically identified as administratively unavailable could have a major impact to visual resources across all alternatives. Continuing to develop fluid minerals resources would affect the visual environment through surface disturbance and construction related to the recovery of minerals resources. Deferring fluid minerals leasing to accommodate recovery of coal resources would result in a stronger contrast in affected areas over the short term, because coal extraction requires more intensive disturbance of the land than fluid minerals.

Effects from mineral resource development is often further intensified by the presence of lights. The ability to substantially shield the nighttime sky from the ambient light created by fluid minerals drilling operations is somewhat limited by operational safety requirements. Night lighting in the immediate area of gas field development, and potentially in large areas surrounding the gas fields, would significantly reduce the nighttime viewing experiences of individuals.

Visual resources in areas available for minerals resource development would likely be more substantially affected over the long term. Portions of the field office with mineral potential classified as VRM Classes II would have the highest level of conflict between mineral development and VRM objectives. Mineral resource development with appropriate mitigation would be compatible in VRM Class III and IV areas, but would still produce impacts to the aesthetic environment.

Fire and Fuels Management (negligible beneficial)

Fuels reduction and unplanned ignitions result in localized, temporary alteration of the landscape. The effects of fire and fuels reduction in the planning area would be negligible to minor. Rehabilitating fire lines will reduce the impacts to visual resources, resulting in fewer adverse effects from wildfire and prescribed burns. The effects of rehabilitating fire lines would be short-term and negligible beneficial.

Unplanned and prescribed fires affect visual resources by changing the line, color, and texture of burned areas in contrast to the surrounding unburned areas. Line would change from a more regular, smooth line to an irregular, jagged line along the adjacent burned and unburned area in the foreground and middleground zones. Short-term effects on color would be expected in burned areas until the areas were revegetated. Fire can enhance color over time by creating more diversity in the hues and colors associated with a more diverse vegetative composition. Vegetative texture can change from a medium to fine, dense texture in natural areas to a coarse, sparse texture in burned areas as a result of fire. Burned areas, if viewed in the foreground-middleground and background zones, would attract the attention of the casual observer and would be minor and adverse.

Biological Resources

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, and Riparian/Wetland Resources, Invasive Species and Pest Management, and Fish and Wildlife Resources – Fish (moderate beneficial)
Management actions designed to protect vegetation resources would generally protect scenic quality and landscape character. However, vegetative treatments (chemical or mechanical) can have a temporary adverse affect on visual resources. Proposed treatments would be subject to interdisciplinary review before implementation to reduce adverse effects. Management of vegetation, riparian areas, and fish habitat would generally limit the amount of surface-disturbing activities and associated removal of vegetation. Measures to prevent noxious weeds would reduce the amount of non-native (and often visually contrasting) vegetation present in the planning area, resulting in a beneficial effect to visual resources. Where these actions overlap with VRM Class I and Class II areas, there would be an increase in the potential for such landscapes to retain or preserve their existing visual character. Overall, the vegetation and fish management actions would have a moderate beneficial effect on visual resources management.

Fish and Wildlife Resources – Wildlife and Special Status Species – Plants, Fish, and Wildlife (moderate beneficial)
Restrictions on facility development related to wildlife concerns are generally beneficial to VRM. However, constraints based on wildlife will likely take precedence over VRM when proposed mitigation measures for VRM conflict with sensitive wildlife resources (e.g., a well cannot be relocated closer to a raptor nest to reduce impacts to visual resources; or wind turbines become

more visible to prevent wildlife collision). Management of vegetation diversity and structure would benefit visual resources as long as the basic elements of the landscape are repeated; if applied across the planning area, the effects would be moderate and long term.

Actions designed to prevent surface disturbance (e.g., CSU and NSO stipulations) and disturbance to wildlife and special status species would indirectly limit the level of change to characteristic landscapes, which would benefit VRM. Where these actions overlap with VRM Class I and Class II areas, there would be an increase in the potential for such landscapes to retain or preserve their existing visual character.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (moderate beneficial)
Measures to protect cultural and paleontological resources generally benefit visual resources. The visual landscape is considered a component of the cultural setting, and areas considered important to Native Americans would likely experience additional protection for retention of natural visual settings.

Land Resources

Forest Products (minor adverse)
Timber and firewood harvest activities would have effects similar to those described above for fire and fuels management because timber activities can primarily affect line, form, color, and texture. The removal of trees changes the density of vegetation, a characteristic of texture. Changes in line from the irregular, weak line of the natural landscape to a regular, strong line between natural vegetation and the harvest area depends on the harvest technique. Removing vegetation changes form from the irregular shape of the vegetation to a regular geometric shape. There would be changes in color from the deeper hue of trees to the more diverse colors of lower-growing vegetation. Clear-cutting would have the greatest effect on visual resources, while select cutting would have the least. Depending on the size of the operation, timber harvest activities could attract the attention of the casual observer in the foreground-middleground and background zones, and even the seldom seen zone. These effects would be limited to the portions of the planning area that are forested (mostly located in the southern Big Horn Mountains), which would have a minor adverse effect on visual resources. Forest products would potentially impact visual resources where harvest of minor wood products through the sale of permits would occur. Some of these harvests would potentially occur in VRM Class II areas, but the acreage would be small and locations of harvest would not be readily visible from key observation points, so visual impacts are anticipated to be minor and short term.

Renewable Energy (minor adverse)
Cooperation with stakeholders to coordinate renewable energy development could produce either an adverse or beneficial effect on visual resources. It can be surmised from the alternative that wind-energy development would be allowed except in areas made administratively unavailable to renewable energy. Promoting opportunities for scientific research and renewable energy would likely include the placement of meteorological towers, which are temporary, tall structures equipped with blinking lights. The adverse effects on visual resources from wind-energy development are difficult to mitigate. Current regulations require turbines to be painted white, usually a noticeable difference from the colors of the natural landscape. Additionally, the requisite red blinking lights detract from the naturalness of the night sky. There are also changes

to the line and form of the landscape as a consequence of placing large (250-400 feet) vertical structures, with motion, in a horizontal landscape. Wind turbines could conceivably be allowed within VRM Class III areas with appropriate mitigation and by siting facilities at an adequate distance (~8 miles or more) away from Key Observation Points to reduce the visual dominance to a scale appropriate to the landscape setting. The portions of the field office with the highest wind potential are generally located in areas with the most unique and intact visual settings. Developing guidelines for determining where wind-energy may be developed would be the first step in projecting effects on visual resources. Renewable energy development would significantly detract from the typical visual settings in the planning area by creating linear and focal visual intrusions on the horizon, and would create an industrial setting. The scale of impacts will be dependent on the size and location of a given project.

Rights-of-Way and Corridors (minor adverse)
Land use authorizations such as leases and ROW could adversely affect visual resources. Most of effects from utilities would be from support structures for powerlines, communications sites, and weather stations, which would introduce straight, vertical lines into a horizontal landscape. Effects on color would include changes from the matte greens of natural vegetation to glossy reflective colors of metal structures and other colors of facilities such as buildings or towers. Effects on texture and form would include changes from irregular, random textures of vegetation to smooth, definite geometric shapes of buildings. Collocating ROW would reduce the overall disturbance in the planning area, but could temporarily increase adverse effects on visual resources on a localized level. Below-ground utilities and some above-ground facilities associated with ROW would be compatible with VRM Class II if properly mitigated.

Travel and Transportation Management (minor adverse)
Travel and transportation management would maintain an adequate road network across the planning area. Development of the transportation network within the planning area would potentially alter visual resources and would likely attract the attention of a casual observer. Adverse effects on visual resources from route construction or OHV use include changes in color, line, and texture on the landscape. In addition, fugitive dust from construction activities and from the use of gravel or natural material roads also has an adverse effect on visual resources. However, fugitive dust is a short-term effect that can be temporary and would depend on the amount of traffic on a road. Limiting travel to designated routes rather than allowing travel on existing routes would benefit visual resource as undesignated routes would be closed and allowed to reclaim. Designating areas Open to OHV use would adversely affect visual resources through road proliferation and vegetation loss. Designating areas “Closed” to OHV use would protect visual resources from the effects of unsustainable OHV use. Road closures and restricted access would enhance the visual settings of the area by removing contrasting linear elements from the natural landscape. Impacts from travel and transportation management would have minor adverse effects on visual resources.

Recreation (minor adverse)
Recreation activities such as development of recreational facilities would affect visual resources by introducing straight, vertical lines and smooth textures into a predominantly horizontal, random landscape. Increased use of existing and new facilities would affect visual resources by introducing different colors into a predominantly green and brown landscape. Some of the facilities could be made of reflective materials, making them more visible from long distances. Buildings and other structures introduce a more geometric square or rectangle form into the more random and irregular form of the landscape. Proper design and construction techniques can reduce effects on visual resources from recreation facilities and help maintain a

more natural-appearing landscape. If viewed from a higher observation point, facilities and recreation activities in the foreground-middleground zone would attract the attention of the casual observer. Depending on size, facilities in the background zone also could attract the attention of the casual observer. As viewed from ground level, only activities in the foreground-middleground zone would attract the attention of the casual observer.

Lands With Wilderness Characteristics (minor beneficial)
Protections related to lands with wilderness characteristics would vary by alternative; however, the LWC area would generally benefit from visual resource management if managed according to the inventory class or if afforded VRM Class II protection through alternatives related to the management of wilderness characteristics.

Livestock Grazing Management (minor beneficial)
Livestock grazing management and rangeland management often require the construction or maintenance of range improvements, including fences and stockwater tanks. While such features can create contrast in the line and texture of the landscape, range improvements are usually low-profile developments with a minor effect on visual resources. Implementing the *Wyoming Standards for Healthy Rangelands* would reduce the potential for overgrazing, which can create a contrast in the color and texture of the landscape. The beneficial effect on visual resources from rangeland management across the planning area would be minor and long term.

Special Designations (minor beneficial)

Stipulations to protect areas with special designations would generally protect visual resources. The three WSAs are currently managed under BLM Manual 6330 – Management of Wilderness Study Areas, which provides protection for the visual setting. Similarly, the Middle Fork Powder River is managed under Manual 6400 which protects the canyon and the viewshed of the river corridor. Protections related to ACECs and BCBs would vary by alternative. Table 4.60, "Estimated BLM Surface Acreage of Visual Resource Management Classes by Alternative" (p. 1189) and Table 4.61, "Estimated BLM-Administered Mineral Acreage of Visual Resource Management Classes by Alternative" (p. 1190) list the estimated BLM surface and mineral estate acreages of VRM classes under each alternative.

Table 4.60. Estimated BLM Surface Acreage of Visual Resource Management Classes by Alternative

	Alternative A[1]	Alternative B	Alternative C	Alternative D
VRM Class I (acres)	30,101	30,101	30,101	30,101
VRM Class II (acres)	127,594	218,178	0	112,350
VRM Class III (acres)	63,717	275,315	167,334	379,385
VRM Class IV (acres)	559,674	259,594	584,500	260,265

Source: BLM 2012f

[1]The 1985 RMP did not designate any Class I areas, but the three WSAs and Middle Fork Powder River corridor that is suitable and eligible for WSR designation are managed as such. The 1985 RMP did designate 702 acres of Class V, which is no longer a VRM classification.

BLM Bureau of Land Management
VRM Visual Resource Management

Table 4.61. Estimated BLM-Administered Mineral Acreage of Visual Resource Management Classes by Alternative

	Alternative A[1]	Alternative B	Alternative C	Alternative D
VRM Class I (acres)	30,050	38,830	38,830	38,830
VRM Class II (acres)	341,880	448,243	394,935	233,625
VRM Class III (acres)	422,138	1,377,260	1,416,421	1,590,575
VRM Class IV (acres)	4,009,209	2,938,944	2,953,091	2,940,247

Source: BLM 2012f

[1]The 1985 RMP did not designate any Class I areas, but the three WSAs and Middle Fork Powder River corridor that is suitable and eligible for WSR designation are managed as such. The 1985 RMP did designate 702 acres of Class V, which is no longer a VRM classification.

BLM Bureau of Land Management
VRM Visual Resource Management

4.5.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. This section describes potential impacts to visual resources from management actions for those and other resources under Alternative A. The following resources would have no discernible impacts under Alternative A: **Air Quality, Water Resources, Grassland and Shrubland Communities, Livestock Grazing Management, Scenic and Back Country Byways, Wilderness Study Areas, and Socioeconomic Resources.**

Visual Resources (moderate adverse)
Alternative A would place almost 71% of BLM surface in the planning area in VRM Class IV, which allows effects on visual resources that would change the character of the landscape and would dominate the view of the casual observer. Only 19% of BLM surface would be managed as VRM Class II areas and approximately 10% as VRM Class III.

The current VRM classes cannot be traced to a science-based study of the planning area and therefore could be considered arbitrary. Careful consideration should be given to a quantifiable method for assigning the VRM classes. Current VRM classes were designed to protect visual resources along major travel routes; however, the mixed land tenure along many routes (e.g., Interstate 90) can make protection of visual resources across the landscape obsolete. In addition, the current VRM classes do not adequately account for visual resource management of recently acquired parcels. Finally, using visual simulations on a project-specific basis has resulted in inconsistent VRM mitigation measures applied across the planning area due to discrepancies in the level of analyses for proposed actions in relation to visual resources, particularly in VRM Class III and IV areas. A more uniform approach to using these simulations (e.g., based on visual sensitivity and VRM class) would benefit visual resources.

Physical Resources

Soil (moderate beneficial)
Prohibiting surface-disturbing activities in areas of severe erosion, on steep slopes and in areas with poor reclamation potential will generally reduce development in areas with high visibility (slope faces) and would produce moderate beneficial effects visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals (major adverse)
Under Alternative A, locatable minerals would be restricted in WSAs (28,931 acres) and winter game ranges (4,583 acres), a minor beneficial impact to the visual resource. For salable minerals, prohibitions are limited to the WSAs only, producing a minor beneficial effect on visual resources. However, the majority of the planning area would remain open to locatable and salable mineral development, resulting in a net major adverse effect on visual resources.

Leasable Minerals - Coal and Fluids (major adverse)
Under Alternative A, 96% of the planning area would be available for oil and gas leasing or for coal development, and effects from accompanying development would be widespread throughout the area. Effects would include those from low-profile developments such as access roads and CBNG wells and high-profile developments such as open pit mines and oil rigs. The adverse effect on visual resources in the PRB would be major and long term. Elsewhere in the planning area, the effect of mineral resource development would be less severe.

Fire and Fuels Management (minor beneficial)

Under Alternative A, restricting the use of heavier or larger types of suppression equipment in some areas could benefit visual resources, because the extent of disturbance related to fire suppression often increases as the size of equipment increases. Rehabilitating disturbance related to fire and fire suppression could temporarily increase the amount of disturbance in an area, but the long-term effects on visual resources would be beneficial.

Biological Resources

Vegetation – Forests and Woodlands, Riparian/Wetland Resources, and Invasive Species and Pest Management (minor beneficial)
There were slight but detectable beneficial impacts from the forests and woodlands resource through stipulations of vegetation treatment design. Additionally, prohibitions on surface-disturbing activities within 500 feet of water produced a minor beneficial impact to visual resources from the riparian/wetland resource. Controlling noxious weeds is also generally beneficial to the visual resource.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (no effect)
Management related to biological resources that may affect visual resources were generally not previously addressed. There would be little to no effect from fish, wildlife and all special status species resources in Alternative A.

Heritage and Visual Resources

Cultural Resources (moderate beneficial)
Management alternatives related to cultural resources that may affect visual resources were generally not previously addressed. However, some provisions to protect the viewshed of the Bozeman Trail and Pumpkin Buttes were applied in Alternative A. The overall impact to the visual resource is moderate and long term.

Paleontological Resources (no effect)

Management related to paleontological resources that may affect visual resources were generally not previously addressed. There would be little to no effect from paleontological resources in Alternative A.

Land Resources

Forest Products (minor adverse)
Basing timber harvest on a desired production level could adversely affect visual resources by producing an unsustainable level of forestry activity. A size limitation on individual clear-cuts would benefit visual resources by restricting the amount of vegetation removal on a local scale. Fencing regeneration areas would adversely affect visual resources over the short term by drawing attention to the area, but would have a beneficial effect over the long term by promoting successful regeneration. Overall, impacts from forest product activities using best management practices would have a slight but detectable, minor adverse effect on visual resources.

Renewable Energy (moderate adverse)
Under Alternative A, renewable energy issues would be considered on a project-specific basis. Wind-energy development would not be compatible with areas currently classified as VRM Class II without a plan amendment. The majority of the southern Big Horn Mountains, which is the area with the highest wind potential, would be protected under this alternative. Conversely, the majority of the PRB would likely allow wind-energy development under Alternative A.

Rights-of-Way and Corridors (minor adverse)
ROW associated with utilities or roads would create linear features across the landscape. However, Alternative A would have less stipulations on the placement of ROW and above ground utilities. The degree of impact would depend on the scale of the individual project. Overall a minor adverse effect is anticipated on visual resources management.

Travel and Transportation Management (minor adverse)
Alternative A would designate more areas as Open compared to other alternatives. This could allow unmanaged OHV use, to the detriment of visual resources as user created routes often produce contrast with natural vegetation.

Recreation (negligible beneficial)
Management alternatives related to recreation resources that may affect visual resources were generally not previously addressed. Stipulations to protect recreational opportunities in Mosier Gulch and Dry Creek Petrified Tree would also protect visual resources. Overall, there would be a negligible beneficial effect from recreation in Alternative A.

Lands With Wilderness Characteristics (no effect)
There were no decisions related to Lands with Wilderness Characteristics in Alternative A. Thus, there would be no effect from this resource.

Special Designations

Areas of Critical Environmental Concern and Wild and Scenic Rivers (no effect)
There were no decisions related to ACECs or WSRs in Alternative A. Thus, there would be no effect from these resources.

4.5.3.4. Alternative B

This section describes management actions under Alternative B, which emphasizes resource conservation, and the likely impacts to visual resources from implementation of Alternative B. Effects would be similar to those described under Impacts Common to All Alternatives, and also would include the following:

Visual Resources (major beneficial)
Alternative B would place 67% of BLM surface in the planning area in VRM Class III and Class IV, which provide for varying degrees of visual effects from resource development activities. Compared to Alternative A, the acreage in Class II would be increased to 28% of the planning area and the acreage in Class III would be increased to 35%. The acreage in Class IV would be decreased to 33% of the planning area.

Basing VRM classifications on the corresponding VRI class provides some consistency between an objective science-based inventory and management decisions. This approach will further require that the BLM consider the existing character of the landscape identified in the VRI (BLM 2009b) and the context of the individual scenic quality, sensitivity and distance zones at the site-specific analysis level to ensure VRM Class Objectives are met. By including special emphasis areas in VRM Class II, sensitive visual resources are ensured administrative protection. Currently, several areas with high recreational value or cultural significance are managed as VRM Class III and Class IV. Managing special emphasis areas as VRM Class II would ensure that the visual resources are adequately protected, which in turn, would protect the unique settings and other resource values present in these areas. Prohibiting surface disturbance in areas with historic properties to retain the integrity of the setting also would retain the integrity of the visual resources. However, constraints based on cultural resources will likely take precedence over VRM when proposed mitigation measures for VRM conflict with an eligible cultural site. Completing a visual simulation and mitigation design for all proposed actions within or viewable from VRM Classes I, II, and III would benefit visual resources because potential effects for sensitive areas would be properly identified and mitigated.

Physical Resources

Soil (moderate beneficial)
Prohibiting surface-disturbing activities in areas of severe erosion, on steep slopes and in areas with poor reclamation potential will produce moderate beneficial effects visual resources by decreasing the likelihood of development in area with high visibility (slopes).

Mineral Resources

Locatable Minerals and Salable Minerals (moderate adverse)
Alternative B proposes the greatest restrictions to mineral resource development, however, the adverse effects to visual resources from permissible locatable and salable development would remain scattered throughout the planning area. Development would be readily apparent to the casual observer within the viewshed of each project. The net effect to the visual resource would be moderate and adverse.

Leasable Minerals – Coal and Fluids (moderate adverse)
Under Alternative B, nearly half of the planning area would be administratively unavailable for

oil and gas leasing and a quarter would be unavailable for coal development. The remaining lands would be subject to additional constraints compared to Alternative A. Development would be readily apparent to the casual observer within the viewshed of each project. The adverse effect on visual resources in the PRB would be moderate and long term. Elsewhere in the planning area, the effect of mineral resource development would be less.

Fire and Fuels Management (minor beneficial)

Under Alternative B, limiting heavy equipment usage for fire suppression to areas immediately adjacent to existing roads would benefit visual resources because future disturbance from such equipment would be limited to areas of existing disturbance. Rehabilitating disturbance related to fire and fire suppression could temporarily increase the amount of disturbance in an area, but the long-term effects would benefit visual resources.

Biological Resources

Vegetation – Forests and Woodlands and Riparian/Wetland Resources, Invasive Species and Pest Management, Fish and Wildlife Resources – Fish, and Special Status Species – Plants and Fish (minor beneficial)
Alternative B management actions would limit the amount of surface disturbance compared to Alternative A by encouraging the placement of structures away from the viewshed of waterways, which often are sensitive to disturbance due to public support for the recreational values present. Measures to protect vegetation would benefit visual resources.

Fish and Wildlife Resources – Wildlife (minor beneficial)
Increasing prohibitions on above-ground powerlines would benefit visual resources because the disturbance time associated with burying lines is shorter and the disturbance is less noticeable than traditional aboveground utility lines. Requiring installation of anti-perching devices on new high-voltage powerlines could increase the visibility of the powerlines, increasing the level of effects on visual resources at a local level.

Special Status Species – Wildlife (minor adverse)
Any action that increases the visibility of human structures, including fencing designs for the protection of Greater Sage-Grouse, would be detrimental to visual resources. Considering the VRM classes designated under this alternative, the small size of the fence markers, and the relative size of Greater Sage-Grouse habitat where theses measures would be applied, on a planning area basis the effect should be minor. Prohibitions on development related to protection of sensitive species (buffering leks, riparian areas, etc.) may also increase protection of visual resources in the PRB and along creeks and rivers. However, protection of sensitive species would likely take priority over protection of visual resources in site-specific decisions. The overall impact is expected to be minor and long-term.

Heritage and Visual Resources

Cultural Resources (moderate beneficial)
Initiating withdrawals to protect cultural resources would produce a beneficial effect on visual resources. Specifically, a protection of the visual horizon up to 5 miles from historic properties would include a substantial portion of the planning area. The overall impact to the visual resource is moderate and long term.

Paleontological Resources (negligible beneficial)
Initiating withdrawals or closing to leasing to protect paleontological resources would produce a beneficial effect on visual resources. Given the small portion of the planning area with high quality specimens, the overall impact to the visual resource would be negligible.

Land Resources

Forest Products (minor beneficial)
Designing timber harvest areas to have meandering boundaries, follow topography, and avoid natural barriers would help mitigate adverse effects on visual resources. The benefits would be detectable by the casual observer.

Renewable Energy (major beneficial)
Renewable energy development would be excluded from the majority of the planning area, a major beneficial effect to visual resources. Considering the VRM classifications, wind development potential and renewable energy exclusion and avoidance areas, very little development would be permitted under this alternative.

Rights-of-Way and Corridors (minor beneficial)
While disturbance associated with ROW development generally creates adverse impacts to visual resources, ROW grants would avoid the placement of above-ground facilities along major transportation routes to protect visual resources. This would result in a minor beneficial effect to visual resources along routes. Collocation of ROW and facilities would be required, which would increase the visibility of a project at the site-specific level, but would benefit visual resources overall by reducing the amount of surface disturbance.

Travel and Transportation Management (moderate beneficial)
Designating areas Closed to OHV use and limiting OHV use in other areas to designated roads and trails would increase the ability to protect such areas from OHV-related effects on visual resources. Alternative B would close or limit motorized use across much of the planning area, and would result in considerably fewer adverse effects on visual resources as a result of unmanaged motorized recreation.

Recreation (moderate beneficial)
Under Alternative B, designating eight SRMAs (55,529 acres; 7.0% of BLM surface) would increase the acreage under VRM Class II management. Additionally, development within SRMAs would be restricted, to the benefit of the visual resources.

Lands With Wilderness Characteristics (minor beneficial)
Under Alternative B, 12,237 acres (1.5% of BLM surface) would be managed as VRM Class II. Additionally, development within the LWC would be restricted, to the benefit of the visual resources.

Special Designations

Areas of Critical Environmental Concern (major beneficial)
Designation of eight ACECs (536,304 acres; 65% of BLM surface) under Alternative B would substantially increase the acreage managed as VRM Class II. Almost all of the ACECs include scenic values as relevant and important, and designation would increase protections for visual resources.

Wild and Scenic Rivers (negligible beneficial)
Under Alternative B, the outstanding and remarkable values, including visual values, of the Middle Fork Powder River would be protected regardless of a Congressional designation. The Middle Fork Powder River canyon (9.5 miles in length, 0.5-mile buffer of river; 0.7% of BLM surface) would be managed as VRM Class II.

4.5.3.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource use, and the likely resulting impacts to visual resources due management of those and other resources from its implementation.

Effects under Alternative C would be similar to those described under Impacts Common to All Alternatives, and also would include the following:

Visual Resources (major adverse)
Alternative C would place 95% of BLM surface in the planning area in VRM Classes III and IV, which provide for varying degrees of effects on visual resources from resource development activities.

This alternative would result in the greatest degree of adverse effects on visual resources of any of the alternatives. The Alternative C surface acreage under VRM Class IV management would be 584,500 acres; the surface acreage under VRM Class III management would be 167,334 acres (21%), and no areas would be designated as VRM Class II. This alternative would allow effects on visual resources that would change the character of the landscape and dominate the view of the casual observer (Class IV) on 74% of the total public land surface in the planning area. Effects would result from surface disturbance and construction of structures, primarily (but not exclusively) from the oil and gas industry. Vegetative manipulation, range improvement projects, and communications facilities also would affect visual resources. There would be adverse effects on form, line, color, and texture.

BLM would generally manage high visual values for moderate levels of visual change under this alternative. Managing VRI Class II areas as VRM Class III areas would reduce the protection of visual resources in VRI Class II areas that were formerly protected under the VRM Class II objectives. Such management is not likely to adequately protect sensitive areas such as recreation areas and cultural sites. Allowing surface disturbance in areas with historic properties could affect visual resources because mitigation would be decided on a project-specific basis. Under Alternative C, areas with VRI Class III values would be managed for major modification that may visually dominate the landscape under a VRM Class IV designation. The adverse effects could be major and long term. Finally, using visual simulations on a project-specific basis has resulted in inconsistent VRM mitigation measures applied across the planning area due to discrepancies in the level of analyses for proposed actions in relation to visual resources, particularly in VRM Class III and IV areas. A more uniform approach to using these simulations (e.g., based on visual sensitivity and VRM class) would benefit visual resources.

Physical Resources

Soil (moderate adverse)
Allowing surface disturbing-activities in areas of severe erosion, on steep slopes which are

highly visible, and in areas with poor reclamation potential will produce moderate adverse effects visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals (major adverse)
The effects from locatable and salable minerals would essentially be the same as Alternative A.

Leasable Minerals - Coal and Fluids (major adverse)
Under Alternative C, most of the planning area would be available for oil and gas leasing, and adverse effects on visual resources from accompanying development would be widespread throughout the planning area. Effects would include those from low-profile developments such as access roads and CBNG wells and high-profile developments such as oil rigs. The adverse effect in the PRB would be major and long term. Elsewhere in the planning area, the adverse effect on visual resources from mineral resources development would be less severe.

Fire and Fuels Management (minor adverse)

Under Alternative C, using heavy equipment for fire suppression with few tactical constraints could be inconsistent with visual resource values. Heavy equipment would be likely to increase the amount of disturbance in a given area compared to hand tools. Rehabilitating only suppression-related damage would ignore damage from wildfire and prescribed fire. The effects on visual resources would depend on the locations and extents of such fires, but should be minor and short term.

Biological Resources

Vegetation – Forests and Woodlands (moderate adverse)
Utilizing intensive management tactics such as large clear-cuts would have a minor effect on visual resources depending on the location and intensity of related projects.

Vegetation – Riparian/Wetland Resources, Invasive Species and Pest Management, Fish and Wildlife Resources – Fish, and Special Status Species – Plants and Fish (minor adverse)
Under Alternative C, removing limitations on the amount of surface disturbance in the viewshed of waterways would have an adverse effect on visual resources. The effect of allowing surface disturbance near streams and waterways would be minor and long term.

Fish and Wildlife Resources – Wildlife (negligible adverse)
The effect of not requiring operators to bury all new low-voltage utility lines or to require anti-perching devices on powerlines would increase visibility and generally be adverse.

Allowing facility development or prohibiting renewable-energy projects and occupancy in elk crucial winter range and calving areas would have adverse effects on visual resources. Under Alternative C, visual resources will be considered on a case-by-case basis as projects are proposed.

Special Status Species – Wildlife (no effect)
Under Alternative C, there would be no special provisions to increase visibility of fencing, thus there would be no effect on visual resources from this alternative.

Heritage and Visual Resources

Cultural Resources (moderate adverse)
Alternative C allows for surface disturbance with appropriate mitigation, but does not define standards. Therefore adverse effects to the setting of historic properties and visual resources are likely. The overall impact to the visual resource is moderate and adverse.

Paleontological Resources (negligible adverse)
Withdrawals or closing to leasing to protect paleontological resources would not occur under Alternative C. Given the small portion of the planning area with high quality specimens, the overall impact to the visual resource would be negligible.

Land Resources

Forest Products (moderate adverse)
Under Alternative C, allowing timber harvests without limits on the sizes or shapes of harvest areas could adversely affect visual resources. Under this alternative, visual resources would be considered on a case-by-case basis as projects are proposed. Depending on the size and location of projects, the effect would be moderate.

Renewable Energy (major adverse)
Renewable energy development would be allowed where consistent with other resource values. Because Alternative C would not designate any VRM Class II areas and would place the vast majority of the planning area in VRM Class IV, wind-energy development could take place across the planning area with little requirements for visual mitigation. The effects to the visual resources would be major and adverse.

Rights-of-Way and Corridors (moderate adverse)
ROW grants would not avoid the placement of above-ground facilities along major transportation routes to protect visual resources, resulting in a moderate adverse effect to visual resources.

Travel and Transportation Management (negligible adverse)
Under Alternative C, designating areas Open to OHV use could adversely affect visual resources through road proliferation and vegetation loss. On the other hand, designating areas Closed to OHV use and limiting OHV use to designated roads and trails would increase the ability to protect such areas from OHV-related effects on visual resources. This alternative would open fewer acres to OHV use than Alternative A and would therefore result in fewer adverse effects on visual resources than Alternative A.

Recreation (minor beneficial)
While several SRMAs would be designated (30,570 acres; 3.9% of BLM surface), and recreational use would be a priority in those areas, there would essentially be no protective management decisions associated with SRMAs.

Lands With Wilderness Characteristics (no effect)
There would be no prescriptions related to protection of lands with wilderness characteristics, and therefore there would be no effect from this resource.

4.5.3.6. Alternative D

This section describes management actions and potential impacts to visual resources under Alternative D, which generally allows resource use if the activity can be conducted in a manner

that conserves physical, biological, and heritage and visual resources, and emphasizes moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Effects on visual resources under Alternative D would be similar to those described under Impacts Common to All Alternatives, and also would include the following:

Visual Resources (moderate beneficial)
Alternative D would place 81% of BLM surface in the planning area in VRM Classes III and IV, which provide for varying degrees of effects on visual resources from resource development activities. This alternative would allow effects on visual resources that would change the character of the landscape and dominate the view of the casual observer (Class IV) on 260,265 acres or 32% of the total BLM surface in the planning area. Class II management would encompass 112,350 acres (14%) of the planning area, and the Class III management would affect 379,385 acres (49%).

Basing VRM classifications on the corresponding VRI class provides some consistency between an objective science-based inventory and management decisions. This approach will further require that the BLM consider the existing character of the landscape identified in the VRI (BLM 2009b) and the context of the individual scenic quality, sensitivity and distance zones at the site-specific analysis level to ensure VRM Class Objectives are met. By including special emphasis areas in VRM Class II, sensitive visual resources are ensured administrative protection. Currently, several areas with high recreational value or cultural significance are managed as VRM Class III and Class IV. Managing special emphasis areas as VRM Class II would ensure that the visual resources are adequately protected, which in turn, would protect the unique setting and other resource values present in these areas. Prohibiting surface disturbance in areas with defined historic properties to retain the integrity of the settings also would retain the integrity of the visual resources at the local level. However, constraints based on cultural resources would likely take precedence over VRM when proposed mitigation measures for VRM conflict with an eligible cultural site. Completing a visual simulation and mitigation design for all proposed actions in VRM Class I and II areas and sensitive Class III areas would benefit visual resources because potential effects to sensitive areas would be properly identified and mitigated.

Physical Resources

Soil (minor beneficial)
Increasing requirement for reclamation related to surface-disturbing activities in areas of severe erosion, on steep slopes, and in areas with poor reclamation potential will produce minor beneficial effects visual resources.

Mineral Resources

Locatable Minerals and Salable Minerals (moderate adverse)
Alternative D proposes moderate restrictions to mineral resource development, however, the adverse effects to visual resources from permissible locatable and salable development would remain scattered throughout the planning area. The net effect to the visual resource would be moderate and adverse.

Leasable Minerals – Coal and Fluids (major adverse)
Under Alternative D, the majority of the planning area would be available for oil and gas leasing, and adverse effects on visual resources from accompanying development would be widespread

throughout the planning area. The remaining lands would be subject to additional constraints compared to Alternative A, but the measures would generally be insufficient to prevent a substantial impact to the visual resource. The adverse effect in the PRB would be major and long term. Elsewhere in the planning area, the effect of mineral resources development would be less severe.

Fire and Fuels Management (minor beneficial)

Under Alternative D, limiting the use of heavy equipment for fire suppression to areas immediately adjacent to existing roads would benefit visual resources because future disturbance from such equipment would be limited to areas of existing disturbance. Rehabilitating disturbance related to fire and fire suppression could temporarily increase the amount of disturbance in an area, but the long-term effects would benefit visual resources.

Biological Resources

Vegetation Resources, Invasive Species and Pest Management, Fish and Wildlife Resources – Fish, and Special Status Species - Plants and Fish (negligible beneficial)
Management decisions under Alternative D that limit the amount of surface disturbance or encourage placement of structures away from the viewshed of waterways, which often are sensitive to disturbance due to public support for the recreational values present, would benefit visual resources. Restrictions on facility development or renewable-energy projects are generally beneficial to visual resources. Utilizing intensive management tactics would have an adverse effect on visual resources depending on the location and intensity of related projects. The beneficial and adverse management actions interact to result in an overall negligible. beneficial effect on visual resources.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (negligible beneficial)
Requiring new low-voltage utility lines to be buried would benefit visual resources because the disturbance time associated with burying lines is shorter and the disturbance less noticeable than traditional aboveground utility lines.

Modifying fences to protect Greater Sage-Grouse could increase the visibility of fences and could adversely affect visual resources. Considering the VRM classifications designated under this alternative, the small size of the fence markers, and the relative size of Greater Sage-Grouse habitat where theses measures would be applied, on a planning area basis the adverse effect should be negligible.

Heritage and Visual Resources

Cultural Resources (moderate beneficial)
Applying NSOs and increasing stipulations on surface disturbance to protect cultural resources would produce a beneficial effect on visual resources. The overall impact to the visual resource is moderate and long term.

Paleontological Resources (negligible beneficial)
Applying NSOs and increasing stipulations on surface disturbance to protect paleontological resources would produce a beneficial effect on visual resources. Given the small portion of the

planning area with high quality specimens, the overall impact to the visual resource would be negligible.

Land Resources

Forest Products (minor adverse)
Under Alternative D, failure to place limitations on timber harvest size would increase the potential size of a forestry action and could adversely affect visual resources through the potential permitting of larger-scale operations. Because of resource protections set forth under other resources (ACECs, etc.) in areas with commercial timber, the overall impact to visual resources would be minor.

Renewable Energy (major beneficial)
Renewable energy development would be excluded from the portions of the planning area with the highest VRM classifications, a major beneficial effect to visual resources. Given the VRM classifications, wind development potential and renewable energy exclusion and avoidance areas, some development would be permitted under this alternative, but would likely take place out of the more visually desirable portions of the planning area.

Rights-of-Way and Corridors (negligible beneficial)
ROW grants would require a resource protection plan for the placement of above-ground facilities along major transportation routes to protect visual resources, resulting in a negligible beneficial effect to visual resources. Collocation of ROW and facilities would be preferred, which would increase the visibility of a project at the site-specific level, but would benefit visual resources overall by reducing the amount of surface disturbance.

Travel and Transportation Management and Recreation (moderate beneficial)
Designating areas Open to OHV use would reduce the potential for adverse effects on visual resources through road proliferation and vegetation loss. On the other hand, designating areas Closed to OHV use and limiting OHV use to designated roads and trails would increase the ability to protect such areas from OHV-related effects on visual resources. This alternative would open many fewer acres to OHV use than Alternative A and would therefore result in considerably fewer adverse effects on visual resources from unmanaged motorized recreation than Alternative A. Under Alternative D, designating eight SRMAs would increase the acreage under VRM Class II management.

Recreation (moderate beneficial)
Under Alternative D, designating seven SRMAs (54,160 acres; 6.9% of BLM surface) would increase the acreage under VRM Class II management. Additionally, development within SRMAs would be restricted, to the benefit of the visual resources.

Lands with Wilderness Characteristics (negligible beneficial)
Under Alternative D, 6,864 acres (0.9% of BLM surface) would be managed as VRM Class II. Additionally, development within the LWC would be restricted to the benefit of the visual resources.

Special Designations

Areas of Critical Environmental Concern (moderate beneficial)
Under Alternative D, designation of three ACECs would increase the acreage under VRM Class

II management. Each of the ACECs includes scenic values as relevant and important, and designation would increase protections for visual resources.

Wild and Scenic Rivers (negligible beneficial)
Under Alternative D, the outstanding and remarkable values, including visual values, of the Middle Fork Powder River would be protected regardless of a Congressional designation.

4.5.3.7. Cumulative Impacts

Renewable-energy projects, utility and pipeline projects, communications towers, oil and gas development, and other surface-disturbing developments would degrade the scenic quality of landscapes because of associated roads, barren ground, and facilities associated with industrial development. These effects on visual resources would result primarily from surface disturbance combined with other industrial activities on both federal and non-federal lands. Development activities on private and state lands with no federal jurisdiction would have the greatest potential for cumulative effects on the natural setting of the landscape. Large-scale and high-profile developments such as wind turbines and communications towers and disturbance areas would affect the integrity of settings. In combination with these, some large-scale developments on lands outside federal jurisdiction would alter the landscape surrounding these sites to the point that the development would exceed the prescribed VRM objectives. The incremental damage to and loss of visual integrity would result in a landscape altered from a natural setting to an industrial setting. Under all alternatives, adverse effects on visual resources would be avoided or mitigated by VRM program actions, through special designations, and through BMPs and by VRM program actions (contrast ratings, visual simulations and mitigation measures, etc.) or COAs prescribed to protect visual resources.

Historic uses in the planning area include livestock grazing, forestry actions, and conventional oil production. These uses have negligible to minor effects on visual resources. In the past 10 years, increased minerals extraction in the planning area has resulted in widespread surface disturbance and linear utility development that have altered the appearance of the landscape.

The presence of federal (BLM and USFS) lands in the planning area has an overall affect on visual resources because the BLM and the USFS are required to consider scenic resources. Although management activities by other federal agencies would likely maintain or enhance visual resources through management objectives or mitigation measures, surface-disturbing activities on non-federal land adjacent to BLM surface could affect visual resources if activities that are incompatible with prescribed VRM class objectives occur in the viewsheds of those areas.

4.5.3.8. Conclusion

Under Alternative A, the direct effect on visual setting associated with surface disturbance and facility development would continue throughout the planning area and have the potential to affect areas that are highly valued by the public, such as cultural sites and recreational areas, more than all other alternatives. This conclusion is based on the outdated VRI under Alternative A.

Overall, Alternative B would have the fewest adverse impacts to visual resources because other management actions under this alternative would be restricted to certain geographic areas, cover proportionately less area, or would be buffered from other resources, therefore producing smaller, more localized disturbances to visual resources. Alternatives A and C would allow considerably more disturbance compared to Alternative B, while Alternative D would allow slightly more

disturbance. The order of the alternatives in ascending degree of potential severity of effects on visual resources from least adverse to most adverse is Alternative B, Alternative D, Alternative A, and Alternative C.

Table 4.62, "Summary of Impacts to Visual Resources" (p. 1203) summarizes effects on visual resources.

Table 4.62. Summary of Impacts to Visual Resources

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Moderate beneficial	Moderate beneficial	Moderate adverse	Minor beneficial
Water Resources	No effect	No effect	No effect	No effect
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	Major adverse	Moderate adverse	Major adverse	Moderate adverse
Leasable Minerals – Coal	Major adverse	Moderate adverse	Major adverse	Major adverse
Leasable Minerals – Fluids	Major adverse	Moderate adverse	Major adverse	Major adverse
Salable Minerals	Major adverse	Moderate adverse	Major adverse	Moderate adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Minor beneficial	Minor beneficial	Moderate adverse	Minor adverse
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	Minor beneficial	Minor beneficial	Minor adverse	Negligible beneficial
Invasive Species and Pest Management	Minor beneficial	Minorbeneficial	Minor adverse	Negligible beneficial
Fish and Wildlife Resources – Fish	No effect	Minor beneficial	Minor adverse	Negligible beneficial
Fish and Wildlife Resources – Wildlife	No effect	Minor beneficial	Negligible adverse	Negligible beneficial
Special Status Species – Plants	No effect	Minor beneficial	No effect	Negligible beneficial
Special Status Species – Fish	No effect	Minor beneficial	Minor adverse	Negligible beneficial
Special Status Species – Wildlife	No effect	Minor adverse	No effect	Negligible beneficial
Heritage and Visual Resources				
Cultural Resources	Moderate beneficial	Moderate beneficial	Moderate adverse	Moderate beneficial
Paleontological Resources	No effect	Negligible beneficial	Negligible adverse	Negligible beneficial
Visual Resources	Moderate adverse	Major beneficial	Major adverse	Moderate beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Land Resources				
Forest Products	Minor adverse	Minor beneficial	Moderate adverse	Minor adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Moderate adverse	Major beneficial	Major adverse	Moderate beneficial
Rights-of-Way and Corridors	Minor adverse	Minor beneficial	Moderate adverse	Negligible beneficial
Travel and Transportation Management	Minor adverse	Moderate beneficial	Negligible adverse	Moderate beneficial
Recreation	Negligible beneficial	Moderate beneficial	Minor beneficial	Moderate beneficial
Lands with Wilderness Characteristics	No effect	Minor beneficial	No effect	Negligible beneficial
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	Major beneficial	No effect	Moderate beneficial
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	Negligible beneficial	No effect	Negligible beneficial
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6. Land Resources

4.6.1. Forest Products

4.6.1.1. Methods and Assumptions

This section describes potential effects on the forest product program from BLM management of resources and resource uses under the alternatives. The *Forest Products* section of Chapter 3 describes the BLM forest products program. Actions that reduce the utilization of forest products are considered adverse; actions that promote forest product use are considered beneficial.

Assumptions

- This impact analysis and its conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information from other agencies.
- Spatial analysis was performed using the ESRI ArcGIS 10.0 computer software.
- Effects are quantified where possible. In the absence of quantitative data, best professional judgment was used. Effects are sometimes described using ranges of potential impacts or in qualitative terms, if appropriate.

- Forest inventory data were collected in 2005.
- The resource analysis concentrates on the 16,234 acres of BLM surface within the six forest management areas, because that is where most forest product activities are predicted to occur. However, because opportunities and interest arise in the scattered woodlands for various products, the analysis also considers those lands.

Short-term effects would result during initial surface disturbance (product removal) before commercial quality product is regenerated, or from decreases to forest product quality. Long-term adverse effects would be changes in the sustainabilty of the desired forest products. The scale of effects would be the same as identified in the Introduction of Chapter 4.

4.6.1.2. Impacts Common to All Alternatives

Forest Products (minor adverse)
Under all alternatives, timber harvest would be prohibited within 200 feet of surface water. This would prohibit forest product activities on 396 acres (2.21%) of the forest management areas, a minor adverse effect.

Physical Resources

Air Quality (minor adverse)
Restrictions on vegetative treatments to prevent adverse effects on air quality would vary depending on air quality conditions in the immediate area at the time of proposed treatments. Potential short-term adverse effects on vegetative treatments include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. This effect would be minor. Implementing measures to mitigate adverse effects on air quality by reducing dust emissions could adversely affect forest product sales. However, because such mitigation would not be likely to prevent forest product sales, the effect would be minor.

Soil (moderate adverse)
Soil types and conditions could affect forest management. Timber harvest could be restricted in areas with unstable soils or particularly steep terrain. This would have a moderate adverse effect on forest product sales.

Water Resources (moderate adverse)
Timber harvesting could be limited in areas with high-value water resources. It would be necessary to modify timber sales and stand improvement projects, which would have a moderate adverse effect on the forest product resource.

Cave and Karst Resources (negligible adverse)
Common to all management actions are procedural, conducting inventories and mapping, which would add negligible time and financial costs to forest product projects.

Mineral Resources

Almost the entire planning area would be available for exploration and development of locatable, salable, and fluid minerals under all alternatives. Coal leasing would be limited to areas with high potential for coal development in areas of central Campbell County and north-central Sheridan County.

Locatable Minerals (negligible adverse)
Public lands not formally withdrawn from mineral entry would be available for locatable mineral development. At present, locatable mineral operations affect 0.3% of BLM-administered forest and woodland communities, 138 and 92 acres, respectively. The trend in locatable minerals development is predicted to be similar throughout the planning period. This would have a negligible adverse effect on forest products as the presence of mineral claims could limit forest product sales.

Leasable Minerals – Coal (no effect)
The potential acreage available for coal leasing is extensive, but the foreseeable activity would be confined to central Campbell County and north-central Sheridan County, and would only affect the scattered woodlands. Therefore, coal development activities would not have a noticeable effect on forest products and is not further discussed in this section.

Leasable Minerals – Fluids (minor adverse)
Federal fluid mineral estate in the planning area would be available to fluid minerals leasing unless it is identified as administratively unavailable. Based on the predicted activity from oil and gas operators surveyed as part of the reasonably foreseeable development forecast, conventional oil and gas development (potential of low to moderate 10 to 40 wells per township could occur on 3,468 acres (13%) of BLM-administered woodlands. CBNG development could occur on 5,737 acres (22%) of BLM-administered woodlands. Physical disturbance and the loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result have a minor adverse effect on forest products.

Salable Minerals (negligible adverse)
There are 205 acres (1.2%) of sand and gravel deposits in forest management areas (Billy Creek and the Horn). With the typically small size of salable minerals development, small acreages would be removed from forest production. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed through salable minerals development. Although sand and gravel deposits are present in slightly more than one percent of the forest management areas, it is not likely the entire amount of predicted salable minerals development would occur in forest management areas. Therefore, salable minerals development would have a negligible adverse effect on the forest products program.

Fire and Fuels Management (moderate beneficial)

Fire management can affect forestry activities. Fuels treatment projects in forested areas can reduce the potential for wildfire by reducing the fuels source. These projects can reduce the amount of woody material on the ground and alter the structure of both the understory and overstory, changing the stand composition and structure. These projects also could open seed beds and help regeneration, helping make forest products a sustainable resource. Wildland fire use for resource benefit also could affect forestry. In areas where this practice is allowed, wildland fire could alter stand composition, structure, and function. Wildland fire could change the seral state of the forest or woodland. Potential commercial material (e.g., sawlogs and firewood) could be burned and no longer be salvageable. Fire and fuels management actions common to all alternatives when considered as a whole would have a moderate beneficial effect on forest products.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no forest and woodland management actions common to all alternatives.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Grassland and shrubland communities overlap forest and woodland communities and play an important role in creating vegetative mosaics and diversity; which benefits forest and woodland health and therefore forest products. When products are removed, this allows for residual vegetation to protect the soil and water resources promoting forest product regeneration. Grassland and shrubland management actions common to all alternatives would have a moderate beneficial effect on forest products.

Vegetation – Riparian/Wetland Resources (moderate adverse)
The Wyoming Forestry requires streamside management zones in harvesting operations. These zones are located with consideration of slope, aspect, stream type, and stream life. This could reduce the acres available for the harvest of forest products, which would be a moderate adverse effect.

Invasive Species and Pest Management (minor adverse)
The regulations for controlling invasive species could increase the cost for the removal of forest products. Requirements to flush equipment and reseed only with approved seed are examples of the restrictions that would increase the cost of harvesting forest products. At the same time, the ability to control pests in forests plays a vital role in forest product removal. Invasive species and pest management actions common to all alternatives overall would have a minor adverse effect on forests products due to the increased costs associated with invasive species requirements.

Fish and Wildlife Resources – Fish (minor adverse) **and Special Status Species – Fish** (no effect)
The management actions common to all alternatives would restrict forest product activities near fish bearing waters. There are 3,432 acres (19%) of the forest management areas within 0.25 mile of fish-bearing waterbodies. Because commercial sales would be restricted, but not prohibited, the impact is minor. Special status fish are presently limited to the Tongue River drainage which does not contain any commercial forests; therefore, there would be no effect to forest products from special status fish species and they will not be discussed further in this section.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate adverse)
The management of wildlife and special status wildlife species and their habitats would have an effect on the forest product program. Management would include precluding or placing seasonal restrictions on timber harvest in areas with habitat for these species, such as raptors and their nests. Overall, wildlife management actions common to all alternatives would have a moderate adverse effect on forest products.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Protection of significant cultural resources could indirectly affect the forest products program through increased costs to avoid sites that require protection, and delay projects. Significant sites are rare and typically small, the impacts to the forest product program would be negligible.

Paleontological Resources (no effect)
Retention of public lands with significant paleontological values would likely have no effect on the forest products program as such areas are rare, typically small, and unlikely to occur within commercial forest areas.

Visual Resources (no effect)
Visual resources management actions common to all alternatives would likely not have discernible impacts on the forest products program as the primary requirement would be to screen or paint non-temporary facilities. Typically there would not be any non-temporary facilities associated with forest product sales.

Land Resources

Lands and Realty (no effect)
There are no lands and realty management actions common to all alternatives that would directly effect the forest products program.

Renewable Energy (no effect)
Management actions common to all alternatives are procedural, requiring cooperation, and would not directly effect forest products.

Rights-of-Way and Corridors (minor beneficial)
Placing ROW corridors adjacent to roads and other disturbance corridors would benefit the forest products program by preventing corridors through commercially suitable stands. The potential for new access roads in forest management areas could allow for better access to forest products, thereby increasing demand for those products. Because few ROW actions are anticipated in forest management areas, ROW and corridors management common to all alternatives would have a minor beneficial effect on forest products.

Travel and Transportation Management (minor beneficial)
Travel and transportation management actions common to all alternatives could increase access to forest product areas through negotiating access to isolated parcels of public lands, evaluating and potentially retaining roads constructed for other programs, and minimizing surface disturbance. Few transportation actions are anticipated in the forest management areas. This management would have a minor beneficial effect on forest products.

Recreation (negligible adverse)
The effects of dispersed recreation on forest products are related primarily to access, which is discussed under *Travel and Transportation Management*. Management actions for developed recreation sites and SRMAs could affect the forest products program by removing some areas from commercial production. Since there is little overlap with developed recreation sites, SRMAs and forest management areas these management actions would have a negligible adverse effect on forest products.

Lands with Wilderness Characteristics (no effect)
Newly acquired lands are unlikely to meet the size and naturalness requirements for wilderness characteristics and therefore would not effect the forest products program.

Livestock Grazing Management (negligible adverse)
Appropriate livestock grazing would be authorized under all alternatives. Livestock grazing tends to be compatible with forest product production, except in areas of aspen or other deciduous hardwood regeneration. There have been very few commercial sales of hardwoods. Therefore, the effect of livestock grazing on the forest products program would be negligible.

Special Designations

Areas of Critical Environmental Concern (no effect)
Proposed management of ACECs has no measurable effect on the forest products resource, as the two resources do not overlap, and will not be discussed further in this section.

Scenic or Back Country Byways (minor adverse)
The analysis of suggested byways would not effect the forest products resource. However, Byway designation could increase traffic flow, and therefore increase the need for safety measures and increase costs for logging and hauling activities. This would have a minor adverse effect on the forest products program.

Wild and Scenic Rivers (no effect)
The portion of the Middle Fork Powder River that is suitable and eligible for Wild and Scenic River designation does not intersect a forest management area. Management of Wild and Scenic Rivers would not effect the forest products resource and will not be discussed further in this section.

Wilderness Study Areas (no effect)
Wilderness Study Areas do not overlap with forest management areas. Management of WSAs would not effect the forest products resource and will not be discussed further in this section.

Socioeconomic Resources

There are no social, economic, or health and safety management actions common to all alternatives, or by alternative, that would have a measurable effect on the forest products program. Therefore, socioeconomic resources are not further addressed in this section.

4.6.1.3. Alternative A

This section describes management actions and potential effects associated with the continuation of the current management and provides a baseline to identify potential consequences to the forest products program. The effects described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative A.

Forest Products (moderate beneficial)
The primary management actions under Alternative A would allow the sale of minor forest products from throughout the planning area, offer approximately 18 million board feet of saw timber during the planning period, and limit clear-cuts to 20 acres. These actions would provide for an active forest products program. Because there would be some restrictions on the program, the beneficial effects of this management would be moderate.

Physical Resources

Air Quality (negligible adverse)
Under Alternative A, air quality monitoring would be required of forest product projects expected to approach or exceed emission standards. Few sales would likely be required to perform monitoring, and the monitoring would likely not prevent any sales. The effect on the forest product program would be negligible adverse.

Soil (moderate adverse)
Alternative A soils management actions include prohibiting surface-disturbing activities

seasonally in areas of severe erosion hazard, on slopes equal to or greater than 25%, and in areas with poor reclamation suitability. All three prohibitions have an undefined allowance for waivers, and therefore would not prohibit potential forest product sales outright. The seasonal prohibition would have an effect because it could delay sale activities, which are already limited seasonally by winter weather. There are 10,058 acres (56%) of the forest management areas on slopes equal to or greater than 25%, and 6,203 acres (35%) of the forest management areas in areas rated as having poor reclamation suitability. Silviculture treatments are typically less damaging to soil resources than other surface-disturbing activities, and are commonly authorized when other activities might not be. With the exception of clear-cuts, not all overstory trees are removed; the understory typically is not removed, and physical disturbance to soils is limited. All of this reduces adverse effects on soils compared to other surface-disturbing activities. Therefore, although more than 10% of the forest management areas have sensitive soils, the effect on the forest product program would be moderate.

Water Resources (moderate adverse)
The only water management action under Alternative A that would directly affect forest products is a 500-foot restriction on surface-disturbing activities around springs, reservoirs, water wells, and perennial streams. Like many management actions under Alternative A, the authorized officer can waive the prohibition. This buffer would affect 58,445 acres of forest management areas and therefore restrict product removal from these zones. Forest product sales within 500 feet of water resources would be considered on a project-specific basis. Overall, the effect of Alternative A water management actions on the forest products program would be moderate adverse.

Cave and Karst Resources (negligible adverse)
Under Alternative A, forest product sales in cave and karst areas would be considered on a project-specific basis. Karst formations are present primarily along the Big Horn Mountains and include the forest management areas. Restrictions on forest product activities would likely be confined to buffers around the entrances to significant caves. At present, there is only one documented significant cave in the forest management areas. Alternative A cave and karst management would have a negligible adverse effect on the forest products program.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative A, existing withdrawals from locatable minerals entry would continue. At present, locatable minerals operations affect 0.3% of BLM-administered forest and woodlands communities (138 and 92 acres, respectively). The trend in locatable minerals development is predicted to be similar throughout the planning period. This would have a negligible adverse effect on forest products as the presence of mineral claims could limit forest product sales.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted leasable fluid minerals activity under Alternative A, conventional activity (potential of moderate or above) could occur on 1,209 acres (2.7%) of BLM-administered forest lands and 1,942 acres (7.4%) of woodlands. CBNG activity could occur on 2,148 acres (4.7%) of BLM-administered forest lands and 5,779 acres (22.1%) of woodlands. Physical disturbance and the loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Salable Minerals (minor adverse)
Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 530 acres (Appendix G (p. 1671)) a minor adverse effect on the ability to provide forest product sales.

Fire and Fuels Management (major beneficial)

Alternative A would give priority to fire suppression in commercial timber areas and provide for prescribed fire to support vegetation management objectives. The suppression efforts, utilizing the different levels and restricting some types of suppression, would have a beneficial effect on forest products. Fuels reduction projects could be performed in forested areas to reduce the potential hazard of wildfire. These projects can alter the structure of both the understory and overstory of trees, changing the composition and structure of the stand and leading to increased productivity and desirability for forest products. This would have a major beneficial effect on the forest products program.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
Under Alternative A, designing forest management treatments to meet overall resource management objectives would have a major beneficial effect on the forest products program. Forest management areas could be managed for forest product production.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
The present RMP does not contain any grassland and shrubland management decisions, therefore their management would be considered on a project specific basis. Grassland and shrubland communities are often adjacent to and intermingled with forest and woodland communities; therefore restrictions within grass and shrub communities could limit access to commercial forests. Such limitations are expected to be rare, therefore the effect would be negligible.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Alternative A would prohibit surface-disturbing activities within 500 feet of springs, reservoirs, water wells, and perennial streams. This would affect approximately 23,831 acres, unless the authorized officer waives the prohibition. Aspens, cottonwoods, ash, and willows often grow in these moist areas, and this management would limit actions to ensure the reproduction and maintenance of these species. However, this would have a negligible adverse effect on the forest products program because historically, these species have not played a major role in the forest products market.

Invasive Species and Pest Management (moderate beneficial)
Weed and pest control is limited to biological means, sanitation and salvage harvest to remove insect and disease trees. Forest products are derived from treated lands. Measures to control invasive plant species, would increase the operational expenses of some harvest operations. Applications to make the forest and woodlands more resilient to infestations will produce forest product opportunities. Overall, management of invasive species and pests would benefit forest products to a moderate degree by reducing forest pest infestations.

Fish and Wildlife Resources – Fish (minor adverse)
There are no fisheries management actions under Alternative A. Therefore, effects are considered on a project-specific basis. Forest product sales would likely be controlled and potentially

prohibited near fish-bearing streams. This would have a minor adverse effect on the forest products program as few commercial sales would likely be prevented.

Fish and Wildlife Resources – Wildlife (major adverse)
Big game and raptor management actions under Alternative A would have a major adverse effect on the forest products program. At present, there are no documented raptor nests within 0.5 mile of the forest management areas, but this is likely due to inadequate inventory data, not the absence of nesting raptors. The Alternative A management action with the greatest effect would be the prohibition of timber harvest activities in crucial elk habitat or hiding cover. At present 11,153 acres (62.1%) of the forest management areas provide elk hiding cover.

Special Status Species – Plants (negligible adverse)
Alternative A does not include management for special status plant species except on a project specific basis. Forest products projects would consider special status plants. However, because special status plants are typically rare and have small populations, it is not likely they would have more than a negligible adverse effect on the forest product program.

Special Status Species – Wildlife (moderate adverse)
At present, there are no documented raptor nests, bald eagle nests, or bald eagle roosts in the forest management areas, but there is potential for all to occur. Alternative A does not include management actions for amphibians and reptiles; therefore, they are considered on a project-specific basis. There are 4,680 acres (26.1%) of amphibian and reptile habitat in the forest management areas. Forest product sales would have to consider special status species during planning and projects might have to be modified or relocated. It is not likely that any projects could not be accommodated. The effect on the forest products program would be moderate adverse.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative A does not include cultural resources management actions that would directly affect the forest product program, because none of the cultural resources sites identified for management are in the forest management areas. Cultural resources would be considered on a project-specific basis, and a cultural resources inventory would be required during project planning. Projects might have to be modified to prevent adverse effects on cultural resources, but it is not likely that a forest product sale would be canceled. The adverse effect on the forest products program would be negligible.

Paleontological Resources (negligible adverse)
Alternative A does not include management for the protection of paleontological resources, but would consider effects on a project-specific basis. Implementing protective measures for paleontological resources could require avoidance and other mitigation measures for proposed forest product sales. These measures could require that sales projects be relocated or redesigned. It is not likely that a forest product sale would be canceled, and the effect on the forest products program would be negligible.

Visual Resources (moderate adverse)
Alternative A would manage 14,727 acres (82.1%) of the forest management areas under VRM Class II. Activities in Class II areas should not attract the attention of the casual observer. This management would affect the designs, types, sizes, and shapes of timber harvests, but would not prohibit them. For example, clear-cuts could be kept small and irregular in shape to mimic natural

forest openings. VRM Class III and IV areas have greater management flexibility. The effect on the forest products program would be moderate adverse.

Land Resources

Lands and Realty (minor beneficial)
The BLM-administered land ownership pattern in the planning area is scattered, interspersed with private, state, and lands administered by other federal government agencies. Land tenure adjustments would occur on a project specific-basis under Alternative A, with an emphasis on acquiring areas adjacent to existing blocks of BLM surface and disposing of isolated BLM parcels. The forest management areas are mostly within large blocks of BLM surface. Consolidating surface lands could facilitate forest product management by providing for a more contiguous public land base. Acquisitions are primarily driven by outside proponents; therefore, the result would be a minor beneficial effect on the forest products program.

Renewable Energy (no effect)
The present RMP does not contain any renewable energy decisions and therefore any proposals would be considered on a project specific basis. The forest management areas have wind energy potential, but commercial projects are not anticipated due to the costs associated with removing the forest cover for siting solar panels. Therefore, no effects are expected to the forest products program.

Rights-of-Way and Corridors (minor adverse)
New ROW could increase access to forest products. Alternative A would prohibit ROW on slopes equal to or greater than 25%. There are 10,058 acres (56.0%) of the forest management areas with slopes equal to or greater than 25%. Few ROW applications are anticipated for forest management areas, therefore ROW prohibition effects on the forest products program would be minor.

Travel and Transportation Management (negligible adverse)
Alternative A would limit motorized vehicle use to existing roads and vehicle routes on public lands in and around forest management areas, which would minimize potential damage to forest products. Public access would have the potential to adversely affect forest products (e.g., through damage to regenerating forests by illegal off-road travel and through theft of forest products). Such incidents have been rare and are anticipated to remain rare; therefore, the effect on the forest products program would be negligible adverse.

Recreation (negligible adverse)
Management actions for developed recreation sites and SRMAs would remove some areas from commercial production. Since there is little overlap between developed recreation sites or SRMAs and recreation site development is anticipated to disturb approximately 5 acres, these management actions would have a negligible adverse effect on forest products.

Lands with Wilderness Characteristics (no effect)
Alternative A would continue to manage forest management areas for forest products and other resources. There would be no effect on the forest products program.

Livestock Grazing Management (negligible adverse)
Alternative A would require rest from grazing in vegetative treatment areas for one year following treatment, and defer livestock grazing a second year. Rest and deferment would provide aspen and other hardwoods some time to regenerate. One year of livestock grazing rest likely not be

sufficient for aspens to grow beyond the reach of livestock. This effect on the forest products program would be negligible adverse.

Special Designations

Scenic or Back Country Byways (no effect)
Alternative A does not include special designations or recommendations for scenic or BCBs.

4.6.1.4. Alternative B

This section describes management actions under Alternative B, which would emphasize resource conservation, and the resulting effects on the forest products program due to their implementation. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative B.

Forest Products (minor adverse)
Alternative B would allow timber sales only within the forest management areas and would manage sales to keep forest products within ecologically sustainable limits. These actions would limit the forest products program, a minor adverse effect.

Physical Resources

Air Quality (negligible adverse)
Under Alternative B, potential restrictions on forest product sales to prevent adverse effects on air quality would vary depending on air quality conditions in the immediate area at the time of proposed sales. Few projects would likely be required to perform monitoring, and the monitoring would likely not prevent any sales. Potential short-term adverse effects include planning and timing restrictions to minimize emissions associated with fugitive dust or smoke. The effect on the forest product program would be negligible adverse.

Soil (major adverse)
Alternative B soils management actions include prohibitions on surface-disturbing activities in areas of severe erosion hazard, on slopes equal to or greater than 25%, in areas with poor reclamation suitability, and on miscellaneous soil types. There are 30,819 acres (60%) of the forest management areas with slopes equal to or greater than 25%, and 6,203 acres (35%) of the forest management areas on soils with poor reclamation suitability. Alternative B prohibitions on surface-disturbing activities in these areas would have a major adverse effect on the forest products program.

Water Resources (moderate adverse)
Alternative B would prohibit surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. The water management buffer would affect 1,010 acres (5.6%) of the forest management areas. The effect of Alternative B water management actions on the forest product program would be moderate adverse.

Cave and Karst Resources (major adverse)
Alternative B would prohibit surface-disturbing activities, including most silviculture activities, in cave and karst areas. There are karst formations along the Big Horn Mountains, including in the six forest management areas. Alternative B cave and karst management would have a major adverse effect on the forest products program.

Mineral Resources

Locatable Minerals (major beneficial)
Alternative B would recommend withdrawal from minerals entry 15,870 acres (31%) of BLM-administered forest lands and 10,777 acres (41%) of woodlands. This would have major beneficial effect on forest program by preventing potential claims that could interfere with forest product activities.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted fluid minerals activity under Alternative B, conventional activity (potential of moderate or above) could occur on 340 acres (1.0%) of BLM-administered forest lands and 812 acres (6.9%) of woodlands. CBNG activity could occur on 900 acres (2.7%) of BLM-administered forest lands and 2,820 acres (24.0%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect to potential forest product sales.

Salable Minerals (negligible adverse)
Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 114 acres (Appendix G (p. 1671)) a negligible adverse effect on the ability to provide forest product sales.

Fire and Fuels Management

Unplanned Fire (Wildfire) (moderate beneficial)
Alternative B would use full suppression strategies in commercial timber areas. Full suppression strategies can have a moderate beneficial effect on the forest products program because while most fires would be suppressed the accumulation of fuels could lead to a large uncontrollable fire.

Planned Fire (Prescribed Fire) (moderate beneficial)
Alternative B would provide for fire and other treatments to restore fire-adapted ecosystems. Planned vegetative treatments would be for the benefit of ecosystem health, with forest product suitability a minor consideration. The effect on the forest product program would likely be moderate beneficial, for protection from wildfire and making soil available for forest regeneration.

Biological Resources

Vegetation – Forests and Woodlands (major adverse)
Alternative B would minimize silviculture treatments and allow natural processes to run their course. The forest products program would be minimal and limited to situations where silviculture treatments would only be applied to reduce hazardous conditions. This would have a major adverse effect on the forest products program.

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Requiring native plant species for reclamation activities would contribute to ecosystem health by promoting biological diversity. However, native species can be difficult to establish, costing time and resources, limiting the benefit to moderate.

Vegetation – Riparian/Wetland Resources (moderate adverse)
A 500-foot buffer of water bodies would reduce acres available for harvest activities. The effect on the forest product program would be moderate adverse.

Invasive Species and Pest Management (minor beneficial)
Alternative B would allow aerial applications of insecticides. However, this has not been the preferred treatment in forest management areas. Sanitation harvest and biological treatments are the most common treatments. Forest product sales would likely include measures to control invasive species and pests, and more forest acreage would likely be treated than under other alternatives. Operational expenses would increase, but the overall effect on the forest products program would be minor beneficial.

Fish and Wildlife Resources – Fish (major adverse)
Alternative B would prohibit surface-disturbing activities, including forest product sales, within 0.25 mile of fish-bearing waterbodies. The prohibition would affect 3,432 acres (19%) of the forest management areas. This would have a major adverse effect on the forest products program.

Fish and Wildlife Resources – Wildlife (major adverse)
Big game and raptor management actions under Alternative B would have the greatest effect on the forest products program. Timber harvest activities would be prohibited within crucial elk habitat or hiding cover (which currently includes 11,153 acres, or 62%, of the forest management areas). Wildlife management actions would have a major adverse effect on the forest products program.

Special Status Species – Plants (major adverse)
Surveys for special status plant species would be required during planning for forest product projects, and the projects would be required to avoid adverse effects to special status plant habitat. Projects would likely have to be modified, including changing their locations. Limber pine is designated as a BLM Wyoming Sensitive Species and will require special management for protection. These management could severely limit forest product sales.

Special Status Species – Wildlife (major adverse)
Alternative B would prohibit surface-disturbing activities, including forest product sales, on amphibian and reptile habitat in the forest management areas (4,680 acres, or 26%). Protections for northern goshawks and other special status species residing in forested areas would seasonally restrict and could prevent forest management activities. These actions would have a major adverse effect on the forest products program.

Heritage and Visual Resources

Cultural Resources (major adverse)
Alternative B would prohibit surface disturbance, including forest product sales, up to 5 miles from historic properties. This action would affect 6,475 acres (36%) of the forest management areas, and have a major adverse effect on the forest products program.

Paleontological Resources (negligible adverse)
Forest product activities could be prohibited in areas with paleontological resources of high quality or importance. However, at present, there are no high-quality paleontological areas in the forest management areas, and typically the areas are small. Forest product sales could be located to avoid paleontological sites. Therefore, the effect on the forest products program would negligible adverse.

Visual Resources (moderate adverse)
Alternative B would manage 14,909 acres (83%) of the forest management areas under VRM Class II. This management would affect the designs, types, sizes, and shapes and locations of

timber harvests, but would not prohibit them. The effect on the forest products program would be moderate adverse because projects would need to meet the VRM requirements.

Land Resources

Lands and Realty (major beneficial)
Alternative B would place a priority on retaining and acquiring lands with natural resource values. Consolidating surface lands could facilitate forest product management by providing for a more contiguous public land base, creating better access, and additional acres for forest production.

Renewable Energy (no effect)
Portions of the Big Horn Mountains and PRB area have a potential for renewable-energy (e.g., wind) development. Renewable energy would be prohibited in the Big Horn Mountains thus avoiding potential conflict with forest product sales.

Rights-of-Way and Corridors (minor adverse)
Alternative B would prohibit ROW on slopes equal to or greater than 25%. There are 10,058 acres (56%) of the forest management areas with slopes equal to or greater than 25%. Few ROW applications are anticipated for in forest management areas. Therefore, the adverse effect of the slope prohibition on the forest products program would be minor.

Travel and Transportation Management (moderate beneficial)
Alternative B travel and transportation management actions would have a moderate beneficial effect on the forest product program. The extension of new access roads in forest and woodland areas could allow for better access to resources, which could benefit timber sales. Expanded road access also could mean easier access for wood cutters and other users of forest products, thereby increasing the demand for forest products.

Recreation (minor adverse)
Alternative B designates 55,529 acres as SRMAs. Forest product removal could be adversely affected in these areas as surface-disturbing activities would be restricted within SRMAs. Commercial forest product sales are unlikely within SRMAs due to the small overlap with recreation areas and thus the restrictions would have a negligible to minor effect.

Lands with Wilderness Characteristics (moderate adverse)
Alternative B would manage 12,237 acres for wilderness characteristics. Commercial woodcutting would be prohibited unless for environmental restoration. The LWC unit is predominately forested, however the steep topography limits the potential for commercial woodcutting. This would result in a minor to moderate adverse impact to the forest products resource depending on technological advancements in forest management or the economic market for timber in the area.

Livestock Grazing Management (moderate beneficial)
Alternative B would rest vegetative treatment areas for two years following treatment. Two years of rest from livestock grazing rest could be sufficient for some aspen to grow beyond the reach of livestock. The effect on the forest products program would be moderate beneficial.

Special Designations

Scenic or Back Country Byways (minor adverse)
Under Alternative B, designating Slip Road and Hazelton Road as BCBs could increase the traffic

flow and create safety issues with forest product removal and hauling operations. This would have a minor adverse effect on forest management.

4.6.1.5. Alternative C

This section describes management actions under Alternative C, which would emphasize resource utilization, and the resulting effects on the forest products program. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative C.

Forest Products (major beneficial)
The management actions under Alternative C would allow the sale of forest products throughout the planning area, maximize economic potential, and not limit the design or shape of timber harvests. These actions would provide for an active forest products program that emphasizes economic return. There would be few restrictions on the program; therefore, the beneficial effect of this management would be major.

Physical Resources

Air Quality (no effect)
Alternative C management would not require air quality monitoring for forest product projects.

Soil (major beneficial)
Alternative C soils management actions would include allowing surface-disturbing activities in areas with severe erosion hazard, on slopes equal to or greater than 25%, in areas with poor reclamation suitability, and on miscellaneous soil types. Silviculture treatments would be designed to accommodate the slope, erosion potential, and soil moisture content consistent with the Wyoming Forestry BMPs. These management actions would allow forest product sales on sensitive soils in the planning area, which comprise much more than 10% of the forest management areas. Therefore, this would have a major beneficial effect on the forest products program.

Water Resources (moderate beneficial)
Alternative C would allow surface disturbances within 500 feet of springs, reservoirs, water wells, and perennial streams. This management would allow for project-specific adjustments for slope, aspect, stream type, and other conditions. Wyoming Forestry BMPs and other mitigation measures would be incorporated to reduce adverse effects on water resources. There would be some costs associated with incorporating BMPs and other mitigation measures, however; the overall result would be a moderate beneficial effect on the forest products program.

Cave and Karst Resources (negligible adverse)
Management actions include establishing buffers from significant cave entrances to minimize affects from surface-disturbing activities. Presently, there is only one documented significant cave within the Forest Management Areas. Alternative C cave and karst management would result in a negligible adverse impact to the forest products program.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative C would not recommend any additional minerals withdrawals. At present, locatable

minerals operations affect 0.3% of BLM-administered forest and woodlands communities, 138 and 92 acres, respectively. The locatable minerals development trend is predicted to be similar throughout the planning period, and the effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted fluid minerals activity under Alternative C, conventional activity (potential of moderate or above) could occur on 1,205 acres (2.7%) of BLM-administered forest lands and 1,936 acres (7.7%) of woodlands. CBNG activity could occur on 2,057 acres (4.7%) of BLM-administered forest lands and 5,512 acres (21.8%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. The result would be a minor adverse effect on forest and woodland resources.

Salable Minerals (minor adverse)
Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 2,090 acres (Appendix G (p. 1671)) a minor adverse effect on the ability to provide forest product sales.

Fire and Fuels Management (moderate beneficial)

Alternative C would allow full suppression across the planning area and provide for prescribed fire to support commodity production. Planned vegetation management projects could be used to increase the productivity and desirability of forest products. These actions are moderately beneficial as full suppression can increase the risk of fuel buildup and risk of an uncontrollable wildfire.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
Alternative C would have a major beneficial effect on the forest products program. Designing treatments to maximize forest health would improve opportunities for a sustained forest products program. Clear-cut size would not be regulated. Old-growth forests could be managed to emphasize saw timber or other forest products.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Allowing the planting of desirable non-native species could speed reclamation and vegetation recovery, a beneficial effect for the ecosystem and therefore, forest product production.

Vegetation – Riparian/Wetland Resources (major beneficial)
Alternative C management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. This management would allow for project-specific adjustments for slope, aspect, stream type, and other conditions. Wyoming Forestry BMPs and other mitigation measures would be incorporated to reduce adverse effects to riparian and wetland resources. Although there would be some costs associated with incorporating BMPs and other mitigation, the overall result would be a major beneficial effect on the forest products program.

Invasive Species and Pest Management (minor adverse)
Under Alternative C, invasive species pest management would continue in the forest management areas, with treatment areas and methods determined annually. Management emphasis only on the

State of Wyoming list would be a limiting factor in forest and woodlands pest management. Forest product sales could include measures to control invasive species, which would increase operating expenses. Overall, there would be a minor adverse effect on the forest products program.

Fish and Wildlife Resources – Fish (moderate beneficial)
Alternative C would allow forest product sales within 0.25 mile of fish-bearing waterbodies consistent with other resource values. This management would affect 3,432 acres (19%) of the forest management areas. Forest management activities could be subject to some regulation for the protection of other resources, but protective buffers would not be likely to extend more than 500 feet from fish-bearing waters. The effect on the forest products program would be moderate beneficial.

Fish and Wildlife Resources – Wildlife (major beneficial)
Alternative C would allow forest product activities in elk habitat and near raptor nests, with mitigation appropriate for multiple resource management. The overall result would likely be a major beneficial effect to the forest products program.

Special Status Species – Plants (moderate adverse)
Under Alternative C, adverse effects on documented special status plant populations would be avoided. Surveys would be required all listed proposed, or candidate species. If any populations of such plants were found during surveys, projects would likely be modified, including change their locations. With the limber pine being designated as a BLM Wyoming Sensitive Species, this will impact forest product projects, as this species is often intermixed with commercial species.

Special Status Species – Wildlife (minor adverse)
At present, there are no documented raptor nests, bald eagle nests, or bald eagle roosts in the forest management areas. There are 4,680 acres (26%) of amphibian and reptile habitat in the forest management areas that would be available for forest product sales. Forest product projects would consider special status species during planning, and projects might have to be modified. This would have a minor adverse effect on the forest products program as forest product sales would require modifications but would not be prohibited.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative C would allow surface disturbance in areas surrounding historic sites. Effects on cultural resources would be considered on a project-specific basis. A cultural resource inventory would be required during project planning. Projects might have to be modified to prevent adverse effects on cultural resources. It is not likely that a forest product sale would be canceled. The effect on the forest products program would be negligible adverse.

Paleontological Resources (negligible adverse)
Alternative C would require surveys and monitoring of paleontological resources in PFYC Class 4 and 5 formations during surface-disturbing activities. Forest product activities could be prohibited in areas containing paleontological resources of high quality or importance. However, at present there are no high-quality paleontological areas in the forest management areas, and areas of such resources are typically small. Forest product sales could be located to avoid paleontological resource sites. Therefore, the effect on the forest products program would be negligible adverse.

Visual Resources (major beneficial)
Under Alternative C, managing most of the planning area as VRM Class III or IV would have

a beneficial effect on forest product activities because there would be few restrictions for the protection of visual resources. This would allow harvesting of all areas that are needed for forest health and sustainability, therefore product availability would increase.

Land Resources

Lands and Realty (minor adverse)
Under Alternative C, disposing of lands that have resource value would have an adverse effect on the forest products program. Removing the option of acquiring lands adjacent to the larger public land blocks also would have a long-term adverse effect by denying opportunities to acquire lands with forest product potential. These management actions could have a major effect on the forest products program. However, it is not anticipated that there would be an active disposal campaign and therefore the impact would likely be minor.

Renewable Energy (no effect)
Under Alternative C, renewable-energy development must be consistent with all other resource values. All public lands in the planning area would be open to such development. The forest management areas have wind energy potential, but commercial projects are not anticipated due to the costs associated with removing the forest cover for siting solar panels. Therefore, no effects are expected to the forest products program.

Rights-of-Way and Corridors (minor beneficial)
Alternative C would allow ROW on slopes equal to or greater than 25%, which could increase access to forest products. However, few ROW applications are anticipated in the forest management areas. Therefore, the beneficial effect on the forest products program would be minor.

Travel and Transportation Management (minor adverse)
Under Alternative C, allowing motorized vehicle use on saturated soils and steep slopes would have a long-term adverse effect on forest and woodland areas. This management would open all roads to motorized vehicle use and would allow access to management areas where regeneration could be damaged by OHV use. The adverse effect on forest and woodlands regeneration and therefore products would be minor.

Recreation (negligible adverse)
Alternative C designates 30,570 acres as SRMAs. Forest product removal could be adversely affected in these areas as surface-disturbing activities could be limited or require intense mitigation within SRMAs. The forecast is that 20 acres would be disturbed for recreation facilities over the planning period, it is unlikely any facilities would be proposed in the commercial forest areas. Commercial forest product sales are unlikely within SRMAs due to the small overlap with recreation areas and thus the restrictions would have a negligible effect.

Lands with Wilderness Characteristics (no effect)
Alternative C does not propose any management related to lands with wilderness characteristics, thus there would be no effect on the forest products resource.

Livestock Grazing Management (major adverse)
Under Alternative C, allowing livestock grazing in regeneration areas and after prescribed fire would affect the sustainability and health of forests and woodlands by limiting species and age-class diversity. This would have a major adverse effect on the future availability of forest products.

Special Designations

Scenic or Back Country Byways (no effect)
Alternative C does not include special designations or recommendations for scenic or BCBs.

4.6.1.6. Alternative D

This section describes management actions under Alternative D, the BLM preferred alternative, and the likely resulting on forest products due to its implementation. The effects described above under *Impacts Common to All Alternatives* would be in addition to the effects described below for management actions under Alternative D.

Forest Products (moderate beneficial)
Forest Products Management actions under Alternative D would allow the sale of forest products in portions of the planning area, with accommodations for other resource values such as wildlife and special designations, a moderate benefit.

Physical Resources

Air Quality (negligible adverse)
Under Alternative D, effects on the forest products program would be possible if product sales are anticipated to exceed or approach ambient air quality standards. However, few forest product projects are large enough or have durations long enough to warrant monitoring.

Soil (moderate adverse)
Under Alternative D, disturbances would be considered in areas with severe erosion hazard, on slopes equal to or greater than 25%, and in areas with poor reclamation suitability where the soil resources could be appropriately mitigated. There are 40,032 acres of forest and woodland on slopes equal to or greater than 25% suitability) that would be limited for forest products removal due to safety, inaccessibility, and soil conservation. This would have a moderate adverse effect on the forest product program.

Water Resources (minor adverse)
Alternative D water management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams where water quality could be protected. Project design features and mitigation would ensure that water resources are protected while allowing for activities such as forest product sales and silviculture treatments. Wyoming Forestry BMPs require a 200-foot buffer and other mitigation measures incorporated into project designs. The overall result would be a minor adverse effect (less than 5% of forest and woodlands affected) on the forest products program.

Cave and Karst Resources (negligible adverse)
Alternative D would require a disturbance-free buffer around the entrances and passages of significant caves. This could require the relocation or redesign of individual projects, but likely would not prevent any forest product sales. At present, there is only one documented significant cave in the forest management areas. Alternative D cave and karst management would have a negligible effect on the forest products program.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative D would not recommend any additional minerals withdrawals. At present, locatable minerals operations affect 0.3% of BLM-administered forest and woodlands communities, 138 and 92 acres, respectively. The locatable minerals development trend is predicted to be similar throughout the planning period, and the effect on forest and woodland resources would be negligible adverse.

Leasable Minerals – Fluids (minor adverse)
Based on the predicted fluid minerals activity under Alternative D, conventional activity (potential of moderate or above) could occur on 949 acres (2.2%) of BLM-administered forest lands and 1,576 acres (6.5%) of woodlands. CBNG activity could occur on 1,968 acres (4.6%) of BLM-administered forest lands and 5,350 acres (22.1%) of woodlands. Physical disturbance and loss of vegetation would be much less than the acreage where fluid minerals activity occurs, typically less than two percent for CBNG. However, this could result in fragmentation of adjoining stands of forest and woodland vegetation. The result would be a minor adverse effect on forest products.

Salable Minerals (minor adverse)
Salable mineral activities could prevent potential forest product sales. The estimated areas of salable mineral activity during the planning period would be 1,193 acres (Appendix G (p. 1671)) a minor adverse effect on the ability to provide forest product sales.

Fire And Fuels Management (major beneficial)

Alternative D would prioritize fire suppression based on resource goals and objectives. Forest management areas would receive a higher suppression priority compared to other forested areas. Prescribed fire and other vegetative treatments would be performed to support vegetation management objectives. These projects can alter the structure of both the understory and overstory of trees, changing the composition and structure of the stand and leading to increased productivity and desirability for forest products. Vegetation treatments can keep fuel loads down reducing the risk of an uncontrollable wildfire. This management would have a major beneficial effect on the forest products program.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
Alternative D would utilize silviculture treatments, including intensive tactics to maximize forest health, while emphasizing multiple resource values. Old-growth forests and aspen communities would be maintained and encouraged with multiple treatments. These management actions would benefit the forest products program and promote forest products through making forests and woodlands sustainable.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Allowing desirable non-native plant species for short-term reclamation activities could speed reclamation and vegetation recovery, a beneficial effect for the ecosystem and therefore, forest product production.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative D riparian management would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams with adequate protection. Project design features

and mitigation would ensure that riparian and wetland resources are protected while allowing for forest product sales. Wyoming Forestry BMPs require a 200-foot buffer and other mitigation measures incorporated into project designs. The overall result would be a minor beneficial effect (less than 5% of forest and woodlands affected) on the forest products program.

Invasive Species and Pest Management (minor beneficial)
Alternative D would allow aerial applications of insecticides. BLM specialists would be allowed to determine tree species and areas of treatment. This would benefit forest product sales, including salvage sales. Invasive species pest control would continue in the forest management areas, with priority given to treatment areas that could be a safety factor for the public, and forests and woodlands that have increased mortality. Forest product sales would likely include measures to control invasive species. The cost of control measures is outweighed by the benefit to forest product productions, so that overall these management actions are a minor benefit to the forest product program.

Fish and Wildlife Resources – Fish (moderate adverse)
Alternative D would allow forest product sales within 0.25 mile of fish-bearing waterbodies where fish objectives can be met. This management would affect 3,432 acres (19%) of the forest management areas. Forest management activities would be subject to restrictions for the protection of fish and other resources, but the restriction would likely extend no more than 500 feet from fish-bearing waters. The effect on the forest products program would moderate adverse.

Fish and Wildlife Resources – Wildlife (major adverse)
Under Alternative D, forest product activities would be required to maintain current amounts of crucial elk habitat and hiding cover. This would constrain, but not prohibit, well-planned forest product sales. Restrictions on disturbances in calving areas and big-game corridors, and the buffers around raptor nests would have the greatest effect on forest products by limiting the timing forest products removal, the types of removal, and the sizes of the harvest areas.

Special Status Species – Plants (moderate adverse)
Alternative D would require surveys for special status plant species during planning for forest product projects in modeled habitat, and would require that adverse effects on populations of this species be avoided. There are populations of limber pine throughout the forest and woodlands. The projects will need to be adapted to assure the regeneration and the survival of this tree species and any and all others that are designated and were found in the proposed project areas, the projects could be modified, including relocation.

Special Status Species – Wildlife (major adverse)
Most of the forest and woodland areas include amphibian and reptile habitat and their protective buffers. Forest product sales would have to protect special status species, and this measure would affect harvesting activities. Locating amphibians and reptiles through surveys would result in loss of time to implement forest product sales.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Under Alternative D, the cultural resources program would develop CRPPs for the protection and preservation of identified geographic areas. These could include a prohibition on surface-disturbing activities for specifically identified sites containing historic properties that retain their historic settings, and appropriate mitigation for surface-disturbing activities for

the protection of TCPs, sacred sites, and other culturally sensitive areas. At present, none of the identified sites where surface-disturbing activities would be prohibited are in the forest management areas.

To protect the setting of historic properties, surface-disturbing activities could be restricted up to three miles from the sensitive cultural sites, which would affect 15,694 acres (87%) of the forest management areas. Forest product sales projects would have to mitigate adverse effects on cultural resources, which could include relocating the projects.

Paleontological Resources (negligible adverse)
Alternative D would require surveys and monitoring of paleontological resources in PFYC Class 4 and higher formations. Forest product activities could be prohibited in areas containing paleontological resources of high quality or importance. However, at present there are no high-quality paleontological areas in the forest management areas, and such areas typically are small. Forest product sales could be located to avoid paleontological sites. Therefore, the effect on the forest products program would be negligible adverse.

Visual Resources (moderate adverse)
Alternative D would manage 10,997 acres (61%) of the forest management areas under VRM Class II. This management would affect the designs, types, sizes, locations, and shapes of timber harvests, but would not prohibit them. The effect on the forest products program would be moderate adverse because projects would need to meet the VRM requirements.

Land Resources

Lands and Realty (moderate beneficial)
Management under Alternative D would actively pursue land tenure adjustments to consolidate BLM surface estate and dispose of small, isolated parcels of BLM-administered land or lands have limited natural resource values. Consolidating surface lands would benefit the forest products program by providing for a more contiguous public land base and resolving access issues.

Renewable Energy (no effect)
Under Alternative D, excluding renewable-energy development in the southern Big Horn Mountains would protect and preserve the larger forest management areas for forest production and product removal.

Rights-of-Way and Corridors (negligible adverse)
Alternative D would seek to avoid ROWs on slopes equal to or greater than 25%. There are 10,058 acres (56%) of the forest management areas with slopes equal to or greater than 25%. Few ROW applications are anticipated for the forest management areas, and combined with the slope restriction versus prohibition, this would result in a negligible effect on the forest products program.

Travel and Transportation Management (moderate beneficial)
Under Alternative D, allowing motorized vehicle use on designated routes and managing roads consistent with forest and woodland resources would have a moderate beneficial effect on forest and woodlands management by preventing off-road use which damages regeneration.

Recreation (minor adverse)
Alternative D designates 54,160 acres as SRMAs. Forest product removal could be adversely affected in these areas as surface-disturbing activities would be restricted within

SRMAs. The forecast is that 20 acres would be disturbed for recreation facilities over the planning period, it is unlikely any facilities would be proposed in the commercial forest areas. Commercial forest product sales are unlikely within SRMAs due to the small overlap with recreation areas and thus the restrictions would have a negligible to minor effect.

Lands with Wilderness Characteristics (minor adverse)
Alternative D would manage 6,864 acres for wilderness characteristics. The proposed alternative will prohibit commercial woodcutting unless it is a by-product of environmental restoration. The LWC unit is predominately forested, however the steep topography limits the potential for commercial products. This alternative would result in a minor adverse impact to the forest products resource.

Livestock Grazing Management (major beneficial)
Alternative D would rest or defer livestock grazing in vegetative treatment areas until resource objectives are met. In the forest management areas, the resource objectives would likely include vegetation regeneration. The effect on the forest products program would be major as forest product production would be sustained.

Special Designations

Scenic or Back Country Byways (minor adverse)
Under Alternative D, designating Slip Road and Hazelton Road as BCBs could increase the traffic flow and create safety issues with forest product removal and hauling operations. This would have a minor adverse effect on forest management.

4.6.1.7. Cumulative Impacts

Forest products derived from forest and woodland management activities play an important role in supporting the socioeconomics of the community and supporting other resources in forest and woodland communities.

The intermingling of private, state, and USFS lands with BLM-administered lands throughout the planning area ensures that activities outside BLM control would continue. Timber harvest activities, silviculture treatments, and development of housing and other structures on private, State of Wyoming, and USFS lands would leave roads in place and reduce forest and woodland acres by creating more fragmentation and edge effects. This could delay implementation of BLM harvest activities, fuel reduction activities, or silviculture activities until effects associated with the activities are mitigated or are no longer a factor. However, using these same roads to manage BLM-administered lands would result in fewer roads being built, and the BLM would have the option of mitigating the effects of roads on BLM-administered lands.

As private land is fragmented, there will be less forest product activity because having numerous landowners to negotiate with will make it more difficult to gain access to the adjacent public lands.

4.6.1.8. Conclusion

Alternative B would place the greatest restrictions on the forest products program, and Alternative C the least. Alternative D provides for forest product sales and other land uses while conserving resource values. Table 4.63, “Summary of Impacts to the Forest Products Program” (p. 1227) summarizes impacts to the forest products program by alternative.

Table 4.63. Summary of Impacts to the Forest Products Program

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Soil	Moderate adverse	Major adverse	Major beneficial	Moderate adverse
Water Resources	Moderate adverse	Moderate adverse	Moderate beneficial	Minor adverse
Cave and Karst Resources	Negligible adverse	Major adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Negligible adverse	Major beneficial	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Salable Minerals	Minor adverse	Negligible adverse	Minor adverse	Minor adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Major beneficial	Moderate beneficial	Moderate beneficial	Major beneficial
Planned Fire (Prescribed Fire)	Major beneficial	Moderate beneficial	Moderate beneficial	Major beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Major beneficial	Major adverse	Major beneficial	Major beneficial
Vegetation – Grassland and Shrubland Communities	Negligible adverse	Moderate beneficial	Major beneficial	Major beneficial
Vegetation – Riparian/Wetland Resources	Negligible adverse	Moderate adverse	Major beneficial	Minor beneficial
Invasive Species and Pest Management	Moderate beneficial	Minor beneficial	Minor adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Minor adverse	Major adverse	Moderate beneficial	Moderate adverse
Fish and Wildlife Resources – Wildlife	Major adverse	Major adverse	Major beneficial	Major adverse
Special Status Species – Plants	Negligible adverse	Major adverse	Moderate adverse	Moderate adverse
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	Moderate adverse	Major adverse	Minor adverse	Major adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Major adverse	Negligible adverse	Minor adverse
Paleontological Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	Moderate adverse	Moderate adverse	Major beneficial	Moderate adverse
Land Resources				
Forest Products	Moderate beneficial	Minor adverse	Major beneficial	Moderate beneficial
Lands and Realty	Minor beneficial	Major beneficial	Minor adverse	Moderate beneficial
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	Minor adverse	Minor adverse	Minor beneficial	Negligible adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Travel and Transportation Management	Negligible adverse	Moderate beneficial	Minor adverse	Moderate beneficial
Recreation	Negligible adverse	Minor adverse	Negligible adverse	Minor adverse
Lands With Wilderness Characteristics	No effect	Moderate adverse	No effect	Minor adverse
Livestock Grazing Management	Negligible adverse	Moderate beneficial	Major adverse	Major beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	Minor adverse	No effect	Minor adverse
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.2. Lands and Realty

The land ownership pattern in the planning area is scattered and interspersed with private and state lands and other agency-administered lands. Through the lands and realty program, lands in the planning area will be acquired or disposed of through exchanges, sales, or the Recreation and Public Purpose Act of 1926 (as amended, 43 U.S.C. 869 et seq.). Exchange is the preferred method of land tenure adjustments and must be considered before other land tenure adjustment methods. Approximately 120,722 acres in the planning area are identified for disposal (Appendix L (p. 1799)). This section describes potential impacts to the lands and realty program from land actions within the program and management actions for other resources and programs.

4.6.2.1. Methods and Assumptions

In an effort to consolidate ownership and improve access and management opportunities, adjustments will focus on disposing of scattered, isolated parcels while acquiring lands adjacent to larger blocks of BLM-administered public lands. This will decrease conflicts between public land users and private landowners, and decrease the cost of public land administration. Adjustments also will provide community expansion opportunities.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information provided by other agencies. Spatial analysis was performed using computer software. Effects are quantified where possible. In the absence of quantitative data, effects are described using ranges of potential effects or in qualitative terms if information is available and appropriate.

Demand for land tenure adjustments (e.g., retention, and disposal and acquisition [primarily through exchange]) will likely increase during the planning period. Land tenure adjustments will

benefit the overall administration of the lands and realty program by improving the BFO ability to administer resources and protect resource values. If there are effects that were not beneficial and could not be properly mitigated, a land tenure adjustment will not be considered. Certain lands will not be considered for disposal unless they are exchanged with lands of equal or greater value, including functional resource value or monetary value.

Assumptions

This analysis uses the following assumptions:

- The demand for land tenure adjustments and land use authorizations will increase over the life of the plan.
- Lands with known minerals values or lands likely to include minerals values will generally be retained. Alluvial valley floors will generally be retained under federal ownership to protect the resource. Consistent with the Surface Mining Control and Reclamation Act of 1977, minerals owned or leased by other entities, and occurring in alluvial valley floors will be considered for exchange. Currently there is one alluvial valley floor exchange proposal that is being entertained, waiting legal ruling.
- Unless identified for disposal, all BLM-administered lands will generally be retained in federal ownership to protect resource values. Because of their limited presence in the planning area, the BFO will generally retain lands with aquatic resources, agricultural potential, and wetland/riparian habitat.
- Disposal of small, isolated parcels of public land will enhance efficiency in management of the remaining public lands. Accomplishing these types of disposals will increase the BFO financial ability to pursue land tenure adjustments.
- Land acquisitions will occur, when appropriate, if required to meet the goals and objectives of other resources programs (e.g., cultural resources, fish and wildlife, and recreation).
- Resolving trespass issues on public lands will continue during the planning period. Avoiding inadvertent trespass by people accessing public lands will be addressed through the use of appropriate signs and access authorizations.
- Existing withdrawals will be retained throughout the planning period unless it is determined, through a withdrawal review, that existing withdrawal(s) should be revoked or modified. Management will consider withdrawals on surface and minerals estate on a project-specific basis. In addition, review of withdrawal proposals from other agencies will be addressed on a project-specific basis.
- There are multiple resource values on a given land parcel making acquisition into public ownership more desirable or decreasing the potential for disposal.
- Opportunities for land tenure adjustments are substantially reduced due to increased demand for other land use authorizations. For example: a higher priority is placed upon the ROW, or renewable energy programs not providing sufficient time for BLM realty specialists to devote to the lands and realty program, as well as budget constraints.

4.6.2.2. Impacts Common to All Alternatives

Lands and Realty (major beneficial)
There are no proposed management actions common to all alternatives that would adversely effect the lands and realty program. The management actions provide for a flexible and diverse lands and realty program. Lands and realty management common to all alternatives management seeks to improve access to public land and enable better overall management of BLM-administered

land. Lands and realty management would consider R&PP leases on a project specific basis and prohibit subsequent uses on these lands unless they are compatible with R&PP authorization. Lands and realty management common to all alternative would consider FLPMA leases and permits, acquisitions to include easements, exchanges, sales, and withdrawals on a case by case basis. Consider land withdrawals for other agencies and review withdrawal proposals on a project specific basis. Review existing land withdrawals to determine if the use is consistent with the intent of the withdrawal and whether the withdrawal should be continued, modified, revoked or terminated. Review existing land classifications and segregations on a case by case basis to determine whether this land management is appropriate and should be continued, modified, or terminated. Lands on which withdrawals, classifications, and segregations have been terminated or revoked, will be managed in a manner consistent with the adjacent land within the planning area, opening the lands. Lands meeting the identified disposal criteria will have priority consideration for disposal. 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. Avoid the potential of inadvertent trespass on public lands through the use of appropriate signage and access authorizations.

Overall, lands and realty management actions common to all alternatives would have a major beneficial effect on the lands and realty program.

Physical Resources

Air Quality (no effect)
There are no air quality management actions common to all alternatives or that vary by alternative that would effect the acquisition, disposal, or withdrawal of public lands; therefore air quality will not be addressed further in the Lands and Realty section.

Soil (no effect)
The soil management actions common to all alternatives and by alternative all discuss surface-disturbing activities and would not affect the acquisition, disposal, or withdrawal of public lands. Soil is typically not a primary resource when considering a proposed land tenure adjustment. Proposed soil management actions would have no effect on the lands and realty program and will not be addressed further in the Lands and Realty section.

Water Resources (no effect)
The water management actions common to all alternatives and those that vary by alternative all relate to surface disturbance or water use; they would not affect the acquisition, disposal, or withdrawal of public lands. The presence or absence of water would be a primary factor when considering proposed land tenure adjustments. Water will not be addressed further in the Lands and Realty section.

Cave and Karst Resources (no effect)
The cave and karst management actions common to all alternatives and those that vary by alternative are not directly related to land tenure adjustments; they would not affect the acquisition, disposal, or withdrawal of public lands. The presence or absence of significant caves would be a primary factor when considering proposed land tenure adjustments. Cave and karst resources will not be addressed further in the Lands and Realty section.

Mineral Resources (no effect)

Mineral resource (locatable, leasables, salables) management actions common to all alternatives and those that vary by alternative are not directly related to land tenure adjustments. The management actions relate to what lands would be available for mineral development. The proposed management actions would not affect the acquisition, disposal, or withdrawal of public lands. The presence or absence of a federal mineral resource would be a primary factor when considering proposed land tenure adjustments. Mineral resources will not be addressed further in the Lands and Realty section.

Fire and Fuels Management (no effect)

Fire and fuel management actions common to all alternatives and those that vary by alternative pertain to managing planned and unplanned fires. They do not directly related to land tenure adjustments and would not effect the land and realty program; fire and fuels management will not be addressed further in the Lands and Realty section.

Biological Resources (no effect)

There are no management actions common to all alternatives or by alternative for vegetation resources (forest and woodland communities, grassland and shrubland communities, riparian and wetland communities, and invasive species) or fish and wildlife species, including special status species, that propose to acquire or dispose of public lands. The presence or absence of particular biological resources (e.g., riparian and wetland communities, special status species habitat) would be a primary factor when considering proposed land tenure adjustments. Biological resources will not be addressed further in the Lands and Realty section.

Heritage and Visual Resources (no effect)

There are no management actions common to all alternatives or by alternative for heritage resources (cultural, and paleontological) or visual resources, that propose to acquire, dispose, or withdrawal of public lands. The presence or absence of heritage resources would be a primary factor when considering proposed land tenure adjustments, lands with significant paleontological values would be retained in federal ownership and visual resources would likely be a secondary consideration. Heritage and visual resources will not be addressed further in the Lands and Realty section.

Land Resources (no effect)

Management actions common to all alternatives and management actions by alternative for all land resources (**Forest Products, ROW and corridors, Travel and Transportation Management, Recreation, Lands with Wilderness Characteristics, and Livestock Grazing Management**) with the exception of Lands and Realty do not propose to acquire, dispose, or withdrawal of public lands. Designated stock driveways withdrawals and livestock trails will be retained. The presence or absence of commercial forests, legally accessible public lands, recreational opportunities, wilderness characteristics, and forage productions would all be primary factors when considering proposed land tenure adjustments. Lands and realty will be the only resource addressed further in the Lands and Realty section.

Special Designations (no effect)

There are no management actions common to all alternatives or by alternative for special designations (ACECs, BCBs, WSRs, and WSAs) that propose to acquire, dispose, or withdrawal of public lands. The presence or absence of special designations would be a primary factor when considering proposed land tenure adjustments. Special designations will not be addressed further in the Lands and Realty section.

Social and Economic Resources (no effect)

There are no management actions common to all alternatives or by alternative for social and economic resources or health and safety that propose to acquire, dispose, or withdrawal of public lands. Social and economic resources would likely be a minor factor when considering proposed land tenure adjustments. Social and economic resources will not be addressed further in the Lands and Realty section.

4.6.2.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Lands and Realty (moderate beneficial)
Alternative A would support the acquisition of lands or interests in lands from willing private and state entities on a project specific basis. Priority would be given to lands adjacent to larger blocks of BLM-administered public lands, particularly those with high recreational potential. In acquiring lands or interests in lands from willing sellers the BLM will initially consider the following: (1) any lands considered void of important natural resource values could be exchanged for the acquired lands, and (2) during the planning period, the BLM will not engage in acquisitions resulting in an overall net gain of publicly administered lands. Acquiring easements will result from access needs that will improve administration of public lands. Acquiring lands with important natural resource values will require coordination with other resource disciplines, appropriate to the acquisition.

Over the last 25 years, the identified disposal lands were reduced by approximately 30,500 acres. However, authorizations related to oil and gas development have taken precedence over land tenure adjustments. CBNG activity is expected to continue, although reasonably foreseeable development data show a steady reduction in CBNG development and increase in federal conventional development. Therefore, it would be reasonable to assume that the overall decrease in land disposals would be similar to the last planning period. Assuming this pattern continues, an average disposal rate of 1,200 acres per year under Alternative A would have a major effect on the lands and realty program through the disposal of small, isolated parcels. This would increase multiple resource management opportunities in a more contiguous land ownership pattern.

Approximately 117,427 acres of BLM-administered lands identified for disposal and have high priority consideration for exchange, public sale, or transfer of jurisdiction to another agency, subject to the disposal criteria. Lands with high surface values would generally be retained, although BLM would consider disposal of lands having agricultural potential and water through sale, exchange or Desert Land Entry.

Overall, Alternative A lands and realty management actions would have a moderate beneficial effect on the lands and realty program, by improving the ability to administer resources and protect resource values.

4.6.2.4. Alternative B

Alternative B would emphasize resource conservation.

Lands and Realty (moderate beneficial)
Alternative B management would pursue all lands available for acquisition in the planning area, without regard to their priority of major blocks of public land consolidation and high recreational or natural resource values. If land acquisitions occur, the effect would likely be beneficial.

All lands identified for disposal will be examined for the presence of high-value resources. Lands with high surface values would be retained, including those with agricultural potential. The BFO would generally retain lands identified for disposal, having natural resource values, until all other identified disposal lands (those with no natural resource values) were disposed of. This practice would have an adverse effect on the ROW program.

Alternative B management would recommend withdrawal of mineral lands within 4.0 miles of Greater Sage-Grouse leks and winter concentration areas. In proposed large withdrawals, the analysis that must be made is a review of the adequacy of application of the 43 CFR 3809 surface management regulations with mitigation impacts, consistent with whatever cumulative disturbance threshold is allowed in a particular Priority Habitat Area. Such analysis would clearly demonstrate that application of the 43 CFR 3809 surface management regulations could not adequately control or mitigate impacts when considering the Priority Habitat Area as a whole and only under this circumstance can a withdrawal be justified. Withdrawal recommendation would apply to proposals not associated with mineral activity unless the land management is consistent with Greater Sage-Grouse conservation measures.

Alternative B would pursue easements to access public lands that would benefit BLM management for any resource value and pursue land tenure adjustments on lands holding Category C allotments and sales, in accordance with other resource values. Areas within 4.0 miles of leks and winter concentration areas would be recommended for withdrawal to protect Greater Sage-Grouse habitat.

Overall, Alternative B lands and realty management actions would have a moderate beneficial effect on the lands and realty program, by improving the ability to administer resources and protect resource values.

4.6.2.5. Alternative C

Alternative C would emphasize resource use.

Lands and Realty (major adverse)
Under Alternative C, the BLM would not acquire lands or interests in lands. This would eliminate the agency's ability to gain access to some BLM-administered parcels. This would inhibit the BFO ability to manage resources and multiple uses, and would limit recreational opportunities. The consequences would be continued higher costs because of the difficulty and time-consuming efforts required to obtain access through private lands to administer multiple uses manage natural

resources, and to negotiate conflicts for activities and development with other land owners where federal actions would cross ownership boundaries.

Under Alternative C, the BLM would not retain lands identified for disposal having important natural resource values, until all other land identified for disposal are disposed of (Map 47). Alternative C management would not acquire land in areas adjacent to major blocks of public land and high recreational potential, or pursue easements to facilitate BLM management.

Under Alternative C, the BLM would dispose of lands having agricultural or water potential. Lands and realty management would allow land tenure adjustments for lands holding Category C allotments and sales independent of other resource values. Overall, Alternative C would have a major adverse effect on the lands and realty program, by limiting access to isolated parcels and would not improve the ability to administer resources and protect resource values.

4.6.2.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Lands and Realty (major beneficial)
Under Alternative D, priority would be given to acquiring lands or interests in lands in areas adjacent to large blocks of BLM-administered lands and pursue easements accessing public lands that would benefit any resource value on a project specific basis.

Alternative D management would actively pursue disposal of all identified disposal lands and other lands not identified but meeting appropriate disposal criteria. These parcels would be examined for the presence of high-value resources. Approximately 85% of BLM surface in the planning area is identified for retention and management, whereas approximately 120,722 acres (15%) is identified for disposal (Map 47 and Appendix L (p. 1799)). Lands with high surface values would be retained, including those with agricultural potential. The BFO would generally retain lands identified for disposal, but possessing natural resource values, until all other identified disposal lands (those with no natural resource values) were disposed of. Actively disposing of identified disposal lands would have a beneficial effect on the lands and realty program.

Alternative D management would not classify, open or make available any BLM surface in the planning area for agricultural leasing or agricultural entry under either Desert Land Entry or Indian Allotment for one or more of the following reasons: rugged topography, presence of sensitive resources, lack of water or access, small parcel size, and/or unsuitable soils.

The BLM would pursue land tenure adjustments related to custodial grazing allotments. Under Alternative D, disposing of these types of grazing lands would decrease the potential need for the public to request land use authorizations. It would therefore eliminate the need to monitor activities on these small, isolated parcels that are generally surrounded by private land. There are 171,749 acres (22%) of BLM-administered lands in the planning area under custodial allotments. Disposing of these acres would have a major beneficial effect on the lands and realty program.

Overall, Alternative D lands and realty management actions would have a major beneficial effect on the program by reducing small isolated parcels that are difficult to manage.

4.6.2.7. Cumulative Impacts

There is a high interest in pursuing land tenure adjustments amongst the BLM, the state, local government, and private land owners. The difficulties in pursuing action are typically finding equitable resources, in terms of funding or resource values (appraisal, mineral deposits, etc.), or BLM staff availability. The predominant land use activities within the planning area are energy development and livestock production. Both have tremendous potential to influence land tenure adjustments. Many past land tenure proposals have been related to livestock production, and many future proposals are anticipated, with the objective of consolidating land ownership. Mineral resources have also prompted several past land tenure adjustments as the BLM or another party has desired to consolidate mineral ownership. For example the Pittsburgh-Midway Coal exchange where BLM exchanged federal coal lands with Pittsburgh Midway for several of their private surface holdings. The presence of surface oil and gas facilities, or other energy facilities, would likely deter land tenure adjustments, unless mineral rights were a component of the adjustment.

4.6.2.8. Conclusion

Under Alternative A, the BFO would not pursue land tenure adjustments, but would consider adjustments on a case-by-case basis. This would likely result in minimal effort to consolidate land ownership patterns, which would cause continued increases in uses on fractionated parcels; continued conflicts with adjacent land owners; continued administrative costs associated with managing the scattered land ownership pattern; and continued trespass incidence. Special management areas (e.g., SRMAs) would continue to be difficult to access and manage, increasing administrative costs continuing the incidence of trespass across BLM-administered or private and state lands.

Alternative B would allow the lands and realty program to actively pursue land tenure adjustments, but does not prioritize based on resource values or other factors.

Alternative C would significantly limit opportunities for land tenure adjustments, compounding the effects described under Alternative A.

Alternative D would provide directed land tenure management to allow multiple resource uses, conservation, access and protection while maintaining or improving the overall health of the landscape.

In summary, Alternative A would have a moderate beneficial impact to the lands and realty program, Alternative B would have a moderate beneficial impacts to the lands and realty, Alternative C would have a major adverse impact and Alternative D would have a major beneficial impact to the lands and realty program. Table 4.64, "Summary of Impacts to the Lands and Realty Program" (p. 1235) summarizes impacts to the lands and realty program by alternative.

Table 4.64. Summary of Impacts to the Lands and Realty Program

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	No effect	No effect	No effect	No effect
Water Resources	No effect	No effect	No effect	No effect
Cave and Karst Resources	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	No effect	No effect	No effect	No effect
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	No effect	No effect	No effect	No effect
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Wildlife	No effect	No effect	No effect	No effect
Special Status Species – Plants	No effect	No effect	No effect	No effect
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	No effect	No effect	No effect	No effect
Heritage and Visual Resources				
Cultural Resources	No effect	No effect	No effect	No effect
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	Moderate beneficial	Moderate beneficial	Major adverse	Major beneficial
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	No effect	No effect	No effect	No effect
Recreation	No effect	No effect	No effect	No effect
Lands With Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.3. Renewable Energy

The BLM manages renewable energy as part of the ROW program. Renewable-energy sources can include wind, solar, thermal, and water. Other renewable-energy sources not yet identified might also fall under this program in the future. Wind presents the greatest renewable-energy potential in the planning area and is therefore, used in this analysis. This section describes potential effects on renewable-energy management from management actions for other resources and other management programs. Chapter 3 describes existing conditions concerning the renewable-energy program.

4.6.3.1. Methods and Assumptions

Assumptions

- The effects analysis focuses on the constraints (adverse effects) that would decrease opportunities for renewable-energy development authorizations.
- The effects analysis focuses on the opportunities (beneficial effects) that would increase opportunities for renewable-energy development.
- Surface-disturbing effects would occur from the implementation of management actions primarily designed to protect natural resources by preventing or minimizing effects on those resources. In other words, the types and degrees of limitations and restrictions on renewable-energy development authorizations depends on the locations of sensitive or high-value resources and the potential for environmental effects on those resources.
- The demand for land use authorizations will continue during the planning period, and will likely remain a primary function of the overall lands and realty program. Land use authorizations would be considered on a project-specific basis and consistent with other resource objectives.
- The demand for compliance monitoring and reclamation activities will likely continue to increase throughout the planning period.
- The BFO would cooperate with stakeholders to promote opportunities for scientific research for renewable energy in accordance with other resource values; and coordinate renewable-energy opportunities in accordance with other resource values.
- The effects analysis and conclusions are based on the 49,694 acres of BLM surface in the planning area with a wind power class rating of good (5) or higher.

Significance Criteria

In addition to acreage where renewable-energy development is excluded, adverse effects on renewable-energy development could be considered significant if there are substantial limitations placed on how to develop renewable energy, such as increased wildlife protections or visual resource constraints.

4.6.3.2. Impacts Common to All Alternatives

Renewable Energy (moderate beneficial)
Future renewable-energy development projects could include wind, solar, hydropower, or other energy-development activities. Cooperation with stakeholders for scientific research and development opportunities would facilitate the renewable-energy program. Cooperative efforts are more likely to be supported by the public and therefore increase opportunity for renewable development. The beneficial effect of cooperation would be moderate.

Physical Resources

Air Quality (minor adverse)
Air quality management actions common to all alternatives include implementing mitigation measures such as dust suppression and cooperative efforts to reduce dust emissions. These actions could require ongoing monitoring for compliance and decreased opportunity, which add cost to renewable-energy projects and therefore would have a minor adverse effect on the renewable-energy program.

Soil (minor adverse)
Soils management actions common to all alternatives include an onsite evaluation of proposed renewable-energy activities, mitigation of adverse effects on soils where necessary, and site-specific reclamation plans. None of these actions would affect where renewable energy could be developed, but would require time and other resources to address. Mitigation measures and site-specific reclamation plans on soils would decrease opportunities for renewable-energy development, this would have a minor adverse effect.

Water Resources (minor adverse)
Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, and managing water to meet Wyoming Standards for Healthy Rangelands. These actions would be applied across the entire planning area, which would have a minor adverse effect by decreasing areas for renewable-energy development.

Cave and Karst Resources (no effect)
The cave and karst program does not have any management actions common to all alternatives that would affect the renewable energy program

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals. Coal leasing would be limited to the high development potential areas of central Campbell County and northern Sheridan County, which does not overlap areas with wind-energy potential rated good or

higher. Coal activity in the planning area would have no effect on renewable-energy development and is not further addressed in the Renewable Energy section.

Locatable Minerals (negligible adverse)
Areas with locatable minerals development would likely be unable to accommodate other energy development. There is minimal overlap between existing locatable minerals activities and areas with wind-energy potential rated good or higher. The maximum foreseeable locatable minerals development is 1,455 acres of BLM surface (0.2%) in the planning area. Therefore, the potential for locatable minerals development to adversely affect renewable-energy development would be negligible.

Leasable Minerals – Coal (no effect)
Coal leasing would be limited to the high development potential areas of central Campbell County and higher. Coal activity in the planning area would have no effect on renewable-energy development and is not further addressed the Renewable Energy section.

Leasable Minerals – Fluids (negligible beneficial)
Oil and gas development activities are anticipated to be compatible with other energy-development activities, potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict that fluid minerals development would disturb less than one percent of BLM surface in the planning area. Overall, fluid minerals development would likely have a negligible beneficial effect on renewable-energy development. There is no discernible difference between the alternatives and therefore fluid minerals will not be discussed further in this section.

Salable Minerals (negligible beneficial)
With the wide spacing of meteorological towers and typically small size of salable minerals development, the two land uses are anticipated to be compatible, potentially even sharing infrastructure such as roads. Salable minerals would likely be needed to construct access roads and pads for renewable energy infrastructure. The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible beneficial effect on renewable-energy development, by sharing infrastructure and increase opportunity for development.

Although mineral resource development would vary across the alternatives, the trade-offs described above would apply to all alternatives. In this respect effects, would not be highly variable among the alternatives, and therefore not discussed for each alternative

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (no effect)
Fire and fuels management would not have actions common to all alternatives or by alternative that would affect renewable-energy development. Therefore, fire and fuels management is not further addressed in the Renewable Energy section.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities such as renewable-energy development.

There are no management actions common to all alternatives for **Vegetation – Forests and Woodlands**, **Fish and Wildlife Resources – Fish**, or **Special Status Species – Plants and Fish** that would affect the renewable-energy program. The forest and woodland management actions that do vary by alternative do not regulate land use activities other than timber harvest, and therefore would have no effect on the renewable-energy program. Therefore, forests and woodlands are not further addressed in the Renewable Energy section.

Vegetation – Grassland and Shrubland Communities (minor adverse)
Grass and shrub vegetation communities cover most of the planning area. renewable-energy facilities would be sited to reduce adverse effects on vegetation impacts, which could result in the relocation or redesign of renewable-energy projects before authorization. The overall adverse effect would be slight but detectable on renewable-energy development from this management and would be minor.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Prohibiting of renewable-energy activities would be required to prevent the degradation, loss, or destruction of riparian and wetland communities; which would most likely exclude renewable-energy development from these communities. Riparian and wetland management actions common to all alternatives would have a negligible adverse effect on renewable-energy development due to the limited amount (23,831 acres or 0.03%) of riparian and wetland communities on BLM-administered lands within the planning area.

Invasive Species and Pest Management (negligible adverse)
Renewable-energy proponents would be required to limit surface disturbance to prevent weed spread, use certified seed during reclamation, and treat reclamation for invasive species. Collectively, these actions would be barely detectable and decrease opportunity, which would have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate adverse)
Wildlife and special status species management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and a permanent disturbance-free buffer for bald eagle nests. Collectively, these actions would be readily apparent and have a moderate adverse effect on renewable-energy development by causing the relocation, modification, or redesign of renewable-energy projects.

Special Status Species – Fish (no effect)
Special status fish distribution is limited to northwestern Sheridan County, where there is little potential for renewable-energy development. Therefore, management of special status fish would not affect the renewable-energy program, and special status fish are not further addressed in the Renewable Energy section.

Heritage and Visual Resources

There are no management actions common to all alternatives for **Cultural Resources** or **Paleontological Resources** that would affect renewable-energy development.

Visual Resources (negligible adverse)
A management action common to all alternatives is the requirement for permanent facilities to blend with the surrounding landscape. This requirement is secondary to managing within the VRM class, meaning that although facilities might be visible within VRM Class II through IV

areas, mitigation for adverse effects on visual resources should be included wherever possible. Because this management action would not prohibit renewable-energy development, but would decrease development opportunity and increase costs of the projects, the adverse effect on renewable-energy development would be negligible.

Land Resources

The following programs do not include any management actions common to all alternatives that would affect the renewable-energy program: **Lands and Realty, Recreation**, and **Lands with Wilderness Characteristics**.

Forest vegetation and renewable-energy potential overlap in the southern Big Horn Mountains. However, with the abundance of shrubland and grassland vegetation in the planning area, including in the southern Big Horn Mountains, it is highly unlikely that renewable-energy development would be proposed in forest communities. Therefore, the forest product program should not affect the renewable-energy program and is not further addressed in the Renewable Energy section.

Rights-of-Way and Corridors (minor adverse)
The designation of ROW corridors preferably adjacent to roads and other disturbance corridors could affect the design of renewable-energy projects by limiting the placement of powerlines and other facilities. Because these management actions would not prohibit development and there would be a small change to the resource with decreased opportunity for development, their level of effect would be minor adverse.

Travel and Transportation Management (no effect)
Travel and transportation management actions under each alternative regulate motorized vehicle access for recreational use, and would not affect the potential for renewable-energy development. Management actions common to all alternatives would include standards for the location, design, and maintenance of roads. These actions would require some expenditures of time and money by renewable-energy developers for compliance, but would not limit renewable-energy development. Therefore, travel and transportation management are not further addressed in the Renewable Energy section.

Livestock Grazing Management (no effect)
Livestock grazing management actions under each alternative would not prohibit or limit other land uses. Therefore, livestock grazing would have no effect on renewable-energy development, and is not further addressed in the Renewable Energy section.

Special Designations

Scenic or Back Country Byways designation would not affect other activities; therefore, byways are not further addressed in the renewable-energy section. WSAs and WSRs are managed to a non-impairment standard under respective Interim Management Policies (IMPs) until Congress acts to designate these areas or release them from consideration. Renewable-energy development is limited to these areas due to the constraints mandated in BLM Manual 6330 – Management of Wilderness Study Areas. The only special designation addressed by alternative is ACECs.

Areas of Critical Environmental Concern (no effect)
There are no management actions common to all alternatives for ACECs.

Socioeconomic Resources

There are no **Social and Economic Conditions** or **Health and Safety** management actions common to all alternatives or by alternative that would have a measurable effect on the renewable-energy program. Therefore, these topics are not further addressed in the Renewable Energy section.

4.6.3.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Renewable Energy (major beneficial)
There are no management actions related to renewable-energy in the 1985 RMP; therefore, the entire planning area would be available to renewable-energy development under Alternative A, and proposals would be considered on a project-specific basis. There have been no renewable-energy projects to date. Under Alternative A, 49,694 acres (6%) of the planning area have a wind potential rating of good or higher, and the BFO anticipates up to 20,000 acres of BLM surface would be developed during the planning period. Renewable-energy development at this scale would have a major beneficial effect on the renewable-energy program.

Physical Resources

Air Quality (negligible adverse)
Alternative A would require air quality monitoring for renewable-energy projects expected to approach or exceed emissions standards. It is likely that few renewable-energy projects would be required to monitor air quality, and the monitoring would not prevent any renewable-energy projects. Due to the effects being barely detectable and a decrease in opportunities for development, the over all effect on renewable-energy development from this management action would be negligible adverse.

Soil (moderate adverse)
Alternative A soils management actions that affect the renewable-energy program include prohibitions on surface-disturbing activities seasonally in areas of severe erosion hazard, on slopes equal to or greater than 25%, and in areas with poor reclamation suitability. All three prohibitions have an undefined allowance for waivers, and therefore would not outright prohibit renewable-energy development. The seasonal prohibition would have an adverse effect because it could delay renewable-energy development, but would not prevent any proposed projects. A total of 25,705 acres (52%) of BLM surface in the planning area with a wind-potential rating of good or higher is rated as having poor reclamation suitability. Although more than 10% of the areas with renewable-energy potential also have sensitive soils, because the authorized officer could waive the surface disturbance prohibition, when the proponents could demonstrate an ability to protect the soil resource, there would be limited development opportunities and an adverse effect on the renewable-energy program would be reduced to moderate.

Water Resources (negligible adverse)
Under Alternative A, surface-disturbing activities would be prohibited near waterbodies unless the authorized officer waived the prohibition. The water buffer affects 697 acres (1%) of BLM surface in the planning area with potential for wind-energy development. However, because the

authorized officer could waive the prohibition, when the proponent could demonstrate an ability to protect the soil resource, the effect on renewable-energy development would be negligible. Renewable-energy projects requiring water resources would be considered on a project-specific basis. Overall, the effect of Alternative A water management on renewable-energy development would be negligible adverse, due to the reduced opportunity for development.

Cave and Karst Resources (negligible adverse)
Under Alternative A, renewable-energy projects in cave and karst areas would be considered on a project-specific basis. Karst formations are located primarily along the Big Horn Mountains; therefore, the overlap between karst formations and renewable-energy potential on BLM surface, would be limited to 44,559 acres (6%) in the southern Big Horn Mountains. Restrictions on renewable-energy development would likely be confined to buffers around significant caves, which would further limit the area of potential overlap. Alternative A management of cave and karst resources would have a negligible adverse effect on the renewable-energy program, due to decreased opportunity for development.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative A, locatable minerals development would be considered on a project-specific basis. The predicted locatable minerals development under Alternative A would disturb 554 acres. This is less than one percent of the planning area, primarily in areas without wind-energy development potential. The effect on the renewable-energy program would be negligible adverse with decreased development opportunities.

Salable Minerals (negligible beneficial)
With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Under Alternative A, management actions for biological resources are designed to protect those resources, typically by limiting surface-disturbing activities.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Alternative A does not include management actions for grassland and shrubland communities. Reclamation activities would be consistent with the BLM reclamation policy. Compliance with the reclamation policy would be barely detectable on grassland and shrubland communities and restrict development opportunities, and therefore have a negligible adverse effect on renewable-energy development.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Under Alternative A, surface-disturbing activities would be prohibited within 500 feet of riparian resources unless the authorized officer waives the prohibition. Although 23,831 acres (3.0%) of BLM surface in the planning area are within the riparian buffer, only 944 acres (less than 1%) of BLM surface, have wind-energy potential rated good or higher. This management

action would likely decrease development opportunities and have a negligible adverse effect on renewable-energy development.

Invasive Species and Pest Management (negligible adverse)
Alternative A management actions would focus on the control of invasive plant species in cooperation with the counties and project proponents. Renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and costs associated with control activities would decrease development opportunities and have a negligible adverse effect renewable-energy development.

Fish and Wildlife Resources – Fish (negligible adverse)
Alternative A does not include management actions specific to fish. Renewable-energy projects would consider fish and incorporate BMPs to mitigate adverse effects on fish. The effect on the renewable-energy program would likely decrease development opportunity and would be negligible adverse.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor adverse)
Under Alternative A, management of wildlife habitat would affect uses administered by the ROW associated with renewable energy. Implementing species-specific conservation measures for BLM-administered sensitive wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses.

The wildlife and special status species wildlife management actions under Alternative A with the greatest effect on renewable-energy development are prohibiting surface-disturbing activities on BLM surface with a wind-energy potential rating of good or higher, including within the Ed O. Taylor winter game range (2,406 acres, or 5% of the federal wind resource) and within biological buffers of raptor nests (1,186 acres or 2% of the federal wind resource). At present, there are no documented Greater Sage-Grouse leks within 0.25 mile or plains sharp-tailed grouse within 750 feet of areas with wind-energy development potential. However, it should be noted that much of the wildlife data, particularly for raptors and both grouse species, have been collected in association with CBNG development; therefore, there is little data associated with the southern Big Horn Mountains. It is doubtful, even with complete wildlife data for the southern Big Horn Mountains, that renewable-energy development would be prohibited on more than five percent of the better wind-energy potential areas. Timing limitations could delay renewable-energy development, however, they typically do not prevent development. Overall, the Alternative A effect on renewable-energy development from management of wildlife and special status wildlife species would be minor adverse.

Special Status Species – Plants (no effect)
Under Alternative A there is no previous management action decision for special status species plants. Renewable-energy development would be considered on a case-by-case basis. Populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management action would have no effect on the renewable-energy development.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible adverse)
Under Alternative A, CRMPs would be developed for sites identified nominated for listing on the National Register. However, none of the nominated sites coincide with areas of wind-energy

development potential rated good or higher. Other than developing the CRMPs, Alternative A would not regulate surface-disturbing activities in relation to cultural or paleontological resources, but would consider effects on a project-specific basis. Implementing protective measures for cultural or paleontological resources could require avoidance and other mitigation measures for proposed land uses near these resources. These measures could result in the relocation or redesign of proposed uses before authorization. Because cultural and paleontological resources occur throughout the planning area, effects could vary in degree throughout the planning area. However, Alternative A does not prohibit renewable-energy development as part of cultural and paleontological resources management, but could decrease development opportunities, and the effect of this management on renewable-energy development would be negligible adverse.

Visual Resources (major adverse)
Under Alternative A, 45,524 acres (92%) of BLM surface in the planning area with wind-energy development potential rated good or higher would be managed as VRM Class II areas. Renewable-energy development would be incompatible within VRM Class II. Therefore, the effect on renewable-energy development would be major adverse.

Land Resources

The following programs do not have any management actions under Alternative A that would affect the renewable-energy program: **Travel and Transportation Management, Recreation,** and **Lands with Wilderness Characteristics**.

Lands and Realty (minor beneficial)
The BLM-administered land ownership pattern in the planning area is scattered, and interspersed with private and state lands and other agency- administered lands. Under Alternative A, land tenure adjustments would occur on a project-specific basis, with an emphasis on acquiring areas adjacent to existing blocks of BLM surface and disposing of isolated BLM parcels, which are difficult to administer. Consolidating surface lands would facilitate renewable-energy development by providing for a more contiguous public land base and by encouraging such development near communities. The result would be a minor beneficial effect on renewable-energy development.

Rights-of-Way and Corridors (minor adverse)
The Alternative A ROW and designated corridors program includes management actions related to soils and exclusion and avoidance areas. The effects of these management actions on renewable-energy are described in the soils and renewable-energy sections above. The only Alternative A management actions not previously discussed that could affect the renewable-energy program concern transmission line placement. Because these management actions would not exclude renewable-energy development, but do constrain the locations of transmission lines to serve renewable-energy projects, the effect would be minor adverse.

Recreation (no effect)
Alternative A would prohibit surface-disturbing activities within 0.5 mile of the Dry Creek Petrified Tree EEA. Renewable-energy development would not be likely, because wind-energy potential in that area is rated as poor. Therefore, there would be no effect on renewable-energy development from the Renewable Energy management action.

Lands with Wilderness Characteristics (no effect)
Alternative A does not include management actions for areas with wilderness characteristics

and would not manage BLM-administered lands outside the three WSAs for wilderness characteristics. This management would have no effect on the renewable-energy program.

Special Designations

Areas of Critical Environmental Concern (no effect)
Alternative A would not designate ACECs in the planning area, and there would no effect on renewable-energy development from ACEC management.

4.6.3.4. Alternative B

Alternative B would emphasize resource conservation.

Renewable Energy (major adverse)
Alternative B would exclude renewable-energy development on 710,376 acres (84%) of BLM surface in the planning area, and recommend avoidance on another 67,319 acres (13%) of BLM surface with a wind-energy potential rating of good or higher. The remaining acreage in the planning area would be available for renewable-energy consideration. The exclusion and avoidance areas at the renewable-energy scale would have a major adverse effect on renewable-energy development by decreasing opportunities for development.

Physical Resources

Air Quality (negligible adverse)
Alternative B would require air quality monitoring for renewable-energy projects expected to approach or exceed emissions standards. Few renewable-energy projects would likely be required to perform monitoring and the monitoring would not prevent any renewable-energy projects, although it would decrease development opportunity. The effect on renewable-energy development would be negligible adverse.

Soil (major adverse)
Soils management actions under Alternative B. include prohibitions on surface-disturbing activities in areas with severe erosion hazard, on slopes equal to or greater than 25%, in areas with poor reclamation suitability, and on miscellaneous soils types. All prohibitions would be absolute, with no allowance for waivers. A total of 25,705 acres (52%) of BLM surface in the planning area with wind-energy potential rated good or higher is rated as having poor reclamation suitability. The surface-disturbing prohibitions under Alternative B soils management would have a major adverse effect on renewable-energy development by decreasing opportunities for development.

Water Resources (minor adverse)
Alternative B would prohibit surface disturbance within 500 feet of springs, reservoirs, water wells, or perennial stream. Land use authorizations would be routed to avoid these areas. The water buffer would affect 697 acres (1%) of BLM surface with wind-energy development potential. This action would have a minor adverse effect renewable-energy development by decreasing opportunities for development.

Cave and Karst Resources (minor adverse)
Alternative B would prohibit surface-disturbing activities in cave and karst areas. BLM surface with karst-bearing formations and renewable-energy potential is limited to 44,559 acres (6%)

in the southern Big Horn Mountains. This management would have a minor adverse effect on renewable-energy energy by decreasing opportunities for development.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative B, foreseeable locatable minerals development would disturb 277 acres, which is less than one percent of BLM surface in the planning area. Most of these areas would likely not coincide with areas that have wind-energy potential. Therefore, decreasing opportunities for development would have an adverse effect on renewable-energy development and would be negligible.

Salable Minerals (negligible beneficial)
With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Under Alternative B, native plant species would be required for reclamation. Native species could increase the reclamation time and cost, but would not restrict, but would decrease renewable-energy development. The anticipated effect on the renewable-energy program would be negligible adverse.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Under Alternative B, surface-disturbing activities would be prohibited within 500 feet of riparian resources. Although 23,831 acres (3%) of BLM surface in the planning area are within the riparian buffer, only 944 of those acres have wind-energy potential rated good or higher, and would decrease development opportunity. Therefore, Alternative B management of riparian and wetland communities would likely have a negligible adverse effect on renewable-energy development.

Invasive Species and Pest Management (negligible adverse)
Alternative B would take an aggressive approach to managing invasive species. Renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and cost associated with control activities would decrease development opportunities and have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Fish (moderate adverse)
Alternative B would prohibit surface-disturbing activities, including renewable-energy development, within 0.25 mile of fish-bearing waters. There are 3,994 acres (8.0%) of BLM surface within the fisheries buffer in areas with wind-energy potential rated good or higher, all confined to the southern Big Horn Mountains. The result would be a moderate adverse effect on the renewable-energy program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major adverse)
The wildlife and special status species wildlife management actions under Alternative B that would have the greatest effect on renewable-energy development are prohibitions on

surface-disturbing activities on BLM surface with wind-energy potential rated good or higher in the Ed O. Taylor winter game range (2,406 acres, or 5%), within big-game migration corridors (3,688 acres, or 7%), within elk crucial ranges (20,470 acres, or 41%), within elk security habitat (35,915 acres, or 72%), and within biological buffers for raptor nests (1,186 acres, or 2%). Renewable-energy development would be prohibited on BLM surface with wind potential of good or better that are within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas. At present, there are no documented plains sharp-tailed grouse within 750 feet of areas with wind-energy development potential. The effect on renewable-energy development would be major adverse particularly from the management of big game (general wildlife) and Greater Sage-Grouse (special status species) and decreasing development opportunities.

Special Status Species – Plants (minor adverse)
Alternative B would allow renewable-energy development in special status plant habitat, but not within known populations. Because populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management action would prohibit ROW within suitable habitat which includes the South Big Horns, and would have a slight and detectable effect on the renewable-energy development. Overall this would have a minor adverse effect by limiting development to the renewable-energy program.

Heritage and Visual Resources

Cultural Resources (major adverse)
Alternative B would prohibit surface disturbance up to 5 miles from historic properties. This action would affect 33,879 acres (68%) of BLM surface in the planning area with wind-energy potential rated good or higher and decrease development opportunity. This would have a major adverse effect on renewable-energy development.

Paleontological Resources (negligible adverse)
Alternative B would regulate surveying and monitoring of paleontological resources during surface-disturbing activities. Renewable-energy activities could be prohibited in areas with paleontological resources of high quality or importance. However, at present, there are no high-quality paleontological areas in potential renewable-energy development areas, such areas are typically small, and renewable-energy projects could be located to avoid the sites. Therefore, the effect on renewable-energy development would be negligible adverse due to the decreased opportunity for development.

Visual Resources (major adverse)
Under Alternative B, 5,838 acres (12%) and 12,544 acres (25%) of BLM surface with wind-energy development potential would be managed as VRM Class I and II, respectively. Renewable-energy development would be incompatible with these VRM classes and decrease development opportunity. This would have a major adverse effect or renewable-energy development.

Land Resources

Lands and Realty (minor beneficial)
Alternative B would place a priority on retaining and acquiring lands with natural resource values. Consolidating surface lands would facilitate renewable-energy development by providing for a more contiguous public land base and by encouraging such development near communities. This would have a minor beneficial effect on renewable-energy development.

Rights-of-Way and Corridors (major adverse)
Alternative B would restrict major transmission lines to identified ROW corridors, of which only one would overlap (52 acres, or 0.1%) an area with wind-energy potential rated good or higher. This management action would essentially preclude renewable-energy development from the planning area, a major adverse effect.

Recreation (minor adverse)
Alternative B would prohibit surface-disturbing activities in designated SRMAs unless those activities would be consistent with other resource values. There are 2,101 acres (4%) of BLM surface in identified SRMAs that also have wind-energy potential rated good or higher. This management action would have a minor adverse effect on renewable-energy development by decreasing opportunity for development.

Lands with Wilderness Characteristics (major adverse)
Alternative B would manage the LWC area to emphasize natural values, thereby prohibiting renewable-energy development on 12,237 acres (17%) of BLM surface with wind-energy potential rated good or higher. This exclusion would have a major adverse effect on the renewable-energy program.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Alternative B would designate seven ACECs, within which renewable-energy development would be prohibited. The Pumpkin Buttes ACEC has 888 acres (2%) of BLM surface with wind-energy potential rated good or higher. Designating the Pumpkin Buttes ACEC would have a minor adverse effect on renewable-energy program.

4.6.3.5. Alternative C

Alternative C would emphasize resource use.

Renewable Energy (major beneficial)
Renewable energy development would be allowed anywhere in the planning area, consistent with other resource values. This would have a major beneficial effect on renewable energy development.

Physical Resources

Air Quality (moderate beneficial)
Alternative C would not require air quality monitoring for renewable-energy projects. The effect on the renewable-energy program would be readily apparent with measurable change to air quality and would increase opportunity for development. This would have a moderate beneficial effect on renewable-energy development.

Soil (negligible adverse)
Under Alternative C, requests for disturbances would be considered in areas of severe erosion hazard, on slopes equal to or greater than 25%, in areas with poor reclamation suitability, and on miscellaneous soils types. This would allow renewable-energy development on all sensitive soils in the planning area. BMPs and other mitigation measures would be incorporated to reduce and localize renewable-energy effects on sensitive soils. Overall, Alternative C soils management

would have a negligible adverse effect on renewable-energy development due to the limited amount of acres rated good or higher for renewable-energy the effect would be barely detectable and decrease opportunities for development.

Water Resources (negligible adverse)
Alternative C would allow surface disturbance within 500 feet of springs, reservoirs, water wells, and perennial streams. Land use authorizations would be routed to avoid these areas. BMPs and other mitigation measures would be incorporated to reduce and localize renewable-energy effects on water resources. Overall, Alternative C water management would have a negligible adverse effect on renewable-energy development due to the limited number of acres rated good or higher and the effect would barely be detectable with decreased opportunities for development.

Cave and Karst Resources (negligible adverse)
Under Alternative C, site-specific buffers would likely prohibit surface-disturbing activities near significant caves. This could result in the relocation or redesign of individual facilities, but likely would not prevent any renewable-energy project authorizations. Overall, Alternative C management of cave and karst resources would barely be detectable and decrease opportunities for development this would have a negligible adverse effect on renewable-energy management.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative C, foreseeable locatable minerals development would disturb 1,455 acres, less than one percent of BLM surface. This would have a negligible adverse effect on renewable-energy development with decreased opportunity for development.

Salable Minerals (negligible beneficial)
With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Under Alternative C, the BLM would authorize native and non-native plant species for initial reclamation activities. There would be some time and financial expense for renewable-energy proponents to plan and perform reclamation, but renewable-energy activities would not be restricted, although it could decrease development opportunity. The anticipated effect on the renewable-energy program would be a negligible adverse effect.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Alternative C would allow surface-disturbing activities in riparian communities; BMPs would be incorporated to mitigate adverse effects to riparian resources. This management action would likely be barely detectable and decrease opportunity, and would have a negligible adverse effect on renewable-energy development.

Invasive Species and Pest Management (negligible adverse)
Under Alternative C, renewable-energy developers would be expected to control invasive species

as part of their authorizations. The time and costs associated with control activities and decrease opportunity would have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Fish (minor adverse)
Alternative C would allow surface-disturbing activities, including renewable-energy development, within 0.25 mile of fish-bearing waters. Fish and other resource values would be considered during project analyses. There are 3,994 acres (8.0%) of BLM surface in the fisheries buffer with a wind-energy potential rating of good or higher, all confined to the southern Big Horn Mountains. Because Alternative C fish management would allow development and decrease development opportunity, this would have a minor adverse effect on the renewable-energy program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (minor adverse)
Alternative C would allow renewable-energy development on BLM surface with a wind-energy potential of good or higher within the Ed O. Taylor winter game range (2,406 acres, or 5%), within big game migration corridors (3,688 acres, or 7%), within elk crucial ranges (20,470 acres, or 41%), within elk security habitat (35,915 acre or 72%), within biological buffers for raptor nests (1,186 acres, or 2%), and near Greater Sage-Grouse and plains sharp-tailed grouse leks. At present, there are no documented Greater Sage-Grouse leks or plains sharp-tailed grouse within 0.25 mile of areas with wind-energy development potential. However renewable-energy development proposals must consider and mitigate adverse effects on wildlife and other resource values. Alternative C wildlife management would have a minor adverse effect on renewable-energy program with decreased development opportunities.

Special Status Species – Plants (negligible adverse)
Alternative C would allow renewable-energy development in special status plant habitat, but not within known populations. Because populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management would barely be detectable but could decrease opportunity, having a negligible adverse effect by avoiding populations that are small and isolated or relocating sites on renewable-energy development.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative C would not prohibit surface-disturbing activities from any large areas of the planning area, but rather would manage cultural sites individually with site-specific mitigation. Implementing mitigation for potential adverse effects on cultural resources would require avoidance and other protective measures for renewable-energy development proposed near these resources. These measures could result in the relocation or redesign of proposed renewable-energy development structures and infrastructure, but should not prevent renewable-energy projects. The effect on the renewable-energy program would be negligible adverse.

Paleontological Resources (negligible adverse)
Alternative C would regulate surveying and monitoring of paleontological resources during surface-disturbing activities. The effects of renewable-energy activities would be mitigated in areas with paleontological resources of high quality or importance. The effect on renewable-energy development would be negligible adverse with barely detectable effects and decreased development opportunities.

Visual Resources (moderate adverse)
There would be no areas in the planning area managed as VRM Class II. Under Alternative C, 8,443 acres (17.0%) of BLM surface in the planning area with wind-energy development potential would be managed as VRM Class III; renewable-energy development would not be precluded, but could be heavily regulated to prevent more than a moderate change to the landscape. Overall, Alternative C management of visual resources would have a moderate adverse effect on renewable-energy development.

Land Resources

Lands and Realty (minor adverse)
Under Alternative C management, the BLM would not acquire lands or interests in lands. This would eliminate the BLM ability to gain access to some BLM-administered parcels and inhibit the BFO ability to manage resources and uses such as renewable-energy. The consequences of this would be continued higher costs for the BLM and renewable-energy proponents because of the difficulty and time required to obtain access through private lands. Alternative C would have a minor adverse effect on renewable-energy development.

Rights-of-Way and Corridors (minor adverse)
The only management actions for Alternative C not previously discussed that could affect the renewable-energy program concern transmission line placement. These management actions do not exclude renewable-energy development, but do constrain the locations of major transmission lines to serve renewable-energy developments. This would have a slight but detectable effect with an overall minor adverse effect on renewable-energy development.

Recreation (minor adverse)
Alternative C would designate six SRMAs (30,570 acres). Renewable-energy development could be authorized if in those areas if it would be compatible with other resource values. Because renewable-energy development conflicts with recreation and other values are likely within some SRMAs, effects on renewable-energy development would be minor adverse.

Lands with Wilderness Characteristics (moderate adverse)
Under Alternative C, lands with wilderness characteristics areas would be managed consistent with management for the surrounding areas. This would likely allow for renewable-energy development except for immediately adjacent to the current WSAs and Middle Fork WSR. Because these areas coincide with areas that have a wind-energy potential rating good or higher, the Renewable Energy management action would readily be apparent and would decrease opportunity development this would have a moderate adverse effect on the renewable-energy program.

Special Designations

Areas of Critical Environmental Concern (no effect)
Alternative C would not designate any ACECs. Therefore, there would be no effect on renewable-energy development.

4.6.3.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize

moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Renewable Energy (major adverse)
Under Alternative D, renewable-energy development would be excluded on 413,001 acres (52%) of BLM surface. Exclusion at this scale would have a major adverse effect on renewable-energy program.

Physical Resources

Air Quality (negligible adverse)
Air quality monitoring would be required of renewable energy projects expected to approach or exceed emission standards. Few renewable energy projects would likely be required to conduct monitoring and the monitoring would not prevent any renewable energy projects. The effect on renewable energy development would be negligible adverse and would decrease development opportunities.

Soil (moderate adverse)
Under Alternative D, requests for disturbances would be considered under defined conditions within areas with severe erosion hazard, on slopes equal to or greater than 25%, and in areas with poor reclamation suitability with an approved reclamation and stabilization plan. Surface-disturbing activities would be required to avoid miscellaneous soils types unless they have an approved project construction and site-specific reclamation plan. This would allow renewable-energy development on sensitive soils in the planning area while adequately protecting soil resources. Soils with poor reclamation suitability coincide with 25,705 acres (52%) of BLM surface in the planning area with wind-energy development potential. Although more than 10% of the planning area has sensitive soils, Alternative D soils management would have a moderate adverse effect on the renewable-energy program due to the provisions allowing for disturbance of sensitive soils.

Water Resources (negligible adverse)
Alternative D would allow surface disturbance that would meet resource objectives within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams on 697 acres (1%) of BLM surface in the planning area with wind-energy development potential. Land use authorizations might be rerouted to avoid these areas, but rerouting would be required only if the objectives could not be met. BMPs and other mitigation measures would be incorporated to reduce and localize renewable-energy effects on water resources. This would have a negligible adverse effect on the renewable-energy program by decreasing development opportunity.

Cave and Karst Resources (negligible adverse)
Alternative D would require a disturbance-free buffer around entrances and passages of significant caves. This could result in the relocation or redesign of individual facilities, but would not likely prevent any renewable-energy project authorizations. This would have a negligible adverse effect on renewable-energy development.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative D, most of the planning area would be available for locatable minerals development. However, because foreseeable locatable minerals development would disturb 1,252

acres, less than 1% of BLM surface, the effect on renewable-energy program would be negligible adverse and decrease development opportunity.

Salable Minerals (negligible beneficial)
With the wide spacing of met-towers and typically small size of salable mineral development the two land uses are anticipated to be compatible potentially even sharing infrastructure such as roads. The foreseeable development scenarios for all alternatives predict less than one percent of BLM surface would be disturbed. Overall, salable mineral development would likely have a negligible beneficial effect on renewable-energy development.

Biological Resources

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Under Alternative D, grassland and shrubland management objectives would allow desirable non-native plant species for short-term reclamation. This action would provide more opportunities to mitigate the effects of surface-disturbing activities from approved ROW actions. There would be some time and financial expense for renewable-energy proponents to plan and perform reclamation, but renewable-energy activities would not be restricted. The anticipated effect on the renewable-energy program is barely detectable with decrease opportunity for development and therefore, would be negligible adverse.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Alternative D would allow surface-disturbing activities within 500 feet of riparian resources in accordance with identified criteria. Although 23,831 acres (3%) of BLM surface in the planning area are within the riparian buffer, only 944 of those acres (less than 1%) have wind-energy potential rated good or higher. Therefore, Alternative D management of riparian and wetland communities would have a negligible adverse effect on renewable-energy program by decreasing development opportunity.

Invasive Species and Pest Management (negligible adverse)
Alternative D would take a moderate approach to managing invasive species. Renewable-energy developers would be expected to control invasive species as part of their authorizations. The time and cost associated with control activities would have a negligible adverse effect on renewable-energy development.

Fish and Wildlife Resources – Fish (negligible adverse)
Alternative D would allow surface-disturbing activities, including renewable-energy development, within 0.25 mile of fish-bearing waters where fish resource objectives can be met. There are 3,994 acres (0.5%) of BLM surface in the planning area within the fisheries buffer with a wind-energy potential rating of good or higher, all confined to the southern Big Horn Mountains. Alternative D fish management would have negligible adverse effect on the renewable-energy program by decreasing development opportunity.

Fish and Wildlife Resources – Wildlife (moderate adverse) **and Special Status Species – Wildlife** (major adverse)
The wildlife and special status species wildlife management actions under Alternative D that would have the greatest effect on renewable-energy development are prohibitions on surface-disturbing activities on BLM surface with wind-energy potential rated good or higher in the Ed O. Taylor winter game range (2,406 acres, or 5%), within big game migration corridors (3,688 acres, or 7%), within elk security habitat (35,915 acres, or 72%), within Greater

Sage-Grouse Priority Habitat Area (Core Population Area and Connectivity Corridor) (6,521 acres, or 13%), and within biological buffers for special status raptor nests (1,186 acres, or 2%). Within the Core Population Area and Connectivity Corridor, renewable-energy development would be limited to one disturbance per 640 acres and protected within 0.6 mile of Sage-Grouse leks. At present, there are no documented Greater Sage-Grouse leks within 0.6 mile of areas with wind-energy development potential of good or higher. The effect on renewable-energy development would be moderate adverse from management of general wildlife because there would be restricted development and provisions to allow for renewable-energy development with appropriate mitigation, and major adverse from management of special status wildlife species because of the development restrictions in Greater Sage-Grouse Core Population Area and Connectivity Corridor.

Special Status Species – Plants (negligible adverse)

Alternative D would allow renewable-energy development in special status plant habitat, but not within known populations. Because populations are typically small in acreage and within specialized habitats, avoiding populations should not be a burden to renewable-energy proponents. This management would barely be detectable and would decrease opportunity and would have a negligible adverse effect on renewable-energy program.

Heritage and Visual Resources

Cultural Resources (moderate adverse)
Under Alternative D, the cultural resources program would develop CRPPs for the protection and preservation of identified geographic areas. These could include a prohibition on surface-disturbing activities for specifically identified sites containing historic properties that retain their historic settings, and appropriate mitigation for surface-disturbing activities for the protection of TCPs, sacred sites, and other culturally sensitive areas. To protect the settings of the identified historic properties, surface-disturbing activities could be restricted up to 3 miles from the sensitive cultural sites. These management actions would prohibit renewable-energy development on 1,694 acres (3%) and restrict renewable-energy development on 38,648 acres (78%) of BLM surface in the planning area with a wind-energy potential rating of good or higher. Although the prohibition would not affect 5 percent of the potential wind-energy resource, because so much of the potential wind-energy resource would be in the restriction area (for which mitigation could include prohibition), the effect on renewable-energy development would be moderate adverse.

Paleontological Resources (negligible adverse)
Alternative D would regulate surveying and monitoring of paleontological resources during surface-disturbing activities. Renewable-energy activities would avoid areas with high-quality or high importance paleontological resources. The effect on renewable-energy development would be barely detectable and therefore have a negligible adverse.

Visual Resources (major adverse)
Under Alternative D, 5,838 acres (12%) and 9,833 acres (20%) of BLM surface in the planning area with wind-energy development potential would be managed as VRM Classes I and II, respectively. Renewable-energy development would be incompatible with these VRM classes, and there would be a major adverse effect on wind-energy development from the Renewable Energy management.

Land Resources

Lands and Realty (minor beneficial)
Management under Alternative D would actively pursue land tenure adjustments to consolidate BLM surface estate and dispose of lands that are small and isolated or have limited natural resource values. Consolidating surface lands would facilitate renewable-energy development by providing for a more contiguous public land base and by encouraging such development near communities. The end result would effect less than 5% of BLM surface having a wind potential rating of good or higher, which would have a minor beneficial effect on renewable-energy development.

Rights-of-Way and Corridors (minor adverse)
Under Alternative D, these management actions would not exclude renewable-energy development, but would allow transmission lines within existing ROW and designated corridors and other disturbance areas when resource objectives can be met. Constrain the locations of transmission lines to serve renewable-energy developments. There would be a small change and therefore renewable-energy authorizations would have a minor adverse effect on renewable-energy development.

Recreation (minor adverse)
Alternative D would allow surface-disturbing activities in seven designated SRMAs for administrative purposes only. This management action would prohibit renewable-energy development on 2,101 acres (4%) of BLM surface in the planning area with a wind-energy potential rating of good or higher. This management action would have a minor adverse effect on renewable-energy development.

Lands with Wilderness Characteristics (moderate adverse)
Alternative D would manage 6,864 acres for natural values, which would prohibit most surface-disturbing activities in an area with a wind-energy potential rating of good or higher. This would have a moderate adverse effect on the renewable-energy program.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Alternative D would designate three ACECs, within which renewable-energy development would be prohibited. The Pumpkin Buttes ACEC has 888 acres (2%) of BLM surface in the planning area with wind-energy potential of good or higher. Designating the Pumpkin Buttes ACEC would have a minor adverse effect on renewable-energy development.

4.6.3.7. Cumulative Impacts

Wind-energy projects are the most likely form of renewable energy projects in the planning area. The most likely area for development is in the southeast quarter of the planning area where there is very little BLM surface. There are currently two non-federal wind-energy developments proposed within viewshed of Pumpkin Buttes. The maximum estimated foreseeable non-federal renewable-energy development is 323,636 acres. Reasonably foreseeable development assumptions indicate renewable-energy development could affect up to 75,240 acres of BLM-administered lands in the planning area. Furthermore, oil and gas development will affect approximately 39,000 acres (cumulatively), or less than 5 percent of the planning area.

There could be interest in developing other forms of renewable energy development throughout most of the planning area. Renewable-energy technology is changing and could improve future

opportunities for other renewable-energy projects not specifically identified in this analysis. Management actions not identified for specific projects in this analysis would refer to the appropriate resource management goals and objectives to ensure conformance to the land use plan.

4.6.3.8. Conclusion

Table 4.65, "Summary of Impacts to Renewable-Energy Development" (p. 1257) summarizes effects on the renewable-energy program by alternative.

Table 4.65. Summary of Impacts to Renewable-Energy Development

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	Moderate beneficial	Negligible adverse
Soil	Moderate adverse	Major adverse	Negligible adverse	Moderate adverse
Water Resources	Negligible adverse	Minor adverse	Negligible adverse	Negligible adverse
Cave and Karst Resources	Negligible adverse	Minor adverse	Negligible adverse	Negligible adverse
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Salable Minerals	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Vegetation – Riparian/Wetland Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Invasive Species and Pest Management	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fish and Wildlife Resources – Fish	Negligible adverse	Moderate adverse	Minor adverse	Negligible adverse
Fish and Wildlife Resources – Wildlife	Minor adverse	Major adverse	Minor adverse	Moderate adverse
Special Status Species – Plants	No effect	Major adverse	Negligible adverse	Negligible adverse
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	Minor adverse	Major adverse	Minor adverse	Major adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Major adverse	Negligible adverse	Moderate adverse
Paleontological Resources	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	Major adverse	Major adverse	Moderate adverse	Major adverse
Land Resources				
Lands and Realty	Minor beneficial	Minor beneficial	Minor adverse	Minor beneficial
Renewable Energy	Major beneficial	Major adverse	Major beneficial	Major adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Rights-of-Way and Corridors	Minor adverse	Major adverse	Minor adverse	Minor adverse
Travel and Transportation Management	No effect	No effect	No effect	No effect
Recreation	No effect	Minor adverse	Minor adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	Major adverse	Moderate adverse	Moderate adverse
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	Minor adverse	No effect	Minor adverse
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.4. Rights-of-Way and Corridors

This section describes potential impacts on the ROW program from land actions within the program and management actions by other resources programs. The ROW program supports public land use interests by responding to public requests for federal land use authorizations, ROW, permits and leases including; roads, pipelines, fiber optic lines, communication sites, powerlines and power stations, compressor sites, injection wells, etc. This program also acts as a support program for all other resource programs.

Corridor management involves aligning multiple authorizations within identified primary linear routes and development centers to minimize the overall effects to the landscape, wildlife, and natural resources. Chapter 3 describes existing conditions concerning this program.

Significance Criteria effects to ROW management would be considered substantial if any of the following occur:

- Substantial reduction in opportunity for ROW authorizations and related development activities.
- Substantial reduction in the opportunity for land tenure adjustments, limiting connectivity and contiguity for ROW development authorizations.

4.6.4.1. Methods and Assumptions

Impact analysis and conclusions are based on interdisciplinary team knowledge of resources in the planning area, reviews of existing literature, and information provided by other agencies. Spatial analysis was performed using the ESRI ArcGIS Desktop 10.0 computer software. Effects are

quantified where possible. In the absence of quantitative data, effects are described using ranges of potential effects on the qualitative terms if information is available and appropriate.

Assumptions

- The demand for ROW authorizations will increase during the planning period, and shall remain a primary function of the realty program. Consideration of land use authorizations would be addressed on a project specific basis, and shall be consistent with other resource objectives.
- The demand for compliance monitoring and reclamation activities would continue to increase over the life of the planning period.
- Resolving trespass issues on public lands would continue over the life of the planing period. Avoidance of inadvertent trespass by people accessing public lands would be addressed through the use of appropriate signs and access authorizations.
- Denial, deferment, or alternative routes or site locations of ROWs based on management actions for other resource programs would have an adverse effect by decreasing development opportunities.
- Sharing existing infrastructure such as roads for other resource and management actions would reduce trespass potential, increase ROW development opportunities and would benefit the ROW and corridor program.

The discussion of the effects on the ROW program under each Alternative encompasses all influences from land use authorizations. The effects on the ROW program focuses on the constraints and opportunities for ROW authorizations (e.g., for pipelines, powerlines, transmission lines, roads, reservoirs and communication sites, etc.). Surface-disturbing effects would occur from the implementation of management actions primarily designed to protect natural resources by preventing or minimizing effects on those resources. In other words, the type and degree of limitations and restrictions placed on ROW authorizations depends on the location of sensitive or high-value resources and the potential for environmental effects on those resources. This analysis would determine whether the implementation of management actions for other resource programs influences or modifies the location, size, or design of a given ROW proposal. In some cases, management actions for other resources would cause a denial or deferment; or require an alternate route or site location of a given proposal.

4.6.4.2. Impacts Common to All Alternatives

Rights-of-Way and Corridors (major beneficial)
ROW authorizations in Northern Sheridan County and Campbell County would be minimized due to substantial amounts of coal development that adversely affect multiple use opportunities on public lands.

Energy development through mineral and renewable resources would continue into the foreseeable future and would require authorizing uses to facilitate development during the plan period. Currently, more than 90% of the workload under ROW management is related to oil and gas development authorizations, monitoring, and reclamation.

ROW corridors would be designated to minimize surface disturbances and effects to other resources. ROWs would primarily be placed in or adjacent to existing disturbed areas associated with other existing ROW authorizations, or constructed roads and highways and would be the

preferred future location. ROW development would benefit from placement of ROWs in a corridor where land use conflicts have been eliminated or reduced. Designated corridors given preference are intended to reduce resource and land use conflicts as much as possible; which would reduce the potential for modification, or mitigation needed to approve a ROW and develop infrastructure and facilities. Designating and preferring the location of ROW authorizations in corridors could also create adverse impacts to ROWs by preventing the location of ROWs along the most direct route for the intended purpose, or preventing additional ROW authorizations in a corridor if the maximum safe density of existing powerlines or pipelines is reached. Designated ROW corridors would be utilized with major ROW projects, such as intrastate pipelines and transmission lines.

The BFO would maintain a transportation management system in cooperation with appropriate state and local agencies to meet public and resource management needs; provide reasonable access across public land to private land, subject to other resource values; develop a communication site management plan for all existing and newly identified communication site concentration areas.

Increasing demand for greenhouse gas emission mitigation measures is increasing interests for pore space disturbances, or uses. These are considered a lands and realty action and require a land use permit and ROW authorization for geologic studies and injection wells. The majority of the planning area could be utilized for these activities.

Overall the common to all alternatives in the majority of the planning area could be utilized for multiple use ROW and corridors and would have a major beneficial effect on the ROW program.

Physical Resources

Air Quality (minor adverse)
Air quality management would include implementing air quality impact mitigation measures or COAs (within BLM's authority) to reduce emissions from current levels in the planning area and work cooperatively to encourage industry and other permittees to adopt measures to reduce emissions. These actions could require ongoing monitoring for compliance and decreased development opportunity, adding cost to ROW and corridor projects, and would be an ongoing requirement for ROW actions in the planning area. This management would have a minor adverse effect on the ROW program.

Soil (minor adverse)
Using soil surveys and onsite investigation would ensure proper use of soil resources. Applying appropriate mitigation (including project relocation or denial) and requiring an approved reclamation plan would ensure all disturbances were effectively remediated to BLM standards. Authorized surface-disturbing activities would include plans for reclamation; site-specific reclamation actions would reflect the complexity of the project, environmental concerns, and reclamation potential of the site. Applying mitigation measures if necessary, could include relocating the disturbance to a more suitable soil type, or deny the authorization.

There are approximately 215,496 acres of BLM managed surface lands identified as highly erosive by wind and water with little opportunity for successful mitigation and reclamation. These areas include Powder River Breaks, Recluse, Spotted Horse, Durham Ranch, and north of the community of Wright; South of Gillette Highway 59 to Hilight Road includes numerous hills with substantial amounts of scoria; Kaycee areas, including Tisdale Mountain have significant amounts of Bentonite, which limits development opportunities. Implementing management actions for vegetation and soil protection would place land use restrictions on those areas. This would

result in the limitation or avoidance of overall disturbance when reclamation would be difficult, extensive, or where reclamation is known to fail.

Limitations for disturbance on all identified lands with highly erosive soils and poor reclamation potential would include consideration for minimizing surface-disturbing activities within those areas as well as those identified as having slopes of more than 25% (approximately 133,689 acres, see Map 4). The Lands and Realty staff would incorporate stipulations or COAs appropriate for successful mitigation and reclamation of those disturbed areas. The overall effect for disturbances on difficult to reclaim and steep soils as described would have a minor adverse effect on the ROW program.

Water Resources (minor adverse)
Water quality and watershed management actions common to all alternatives would likely cause changes in the locations or design of some projects, but would not be likely to prohibit realty actions in most of the planning area. Water management actions common to all alternatives would not be substantial and would have a minor adverse effect on the ROW program.

Cave and Karst Resources (no effect)
Management actions common to all alternatives for cave and karst resources are procedural actions (inventories) and would have no effect on the ROW program. As a BMP land use requests will not be considered for locations with known or suspected cave and karst values. Protecting this resource has not historically had an effect on the ROW program, and would likely have no effect on land uses in the future.

Mineral Resources

Locatable Minerals (negligible adverse)
Lands not formally withdrawn or segregated from mineral entry would be open for the exploration and development of locatable minerals. However, foreseeable locatable mineral development would affect 1,455 acres of BLM surface (0.2%) in the planning area. Designation of ROW corridors and siting new ROW adjacent to existing disturbances to minimize surface disturbance, which may necessitate modifying the siting of some roads and access routes, which would decrease development opportunity. This would have a negligible adverse effect on the ROW program.

Leasable Minerals – Coal (negligible adverse)
Similarly, the potential acreage available for coal leasing is extensive, but the foreseeable activity would disturb a maximum of 195,700 acres (less than 1% of BLM-administered coal area), all in central Campbell County and north-central Sheridan County (Map 11). Overall, coal leasing would result in a negligible adverse affect on the ROW program by decreasing development opportunities within the leased coal areas.

Leasable Minerals – Fluids (major beneficial)
Authorizations related to oil and gas development would continue to require lessees to conduct operations in a manner that minimizes adverse effects to other resources and other land uses and users. Considerable oil and gas development is likely to continue during the planning period, CBNG and conventional potential is approximately 52% of federal fluid minerals, Energy development is currently the resource dominate surface-disturbing activities under the ROW program, with some of the largest coalbed natural gas reserves found in the PRB. Oil and gas development activities are anticipated to be compatible with other energy-development activities,

potentially sharing infrastructure such as roads, structures and utility corridors, increasing development opportunities. Therefore, oil and gas (fluid) development would have a major beneficial effect on ROW program.

Although mineral resource development would vary across the alternatives, the trade-offs described above would apply to all alternatives. In this respect, effects would not be highly variable among the alternatives, and therefore not discussed for each alternative.

Salable Minerals (negligible adverse)
The BFO would make most of lands in the planning area, including federally administered surface, minerals, and split estate, available for mineral materials exploration and development. Salable minerals projects are relatively rare, these actions likely have an overall negligible adverse effect, due to possible increased costs from limited projects and would decrease development opportunities. The maximum predicted disturbance from ROW actions related to salable minerals is 2,090 acres of BLM surface lands (0.2%). This would have a negligible adverse effect on the ROW program.

Fire and Fuels Management (no effect)

Fire and fuels management will have no effect on the ROW program and will not be discussed any further in the ROW and corridors section.

Biological Resources

Management actions for biological resources are designed to be protective of the biological resources typically by limiting surface-disturbing activities.

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for forests and woodlands that affect the ROW and corridor program. The forest and woodland management actions that do vary by alternatives do not regulate land use activities other than timber harvest, and therefore would have no effect on ROW and corridor program. Therefore, forests and woodlands are not further addressed in the ROW and corridor section.

Vegetation – Grassland and Shrubland Communities (major adverse)
Achieving a high level of species diversity, meeting the Wyoming Standards for Healthy Rangelands for vegetation, and preventing or minimizing soil erosion would result in the relocation or redesign of projects before they are authorized, when appropriate. Achieving diversity as well as an integrated management approach (e.g., mechanical, chemical, biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives would be managed to maintain sustainable forage levels for livestock and wildlife habitats. Manage grasslands and shrublands to protect, preserve, or enhance plant communities. Managing the siting of facilities and related infrastructure (utility corridors, roads) would reduce effects to vegetation resources, and managing the planning and development of ROW would reduce effects to the vegetation resource.

Short-term effects would occur with disturbance and reclamation activities. Application of appropriate mitigation measures would limit or avoid long-term effects on the resources.

Long-term effects primarily occur from roads and powerlines. They would continue to occur in the planning area and would likely include further disturbances from roads, overhead powerlines, and some structures (e.g., abandoned structures from current mineral energy development, and future energy development structures like wind towers and potentially solar fields, or others not yet identified). Grass and shrub vegetation communities cover most of the planning area, ROW projects would be sited to reduce affects on vegetation impacts, which could result in relocation or redesign, therefore management common to all alternatives would have a major adverse effect on the ROW and corridor program.

Vegetation – Riparian/Wetland Resources (minor adverse)
ROW management would strive to prevent degradation, loss, or destruction of riparian/wetland habitat, prohibit conflicting uses within riparian research areas and special enclosures, such as waterfowl supporting reservoirs and wetland systems on springs and streams, and evaluate CBNG created riparian and wetland systems for retention or reclamation. Riparian areas are generally held under BLM administration for the conservation, maintenance, and improvement to wildlife and natural resources. For all proposed surface disturbances, the BFO would prohibit surface disturbances that would have adverse effects on water sources that support wetland and riparian conditions. If a water source is considered important to other natural resource discipline(s), the parcel would be retained under BLM administration. There is 2% of riparian and wetland communities on BLM-administered lands within the planning area. Retaining these lands and avoiding disturbances that would affect riparian and wetland communities would likely have a minor adverse effect on the ROW program and would decrease development opportunities.

Invasive Species and Pest Management (minor adverse)
ROW authorizations would require operators and users to manage to limit surface disturbance to prevent weed spread, using an IPM approach consistent with DOI Manual 517. This program would limit surface disturbance to the minimum needed for safe project completion to limit the spread of invasive species, and require permit holders to use vegetation products certified to be free of invasive species on all BLM-administered projects and lands. Collectively these measures would barely be detectable and decrease ROW development opportunity, having a minor adverse effect on the ROW program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate adverse)
ROW authorizations would include stipulations or COA requiring authorized users to construct new fences to avoid adverse affects on wildlife and in accordance with BLM Fencing Handbook 1741-1 (BLM 1989), WO IM 2010–022 (BLM 2009e), and to promote the maintenance and improvement of habitat for migratory bird species of conservation concern in a manner consistent with national, regional, and statewide bird conservation priorities. Projects that could affect special status species fish would be modified or denied as appropriate. Stipulations or COAs would also require users to minimize disturbances that would result in alterations to springs and riparian Greater Sage-Grouse habitat.

Water facilities would be designed with protective features to reduce the risk of mosquito infestations resulting in an increase of WNv, and reduce the risk of mortality of Greater Sage-Grouse from drowning or entrapment.

Overall, management of fish and wildlife habitat and special status species will effect uses administered by the ROW program through the implementation of mitigation measures designed to protect them. Implementing species-specific protection measures for BLM-administered sensitive plant and wildlife species and prohibiting actions that would affect Threatened or

Endangered species could result in the relocation of proposed disturbances and uses. This would effect approximately eight percent of the area and would decrease ROW development opportunities. Overall, there would be a moderate adverse effect on the ROW and corridor program.

Fish and Wildlife Resources – Fish and Special Status Species – Plants and Fish (negligible adverse)
The current RMP does not have any management actions that pertain directly to ROW and corridor program due to the limited amount of occupied fisheries and species status plant habitat.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Because there are known cultural resources throughout the planning area, and because it is likely that additional cultural resources would be discovered, there could be vary degrees of effects throughout the planning area. Implementing protective measures and site stabilization for cultural resources would require avoidance and other mitigation measures for ROW actions proposed near such resources. These measures could result in the relocation, redesign or denial of proposed land uses.

Communication towers, compressor stations, tanks, and wind turbines would have the potential to directly effect the visual integrity of classes of cultural properties that derive their significance from natural settings and settings relatively devoid of modern intrusion. This resource would not have a significant effect on the ROW program, but would increase cost for development. Overall, this would have a minor adverse effect on the ROW program.

Paleontological Resources (negligible adverse)
Survey and monitoring activities for paleontological resources will occur during the entire planning period. Any paleontological resources discovered would be protected in accordance with the appropriate protective laws under all alternatives. Dry Creek Petrified Tree Environmental Education Area would continue to be protected from land use effects. The protection and monitoring of paleontological resources would be considered not significant, although it would decrease development opportunity. This would have a negligible adverse effect on the ROW program.

Visual Resources (minor adverse)
Any facilities or structures proposed in WSAs would be designed so as not to impair wilderness suitability. If the Middle Fork Powder River is designated by Congress as a Wild and Scenic River, the river would be managed as VRM Class I. Areas rated as VRI Class IV that do not contain special emphasis areas would be managed as VRM Class IV. Authorizations would require non-temporary facilities and structures to be screened, painted, and designed to blend with the surrounding landscape except where safety indicates otherwise.

Managing the planning area to meet VRM objectives could affect the locations, routes, heights, and colors of proposed uses and associated facilities. Additional effort would be required to design projects to meet the objectives of the specific VRM class designation of an area in which a land use is proposed. Some additional project planning might be necessary for proposed projects within VRM Class III areas to ensure that the landscape is partially retained. The ROW program could require intensive mitigation measures, or preclude uses proposed in VRM Class II areas.

A management action common to all alternatives is the requirement for non temporary facilities to blend with surrounding landscape. This requirement is secondary to managing within the VRM class, meaning, although facilities may be visible within VRM Class II-IV, mitigation for visual effects should be included wherever possible. Because this management action does not prohibit ROW development the cost would increase and therefore decrease ROW development opportunity. The effect on the ROW program is a minor adverse effect.

Land Resources

Forest Products (negligible adverse)
Forest management areas within 200 feet of surface waters would be prohibited and affecting less than one percent of the planning area. ROW and corridors would be denied or relocated which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect for the ROW and corridor program.

Lands and Realty (moderate beneficial)
R&PP applications would be considered on a project specific basis, and prohibit subsequent uses on these lands unless they were compatible with each R&PP authorization. Consideration for land use authorizations (permits, leases, etc.) would occur on a project specific basis consistent with other resource objectives. Consideration for withdrawals for surface and minerals and review withdrawal proposals from other agencies would occur on a project specific basis. Lands meeting the identified disposal criteria would have priority consideration for disposal.

The land ownership pattern in the planning area is scattered interspersed with private and state lands and other government agency administered lands. The lands and realty program will make land tenure adjustments through acquiring and disposing of lands through exchange, sale or through R&PP Act of 1926 patents. This would facilitate the location and routing of uses by providing for a more contiguous public land base and by encouraging such developments near communities.

Approximately 117,427 acres (7% of BLM surface) are identified for disposal. Disposal of small, isolated parcels would improve ROW management by reducing effects to the land by resolving access and adjacent landowner conflicts by 14%.

Trespass Resolution
Access easements would help resolve trespassing issues on public land. Inadvertent trespass would also be minimized through the use of appropriate signage. Other resource uses may affect trespassing incidences through the increased use of BLM-administered lands. Road development resulting from mineral development, grazing activities, and recreation would likely have a minor effect on trespass management. ROW management would include avoiding potential of inadvertent trespass by people accessing public lands through the use of appropriate signs and access authorizations. This level of effect is minor.

Custodial Allotments
Marginal grazing allotments on small, isolated parcels that are surrounded by private land owners are difficult to manage, and contribute little to the rangeland management program. The BFO would consider disposing of these properties through sale or exchange, improving management opportunities for higher priority grazing allotments. If these types of parcels are sold and taken

out of the grazing system, management opportunities would improve by eliminating the need to manage ROW on these isolated, difficult to access, parcels.

Overall, the common to all management actions would likely have a moderate beneficial effect on the ROW program.

Renewable Energy (major beneficial)
The BFO would cooperate with stakeholders to promote opportunities for scientific research for renewable energy in accordance with other resource values. This includes coordinating renewable energy development opportunities in accordance with other resource values.

Energy development in the planning area is expected to continue during the planning period. Future activities may include wind, solar, hydropower, or other energy development activities not yet identified. As a result of these ongoing uses, reclamation activities would continue to increase into the foreseeable future.

The National Renewable Energy Laboratory (NREL) identifies the planning area as having some solar energy development potential, but is not identified for large solar energy fields or high concentration areas. However, future interest is possible with improved technology. The affect is expected to be negligible and not be substantial.

NREL identifies good to excellent potential wind-energy development, and is beginning to enter the planning area on private surface. This would likely result in future applications for wind-energy projects over the life of the plan. Wind energy requires thousands of acres, and could eliminate other uses. Considerations for national energy needs would include other resources to minimize or avoid adverse effects to meet other relevant resource laws. Interests for renewable energy development would increase the need for ROWs, creating a major beneficial effect on the ROW program.

Travel and Transportation Management (moderate beneficial)
Travel and transportation management would affect the ROW program by increasing the number of easements issued per year to provide reasonable access to other government managed lands (federal, state, and local), and privately owned lands. Inventory all roads on public land and develop a transportation plan to identify roads/trails for closure or maintenance. Inventory, designate, number and sign all roads and trials. Post signs authorizing uses and activities. This could lead to less trespass incidents, including illegal dumping, unauthorized access to other agency managed or privately owned lands, and unauthorized grazing access. Providing ROW to maintain or improve transportation needs would be potentially substantial and would continue into the foreseeable future. Overall, travel and transportation management would have a moderate beneficial effect on the ROW program.

Recreation (minor adverse)
Demands for recreation related activities on public lands could increase the need for ROWs to access these areas. This would increase opportunities for willful trespass, dumping, and other illegal uses, requiring recreation management, BMPs, the presence of law enforcement, and monitoring uses on public lands, the presence of recreational sites would preclude the location of certain land use authorizations. Overall, recreation management common to all alternatives would not be substantial and would have a minor adverse effect on the ROW program.

Lands with Wilderness Characteristics (minor adverse)
Areas managed for wilderness characteristics would preclude any ROW actions in those areas,

consisting of approximately less than 1% of BLM surface in the planning area. The majority of the planning area is open for development, however, this would only have a minor adverse effect on the ROW program.

Livestock Grazing Management (no effect)
Livestock grazing activities will likely have a short-term adverse effects on reclamation efforts under ROW management because livestock often use the reclaimed areas as forage and travel corridors. The use of BMP to meet the Wyoming Standards for Healthy Rangeland would minimize any long-term effects. Mitigation actions could include deferring or temporarily limiting grazing on recently reclaimed areas to alleviate long-term effects. Livestock grazing management actions under each alternative would not prohibit or limit other land uses. Therefore, livestock, grazing management would have no effect on the ROW development, and is not further addressed in the ROW and corridor section.

Special Designations (minor adverse)

Potential effects from all special designations whether existing or proposed, would primarily be minimal and would vary by the management prescriptions associated with each special designation. Intensive management could affect the ROW program by altering land disturbance and use locations. WSA management would impose the greatest restriction on ROW management actions, while the other special designations management actions would impose fewer restrictions on proposed disturbance activities. Surface-disturbing activities in ACEC could be allowed in consideration of other resource programs.

Land uses within the boundaries of special designations will be restricted to protect or conserve resource values, such as Gardner Mountain WSA (6,423 acres), North Fork WSA (10,089 acres), and Fortification Creek WSA (12,419 acres). The total acres managed for this resource is less than five percent of the planning area. Management of special designations common to all alternatives would have a minor adverse effect on the ROW program.

WSAs and WSRs are managed to a non-impairment standard under respective IMPs and BLM Manual 6330 – Management of Wilderness Study Areas until Congress acts to designate these areas or release them from consideration.

Socioeconomic Resources (no effect)

There are no **Social**, **Economic**, or **Health and Safety** management actions common to all alternatives that would have a measurable effect on the ROW and corridor program. Therefore, these topics will not be further addressed in the ROW and corridor section.

4.6.4.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained.

Rights-of-Way and Corridors (minor beneficial)
Alternative A, the predicted overall disturbance from ROW actions is 38,762 acres (4.96%) of BLM surface in the planning area. Identified ROW Transmission lines and transportation facilities would primarily be placed within ROW corridors, where feasible and appropriate. The BFO expects to receive ongoing interests in activities related to oil and gas development (e.g.,

reservoirs, utilities, sites, and roads). Incorporating BMP by meeting required road standards and ensuring proper reclamation measures would minimize effects to the greatest extent possible. Use of existing infrastructure, or surface structures where feasible, would increase ROW development opportunities.

Under Alternative A, 32,378 acres of BLM surface would be designated ROW corridors (Map 50). There are seven identified ROW corridors in the planning area the Powder River, Echeta Road, Interstate 90, Highway 59 North, Interstate 25, Powder River Breaks, and Highway 14/16. There are no management restrictions on these corridors, allowing subsurface, surface, or above ground authorizations. Although lines must be buried in Greater Sage-Grouse Core Population Area, unless the line is within one half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile wide.

Under Alternative A, prohibit communications sites on North Middle Pumpkin Butte, unless it becomes absolutely necessary to use the butte for the line-of-sight needs, such as microwave transmission, and limit authorizations to South Middle Pumpkin Butte until that area has been fully utilized, unless the decision is waived.

Alternative A would have a minor beneficial effect on the ROW and corridor program.

Physical Resources

Air Quality (negligible adverse)
Alternative A would require air quality monitoring for ROW and corridor projects expected to approach or exceed emission standards, analysis would be performed on activities with expected effects to air resources and modeling may be performed on a project-specific basis. This would not have a substantial effect on the ROW program and would decrease development opportunities. Overall this management action would have a negligible adverse effect to the ROW program.

Soil (moderate adverse)
Under Alternative A, soils management actions within the 1985 RMP affecting the ROW program include no surface-disturbing seasonally within areas of severe erosion hazard, prohibit surface-disturbing activities on slopes of more than 25%, and within areas having poor reclamation suitability, approximately 170,590 acres, (22%) of BLM surface. All three prohibitions have an undefined allowance for waivers on surface-disturbing activities on soils with poor reclamation suitability and would not protect the soils, primarily because the authorized officer could waive the restrictions. The inadequate protection of soils with poor reclamation suitability on 455,090 acres (58%) of BLM surface in the planning area would have a moderate adverse effect on the ROW program. Even though more than 10% of the area identified in the ROW program contain sensitive soils, since the surface disturbance prohibition is conditional the effect is considered to be a moderate adverse effect by requiring stipulations and COA which would eliminate or minimize adverse effects, and monitoring to ensure compliance associated with authorized activities would potentially decrease development opportunities.

Water Resources (minor adverse)
Under Alternative A, water resource would be managed following current management principles. For all proposed surface disturbances, the BFO would prohibit surface disturbance within 500 feet of any spring, reservoir, water well, or perennial stream unless the prohibition is waived by the authorized officer on a project specific basis, approximately 19,861 acres (2.0%) of BLM

surface. Land use authorizations would be rerouted to avoid these areas which would require a ROW project to be considered on a project specific basis and could decrease development opportunities. Therefore, Alternative A water management would have a minor adverse effect on the ROW program.

Cave and Karst Resources (minor adverse)
Cave and karst formations are characterized by steep cliffs, rocky outcrops, and sensitive soils under desirable ROW and corridor locations. Under Alternative A, no previous management decision was made, therefore current ROW projects in cave and karst areas would be considered on a project specific basis resulting in a slight but detectable effect and proposals would be denied, rerouted or deferred, decreasing development opportunities, overall this would have a minor adverse effect to the ROW program.

Mineral Resources

Locatable Minerals (negligible adverse)
Locatable minerals management is considered on a project specific basis under Alternative A. Because foreseeable locatable mineral development is estimated to disturb 554 acres of surface (less than 1% of the planning area), locatable minerals projects are extremely rare (most crossings/use of BLM surface would qualify as legitimate occupancy under 43 CFR 3715) which could increase costs and therefore decrease development opportunities, effects on the ROW program would have a negligible adverse effect.

Leasable Mineral – Coal (negligible adverse)
Reasonably foreseeable coal development would be localized and would likely occur on 195,700 net disturbance acres less (than 1% of BLM-administered coal area) with high development potential in central Campbell County and north-central Sheridan County. Coal development would limit ROW development opportunities in the planning area. Under Alternative A, this could have a negligible adverse effect on the ROW program.

Salable Minerals (negligible beneficial)
Under Alternative A, salable minerals management is considered on a project specific basis, reasonable foreseeable salable mineral development is estimated to disturb 530 acres of surface (less than 1% of the planning area), and would increase development opportunities by sharing infrastructures, such as road, effects on the ROW program would have a negligible beneficial effect.

Biological Resources

Vegetation – Grassland and Shrubland Communities (major adverse)
Under Alternative A there are no decisions within the 1985 RMP related grassland and shrubland management therefore management would follow current policies and regulations. Reclamation activities would have to be consistent with the BLM Wyoming reclamation policy. Application of appropriate mitigation activities would limit or avoid long-term effects, and short-term effects would occur from vegetative removal and would require appropriate placement, storage, and replacement to minimize or avoid long-term effects. Grassland and shrub vegetation communities cover most of the planning area (over 10%), ROW projects would be sited to reduce adverse effects on vegetation impacts, which would result in the relocation or redesign of ROW projects before authorization, decreasing development opportunities. Overall this would result in a major adverse effect to ROW and corridor program.

Vegetation – Riparian/Wetland Resources (minor adverse)
For all proposed surface disturbances, the BFO would prohibit surface disturbance within 500 feet of water sources that support wetland and riparian conditions, 2% of BLM surface in the planning area. If a water source is considered important to other natural resource discipline(s) the action would be considered and mitigation measures would limit or prevent effects and land use, therefore decreasing ROW development opportunities. Minimizing or preventing disturbances would have a minor adverse effect on the ROW and corridor program.

Invasive Species and Pest Management (no effect)
The only current management action is to control noxious weeds in cooperation with the counties. This management will have no effect on the ROW program.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate adverse)
Under Alternative A, management of fish and wildlife habitat and special status species plant and wildlife species would effect uses administered by the ROW program through the implementation of mitigation measures designed to protect those biological resources. Implementing species-specific protective measures for sensitive plant and wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses. The following management actions apply:

- Restrict surface disturbance and occupancy within a 0.25-mile radius (3,594 acres) of the center of Greater Sage-Grouse strutting grounds, year round, no exceptions. Prohibit surface disturbance within an additional 1.75-mile radius (203,724 acres) from March 15 to June 30. The effect on the resources is approximately 27%, this would have a major adverse effect on the ROW program.
- Prohibit surface disturbance and occupancy within 750 feet of sharp-tailed grouse leks (323 acres) at any time. The effect on the resource is approximately less than one percent. This would have a negligible adverse effect on ROW.
- Prohibit surface disturbance within an additional 0.64-mile radius of sharp-tailed grouse leks (7,607 acres) from April 1 through May 30. The effect on the resource is approximately one percent. There would be a minor adverse effect on ROW.
- Preclude new surface-disturbing activities within 0.5 mile of raptor nests (385,148 acres), which could cause increased stress to and/or displacement of animals during the critical time period (February 1 to July 31). The effect on the resource is approximately 23%. This would have a major adverse effect on ROW.
- Prohibit surface disturbance or occupancy within a biologic buffer zone around active nests of special status raptor species. Under current management, this action is considered minor, adverse.

Any disturbing land use proposal that would disturb areas containing fish bearing waters, and areas with special status fish species, would be addressed on a case by case basis.

These management actions would delay, or reroute ROW proposals, decreasing opportunities. Overall, Alternative A management of wildlife and special status wildlife would have a major adverse effect on the ROW and corridor program although there are provisions for exceptions, which would reduce the impacts of these management actions.

Fish and Wildlife Resources – Fish and Special Status Species – Plants and Fish (negligible adverse)
The current RMP does not have any management actions that pertain directly to ROW and corridor management. Proposals would be considered on a project-specific basis, and

would likely have negligible effects on the ROW and corridor program due to the limited amount of occupied fisheries and special status plant habitat.

Heritage and Visual Resources

Cultural Resources (moderate adverse)
Under Alternative A, implementing protective measures for cultural resources would require avoidance and other mitigation measures for proposed land uses near these resources. These measures could result in the relocation or redesign of proposed use before they could be authorized. Because there are known cultural resources throughout the planning area, and because it is likely that additional cultural resources would be discovered effect could vary in degree throughout the planning area. Land use proposals within the view shed of the Bozeman trail would be denied unless the authorized officer waives the prohibition. Cultural and resource specialists would be included during the scoping and analysis of potential effects, and survey and monitoring activities for proposed uses would be identified in each analysis for land uses. Alternative A, cultural resource management would likely have a moderate adverse effect on ROW program.

Paleontological Resources (minor adverse)
Under Alternative A, implementing protective measures for paleontological resources would require avoidance and other mitigation measures for proposed land uses near these resources. These measures could result in the relocation or redesign of proposed uses before they are authorized. Because there are known paleontological resources throughout the planning area, and because it is likely that additional paleontological resources would be discovered effects could occur in and vary in degrees throughout the planning area. Paleontological and resource specialists would be included during the scoping and analysis of potential effects, and survey and monitoring activities for proposed uses would be identified in each analysis for land uses. Under Alternative A, the Dry Creek Petrified Tee EEA would continue to be protected from the adverse effects of land use, and casual collection areas would be designated on a case-by-case basis. Public lands with significant paleontological values would be retained. Overall, Alternative A management of paleontological resources would have a minor adverse effect on the ROW program.

Visual Resources (moderate adverse)
Under Alternative A, managing the planning area to meet VRM objectives could affect the locations, routes, heights, and colors of proposed land uses and associated facilities. ROW development or other resource use could be considered within the line-of-site of VRM classes. Disturbance in forested areas could cause habitat fragmentation and affect visual resources. Additional effort would be required to design projects to meet the objectives of the specific VRM class designation of an area in which a use is proposed. Visual resources are considered with proposed land uses. Effect on visual resources would be minimized or prevented, appropriate to the VRM classes.

Pumpkin Buttes is a significant VRM feature. All proposed land use actions in the view shed of Pumpkin Buttes would consider and minimize or prevent adverse effects on visual resources coordination with the cultural resources program, consistent with national objectives, and resource management objectives. Some additional project planning might be necessary for VRM Class III areas to ensure that the landscape is partially retained. Considerations for national energy priorities or other land uses, could reduce VRM classifications. There are 127,594 acres (16%) of BLM surface classified as VRM II, which would reduce but not prohibit surface disturbances.

Overall, Alternative A management of visual resources would have a moderate adverse effect on the ROW program.

Land Resources

Under Alternative A, the following programs do not have any management actions that would affect the ROW program: **Travel and Transportation Management, Recreation**, **Lands with Wilderness Characteristics**, and **Livestock Grazing Management**, and therefore will not be discussed any further in this section.

Forest Products (negligible adverse)
Alternative A forest management areas within 200 feet of surface waters would be prohibited and affecting less than one percent of the planning area. ROW and corridors would be denied or relocated which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect for on the ROW and corridor program.

Lands and Realty (minor beneficial)
Under Alternative A, management supports the acquisition of lands or interests in lands from willing private and state entities on a project specific basis. Priority would be given to those lands adjacent to larger blocks of BLM-administered public lands, particularly those with high recreational potential. In acquiring state lands or interests in lands from willing sellers the BLM would initially consider the following: (1) any lands considered void of important natural resource values could be exchanged for the acquired lands and (2) during the planning period, the BLM would not engage in acquisitions resulting in an overall net gain of publicly administered lands. Acquiring easements would result from access needs that would improve administration of public lands. Acquiring lands with important natural resource values would require coordination with other resource disciplines, appropriate to the acquisition.

Over the last 25 years, the identified disposal lands were reduced by approximately 30,500 acres (3%). However, authorizations related to oil and gas development have taken precedence over land tenure adjustments. This activity is expected to continue, although reasonably foreseeable development data shows a steady reduction in coalbed natural gas development; and continued or increased conventional oil development. Therefore, it would be reasonable to assume that the overall decrease in land disposals would be similar to the last planning period. Assuming this pattern continues, an average disposal rate of 1,200 acres per year under Alternative A would have a major beneficial effect on the ROW program through the disposal of small, isolated parcels. This would increase multiple resource management opportunities in a more contiguous land ownership pattern.

Lands with high surface values would generally be retained, although lands could be disposed of if determined to benefit the recipient. This includes land with water and agricultural potential. The BFO would consider selling lands with agricultural development or through the Desert Land Entry Act.

Overall, Alternative A Lands and Realty management actions would have a minor beneficial effect on the ROW program.

Renewable Energy (minor beneficial)
Alternative A, there are no management actions related to renewable energy in the 1985 RMP: therefore, the entire planning area would allow renewable energy development across the

planning area without specific or defined criteria. There are no renewable-energy projects to date. Under Alternative A, the BFO anticipates approximately 20,000 acres (3%) of BLM surface in the planning area during the planning period would be developed, increasing ROW development opportunities. Development on this scale would have a minor beneficial effect on the ROW program and corridor program.

Special Designations

Under Alternative A, potential effect on ROW actions from management of special designations would be minimal even though it would vary by the management prescriptions associated with each special designation area. Intensive management could affect the ROW program by altering locations of land uses.

Areas of Critical Environmental Concern and Scenic or Back Country Byways (no effect)
Under Alternative A, there are currently no ACECs and scenic or national BCBs designated in the planning area, this would have no effect on the ROW program.

Wild and Scenic Rivers (negligible adverse)
Under Alternative A, there is one potential Wild and Scenic River the Middle Fork Powder River which would have with no previous decision, although this will be managed in accordance with the Middle Fork Powder River Interim Management Plan until congress acts upon the management. This would decrease ROW development opportunities and would have a negligible adverse effect on the ROW program.

Wilderness Study Areas (minor adverse)
WSA management would impose the greatest restrictions on ROW management actions of all special designations. Any development or activity within the boundaries of a WSA would be restricted to protect or conserve resource values while meeting national and resource management objectives. This management would affect less than five percent of the planning area (6,423 acres in the Gardner Mountain WSA, 10,089 acres in the North Fork Powder River WSA, and 12,419 acres in the Fortification Creek WSA) resulting in a minor adverse effect on the ROW program.

4.6.4.4. Alternative B

Alternative B would emphasize resource conservation.

Rights-of-Way and Corridors (major adverse)
Management under Alternative B would exclude ROW and corridor activity from 370,088 acres (69%) of BLM surface and restrict communications sites. Prohibit new authorizations for communication sites in the Pumpkin Buttes area and maintain existing lands use authorization until they expire and require collocation of new communication sites within designated areas. The predicted disturbance from ROW actions is 18,011 acres (2.3%) of BLM surface, which would result in a minor adverse effect by limiting opportunities for ROW development across the planning area.

Under Alternative B, a total of 29,126 acres of BLM surface are designated for major ROW corridors (Map 51). The Echeta Road, Highway 14/16, Highway 59 North, Interstate 25, Interstate 90, and Powder River corridors would be authorized, removing Powder River Breaks corridor resulting in 3,167 fewer acres of BLM surface as ROW corridors. Management actions would not allow above ground authorizations only subsurface authorizations.

Under Alternative B, ROW would be prohibited from surface-disturbing activities on slopes equal to or greater than 25%. The BFO expects ongoing interests in overhead powerline development. Transmission lines associated with ROW development would be placed within identified ROW corridors and all other above ground facilities would avoid major transportation routes to prevent visual resources. Overall, this management would likely have a major adverse effect on the ROW program due to the potential need for transmission lines outside identified corridors and require actions that are not feasible or appropriate for the proposed use, therefore decreasing development opportunities.

Physical Resources

Air Quality (negligible adverse)
Under Alternative B, management actions would require air quality monitoring, quantitative air quality modeling of industrial activities (e.g. oil and gas field development or mining activities) in order to determine the potential impacts of proposed emission sources and subsequently potential mitigation strategies for projects expected to approach or exceed emission standards at the project level. This would not have a substantial effect, but would decrease ROW development opportunities, overall there would be a negligible adverse effect to the ROW and corridor program.

Soil (major adverse)
Under Alternative B, requests for disturbances on slopes equal to or greater than 25% and soils with poor reclamation suitability, badlands, rock outcrops, biologic crusts, and slopes susceptible to movement would not be considered and the authorized officer would not waive the prohibition on such disturbances. This would prevent disturbance on approximately 28% of the planning area. Preventing or minimizing soil erosion would result in the relocation or redesign of proposed projects before they could be authorized, decreasing development opportunities. Alternative B would prohibit ROW development on 215,496 acres (28%) of BLM surface in the planning area, which would have a major adverse effect to ROW development.

Water Resources (minor adverse)
Under Alternative B, surface-disturbing activities would be prohibited within 500 feet of springs, reservoirs, water wells, and perennial streams and associated riparian habitat. A NSO stipulation for any mineral leases would also be applied to ROWs within 500 feet of the same features. Additionally, no surface discharge of produced water would be allowed from federal mineral development; and oil and gas wells could not be converted to water supply wells.

This would encompass 19,861 acres, (2.5%) BLM surface in the planning area. Proposed projects would be rerouted to avoid these areas and would decrease development opportunities. Before authorizing ROW, the BLM would consider important resource values. Overall, Alternative B water management actions would have a minor adverse effect on the ROW and corridor program.

Cave and Karst Resources (minor adverse)
Cave and karst formations are characterized by steep cliffs, rocky outcrops, and sensitive soils. Alternative B, would prohibit surface-disturbing and disruptive activities in these areas, a total of 101,455 acres prohibited from ROW development; 13% of BLM surface in the planning area. ROW would not likely occur on these types of surface conditions. Therefore there would be a minor adverse effect to the ROW program.

Mineral Resources

Locatable Minerals (negligible adverse)
Locatable minerals management recommend withdrawals from mineral entry for areas identified to conserve other resource values under Alternative B. Because foreseeable locatable mineral development is estimated to disturb 277 acres of surface (less than 1% of the planning area), locatable minerals projects are extremely rare and would increase costs due to the limited number of projects, development opportunities would be decreased and effects on the ROW program would be negligible adverse effect.

Leasable Minerals - Coal (negligible adverse)
Under Alternative B, the reasonable surface disturbance prediction of 186,600 net acres of coal development (less than 1% of BLM-administered coal) in the planning area. This action would decrease ROW development opportunities and therefore would have a negligible adverse effect on the ROW program.

Salable Minerals (negligible beneficial)
Salable minerals management is to close or restrict from mineral exploration and development and to conserve other resource values under Alternative B. Because reasonable foreseeable mineral development is estimated to disturb 114 acres of surface (less than 1% of the planning area), sharing infrastructure such as roads would increase ROW development and would have a negligible beneficial effects on the ROW program.

Biological Resources

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Under Alternative B, reclamation activities would have to be consistent with the BLM reclamation policy. Authorizing only native plant species for all reclamation activities and applying appropriate mitigation measures activities would limit or prevent long-term effects. Short-term effects would occur from vegetation disturbance and would require appropriate placement, storage, and replacement to minimize or prevent long-term effects. Long-term vegetation disturbance effects would primarily occur from roads and associated structures that support ROW projects. Native species could increase the reclamation time and cost, but would not restrict, but would decrease ROW development opportunities. Overall, this management would result in a negligible adverse effect to the ROW and corridor program.

Vegetation – Riparian/Wetland Resources (minor adverse)
Riparian areas are generally held under BLM administration for the conservation, maintenance, and improvement of wildlife and natural resources. Under Alternative B, surface-disturbing activities and disruptive activities would be prohibited within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains, approximately 2% of BLM surface in the planning area. Proposed projects would be rerouted to avoid these areas, therefore decreasing ROW development opportunities. Overall, Alternative B riparian and wetland management would likely have a minor adverse effect on the ROW program.

Invasive Species and Pest Management (minor adverse)
Alternative B would take an aggressive approach to managing invasive species. Under Alternative B, 15,000 acres (2%) of BLM surface in the planning area are predicted to be treated. The time and cost associated with control activities would decrease ROW development opportunities. This would have a minor adverse effect on the ROW program.

Fish and Wildlife Resources – Fish and Wildlife (minor adverse)
Alternative B, management of fish and wildlife habitat would effect uses administered by the ROW program through the implementation of mitigation measures designed to protect those resources. Surface disturbance and occupancy would be prohibited in the Ed O. Taylor (3,896 acres), Kerns (163 acres), and Amsden Creek (525 acres) winter ranges for big game. This would effect less than one percent of the planning area and have a negligible adverse effect on the ROW program. Surface-disturbing and disruptive activities would not be allowed in crucial elk winter range (50,586 acres) between November 15 and April 30, and in elk calving areas (37,549 acres) from May 1 to June 30. This would have a minor adverse effect on the ROW program. No land uses would be authorized on elk crucial winter range and calving areas. This would affect approximately four percent of the planning area and would have a minor adverse effect on the ROW program. Surface-disturbing activities in or near priority big-game migration and travel corridors would not be allowed. Elk security habitat would require a no net loss in the year round range (132,148 acres, or 17% of BLM surface in the planning area).

Alternative B management would prohibit surface disturbance and occupancy within 0.25 mile (940 acres, or 0.12% of BLM surface in the planning area) of the center of sharp-tailed grouse leks year round and with no exceptions. Surface disturbance and occupancy would be prohibited within a 2 mile radius of sharp-tailed grouse leks (323 acres) from April 1 through May 30. This would affect approximately 0.04% of BLM surface in the planning area.

Alternative B management would prohibit surface-disturbing activities potentially disruptive to nesting raptors within 1.5 miles of an active raptor nests of high federal interest (255,129 acres, or 33% of BLM surface in the planning area) during specific time periods: golden eagle, barn owl, and great horned owl would be from February 1 to July 15; osprey, merlin, sharp-shinned hawk, kestrel, prairie falcon, northern harrier, Swainson's hawk, Cooper's hawk from April 1 to July 31; red-tailed hawk, short-eared owl, long-eared owl, and screech owl would be from March 1 to July 31.

Overall Alternative B would have a minor adverse effect on the ROW development program by incorporating stipulations, and mitigation activities to avoid or minimize effects on fish and wildlife resources which increase cost and time, decreasing ROW development opportunities.

Special Status Species – Plants, Fish, and Wildlife (major adverse)
The special status species management actions under Alternative B would have the greatest effect on the ROW program. Implementing species-specific protective measures for sensitive plant and wildlife species and prohibiting actions that affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses.

Alternative B special status species plants management actions prohibit surface-disturbing activities that could adversely impact special status plant species habitat, mineral exploration and development, all motor vehicles use including uses related to fire suppression and geophysical exploration, ROWs within habitat, and the use of explosives and blasting (Map 28).

Under Alternative B, special status species fish, the proposed surface-disturbing activities within 0.25 mile of fish bearing waters would not be authorized (51,745 acres, 1% of BLM surface in the planning area), and prohibit impoundments and instream structures where adverse impacts on special status fish species and their habitat would potentially occur.

Alternative B, special status wildlife would require enlarging and enhancing habitat and habitat connectivity for special status species; maintain the integrity of traditional wildlife migration

and travel corridors; locate and manage facilities to minimize noise impacts on special status species; manage surface-disturbing and disruptive activities to minimize impacts on special status wildlife and their habitats, and prohibit surface-disturbance activities in all prairie dog colonies (Map 29). Alternative B special status upland game birds management actions, would prohibit renewable-energy projects within Greater Sage-Grouse nesting, brood-rearing and winter habitat, require anti-perching devices on existing and new powerlines in occupied Greater Sage-Grouse habitat, and habitat identified for restoration; prohibit surface-disturbing and disruptive activities, occupancy within 4.0 miles of the perimeter of occupied or undetermined Greater Sage-Grouse leks and winter habitat concentration areas; prohibit surface-disturbing and disruptive activities in nesting and early brood-rearing habitat greater than 4.0 miles of occupied and undetermined Greater Sage-Grouse leks, from March 1 to July 15; prohibit surface-disturbing and disruptive activities within winter habitat greater than 4.0 miles of Greater Sage-Grouse winter concentration areas, from November 15 to March 14; prohibit surface-disturbing and disruptive activities within 4.0 miles of winter concentration areas, from November 15 to March 14; allow no more than one disturbance and 3% total surface disturbance per 640 acres within the DDCT analysis area; to demonstrate and restore disturbed sagebrush communities on BLM surface.

Alternative B special status upland game birds management within Priority Habitat Area would exclude all ROWs within Core Population Area and Connectivity Corridor except were valid existing rights exist; prohibit mineral material sales; avoid constructed roads beyond 4 miles of occupied and undetermined Greater Sage-Grouse leks and winter concentration areas; recommend area for withdrawal, and retire grazing allotments.

Alternative B special status upland game birds management within general habitat areas would avoid ROWs and require full reclamation bonding specific to the site and sufficient to cover costs required for full reclamation.

Alternative B special status raptors would establish a year-round disturbance-free buffer zone of at least 0.5 mile following the Clear Creek, Crazy Woman Creek, Piney Creek, Powder River and Tongue River riparian corridors used by bald eagles (Map 34). This buffer may be adjusted to one mile or greater based on topographic features, visibility, disturbance and human activity levels. This buffer zone restriction will be based on site specific information and coordinated with the Service's Wyoming Field Office, which will provide written concurrence. Prohibit surface disturbance and occupancy within a biologic buffer zone around active nests of special status raptors. Apply TLS prohibiting surface-disturbing and disruptive activities to nesting raptors within 1.5 miles of a special status species raptor nest during January 1 to August 15: bald eagle, March 1 to July 31: ferruginous hawk and peregrine falcon, April 15 to September 15: burrowing owl, April 1 to August 31: northern goshawk (Map 26), for the protection of raptor nesting areas, and a year-round biological buffer zone for raptors of high federal interest during critical times (255,129 acres, 33% of BLM surface in the planning area).

Alternative B special status amphibians, reptiles, and bats would prohibit surface-disturbing and disruptive activities in the following areas: (1) identified 100-year floodplains; (2) areas within the 1,640 feet (500 meters) of perennial waters, springs, playas, wells, and wetlands; (3) areas within 100 feet of ephemeral channels; and (4) within 1,640 feet (500 meters) of south-facing rock outcrops.

Overall, the management of special status species plants, wildlife, and fish, would have a major adverse effect on the ROW and corridor program, decreasing ROW development opportunities.

Heritage and Visual Resources

Cultural Resources (major adverse)
Under Alternative B, implementing protective measures for cultural resources would require that land authorizations be avoided within the boundaries of historic properties and within 5 miles of the visual horizon (whichever is closer) of historic properties that retain their historic settings. This would affect 330,592 acres (42%) of BLM surface in the planning area. Each analysis of a proposed land use would include cultural resource specialists during the scoping and analysis of potential impacts, and identify survey and monitoring activities for proposed uses. Surface-disturbing activities would be prohibited in areas with historic properties that retain their historic settings, TCPs, sacred sites, and other culturally sensitive areas. Alternative B management of cultural resources would have a major adverse effect on the ROW program.

Paleontological Resources (minor adverse)
Alternative B management actions for paleontological resources would require field surveys on all PFYC Class 3, 4, and 5 formations potential affected by proposed activities and monitor surface-disturbing activities on all Class 4 and 5 formations (class 5 formations are 3.6% of BLM surface), and as needed for Class 3 formations. Designate areas containing paleontological resources of high quality or importance for special management, as they are identified, this management action would decrease ROW development opportunities. Therefore, Alternative B would have a minor adverse effect on ROW the program.

Visual Resources (major adverse)
Under Alternative B, managing the planning area to meet VRM objectives would affect the locations, routes, heights, and colors of proposed land uses and associated facilities. WSAs (28,931 acres) and Middle Fork Powder River would be managed as VRM Class I; manage all VRI Class II areas and special emphasis areas as VRM Class III; and manage all VRI Class III areas outside special emphasis areas as VRM Class III. Under Alternative B areas inventoried as Class II and special emphasis areas would be managed as VRM Class II. There are 218,178 acres (28%) of BLM surface in the planning area classified as VRM Class II; however, because surface disturbance would be reduced but not prohibited, ROW development opportunities would decrease, VRM could change the location of or preclude a ROW development action. This would have a major adverse effect on the ROW program by restricting the majority of potential ROW development opportunities.

Land Resources

Forest Products (negligible adverse)
Under Alternative B, forest management areas within 200 feet of surface waters would be prohibited and affecting less than one percent of the planning area. ROW and corridors would be denied or relocated which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect for on the ROW and corridor program.

Lands and Realty (major beneficial)
Under Alternative B, management would pursue all lands for acquisition. All lands would be considered, regardless of their recreational or natural resource values. Acquired lands would include those that improve administrative access, or lie adjacent to or near other large blocks of public lands. Under this Alternative, the impact would moderately effect all resources, including interests for ROW development, and escalate management responsibilities and land

use authorization opportunities. The reasonably foreseeable activities associated with land acquisitions is minimal. The most likely foreseeable activities would occur with retaining lands identified for disposal.

Alternative B, would pursue easements to access public land that would benefit BLM management for any resource value and pursue land tenure adjustments on lands holding custodial grazing allotments and sales, in accordance with other resource values.

All lands identified for disposal would be examined for the presence of high-value resources. There are approximately 117,427 acres (14% BLM surface) currently identified for disposal. Lands containing high surface values will generally be retained, including those with agricultural potential. The BFO would pursue land tenure adjustment on lands identified for disposal having no natural resource values prior to pursuing lands identified for disposal having natural resource values, generally the management action would be to retain these lands identified for disposal until after the no natural resource value lands identified for disposal have been disposed. This management practice would consolidate lands, decreasing trespass potential and would increase ROW development opportunities, this would have a major beneficial effect on ROW and corridor program.

Renewable Energy (minor adverse)
Under Alternative B, 710,376 acres (84%) of BLM surface in the planning area would be excluded and 67,319 acres (11%) would be avoided for renewable energy development. This Alternative would eliminate most of the lands from ROW development. Management would exclude renewable-energy projects wherever mineral development and other surface-disturbing activities are prohibited, and allow ROW development where other surface-disturbing activities are allowed. A predicted 5,000 acres (1%) of BLM surface would be disturbed from renewable-energy development during the planning period. Overall, renewable-energy development at that scale would have a minor adverse effect on the ROW program by restricting development opportunities.

Travel and Transportation Management (major adverse)
Under Alternative B, travel and transportation management would limit motorized vehicle use to designated routes within the stock driveways, allow over-snow vehicle use consistent with motorized use designations, and limit motorized travel to designated roads and trails on 451,077 acres (57%) of BLM surface, consistent with other resource values, prohibit motorized vehicle use from November 15 to April 30 within the big game crucial winter ranges, close areas to motorized vehicle use to protect sensitive resources on 312,561 acres of BLM surface in Middle Fork Canyon, Cantonment Reno, Dry Creek Petrified Tree EEA, and apply a 500 foot buffer of non motorized trails. Allow travel off identified designated routes to signed areas under a special use permit. Authorizations would provide reasonable access to other federally managed lands, state lands and privately owned lands. Alternative B would evaluate existing routes in the vicinity of any new system roads for closure and reclamation consistent with other resource values, as well as close areas for motorized vehicles to protect sensitive resources as defined in the corresponding special designation and resource sections of Alternative B. This management would have a major adverse effect on the ROW program restricting development opportunities.

Recreation (moderate adverse)
Alternative B, recreation management actions would be prioritized for 55,529 acres, (7%) of the planning area, and divide the planning area into the Southern Big Horn Mountains ERMA and Buffalo ERMA. This could restrict ROW development opportunities by

limiting allowable surface disturbance from facilities and infrastructure. Overall, this would have a moderate adverse effect to the ROW program.

Lands with Wilderness Characteristics (minor adverse)
Alternative B would manage lands with wilderness characteristics to emphasis primitive recreational opportunities and natural values. Lands with wilderness characteristics include 12,237 acres (less than 1%) of BLM surface in the planning area. Management prohibitions would be close or limit vehicles to designated roads and trails; manage for visual resources as Class II; close the area to mineral leasing; recommend withdrawal to locatable mineral entry; close areas to salable minerals; exclude ROW; prohibit renewable-energy development; commercial wood cutting would be prohibited only when the by-product would be an environmental restoration; prohibit all other surface-disturbing activities not compatible with retaining or enhancing the areas natural values. Overall, this exclusion would have a minor adverse effect on the ROW program.

Special Designations

Areas of Critical Environmental Concern (major adverse), **Wilderness Study Areas** (minor adverse), **Scenic or Back Country Byways** (negligible adverse), **and Wild and Scenic Rivers** (negligible adverse)
Under Alternative B ROW actions would be restricted in all special designation areas. Management prescriptions associated with each special designation would take precedence over ROW projects. WSA management would impose the greatest restrictions on ROW management actions, while other management of other special area designations would impose fewer restrictions on proposed disturbance activities. Any development or activity within the boundaries of special designation areas would be restricted to protect or conserve resource values while meeting national and resource management objectives when necessary. ACECs would affect 536,304 acres (65%) (major adverse) and WSAs 28,931 acres (4%) (minor adverse) of BLM surface in the planning area. Byway designation should not affect ROW authorization, but could adversely affect the perception of ROWs and therefore be a consideration in proposing ROWs along a designated byway, having a negligible adverse effect. Alternative B would designate one Middle Fork Powder River WSR, which would prohibit ROW development, if congress denies this nomination management will continue in accordance with the Middle Fork Powder River Interim Management Plan to retain its free-flowing characteristics and outstanding resource value, this would have a negligible adverse effect.

4.6.4.5. Alternative C

Rights-of-Way and Corridors (minor adverse)
Management under Alternative C would allow ROW and ROW corridor actions unless they are specifically excluded, developing and designating transportation and utility ROW and ROW corridors. The predicted disturbance from ROW actions under Alternative C is 57,083 acres (7.3%) of BLM surface in the planning area.

Under Alternative C, authorizations for communications sites in the Pumpkin Buttes area would be allowed without first fully utilizing the South Middle Butte and collocation would not be required on new communication site proposals, and authorize communication sites on North Middle Butte regardless of line-of-site needs.

Under Alternative C, allowing surface-disturbing activities on soils with a severe erosion hazard, on slopes equal to or greater than 25%, on soils with poor reclamation potential, and on miscellaneous soil types

Under Alternative C, designate a total of 32,293 acres of BLM surface for ROW corridors, with no management action restrictions allowing subsurface, surface or above authorizations. There are seven identified corridors Echeta Road, Highway 14/16, Highway 59 North, Interstate 25, Interstate 90, Powder River, and the Powder River Breaks. No management restrictions applied regarding subsurface or above ground authorizations. Corridors would be designated for aboveground facilities such as overhead distribution powerlines and would be placed adjacent to existing major transportation routes. Linear ROW transmission lines would be authorized consistent with other resource values. Activities generally excluded from ROW corridors include mineral materials disposals, range and wildlife habitat improvements involving surface disturbance and facility construction, campgrounds and public recreation facilities, and other facilities that would attract public use. Facilities would not be placed adjacent to each other if there would be resource conflicts or issues with safety or incompatibility. Designated corridors would vary by total width, numbers, types, extents, and compatibility with other surface-disturbing activities or other public uses.

Under BMPs, ROW holders are encouraged to use existing disturbed corridors, as well as coordinate with other authorized users for construction, maintenance and reclamation activities. Corridor management would decrease ROW development opportunities across the planning area and would have a minor adverse effect on ROW and corridor program.

Physical Resources

Air Quality (negligible beneficial)
Under Alternative C, quantitative air quality modeling of industrial activities would not be required for ROW and corridor projects. The effect on the ROW and corridor program would be potentially not substantial and would increase opportunity for development. This would have a negligible beneficial effect on the ROW program.

Soil (major beneficial)
Under Alternative C, requests for disturbances on slopes equal to or greater than 25% and soils with severe erosion hazard and poor reclamation potential would be considered. Allowing surface-disturbing activities on miscellaneous soil types would have a major adverse effect on soil resources.

This would increase disturbance on approximately 28% of the planning area failing to protect 218,928 acres of BLM surface and increase development opportunities. Consistent implementation of BMP would strive to minimize those effects and localize them where there are determined sensitive vegetation and soils. This would have a major beneficial effect to the ROW program.

Water Resources (minor adverse)
Alternative C, surface-disturbing activities would not be prohibited within 500 feet of springs, reservoirs, water wells, perennial streams, and associated riparian habitat approximately 19,861 acres of BLM surface. An NSO stipulation for any mineral leases would not be applied within 500 feet of the same features. Additionally, surface discharge of produced water would be

allowed from federal mineral development; and oil and gas wells could be converted for water supply wells.

Riparian areas are generally held under BLM administration for the conservation, maintenance, and improvement of wildlife and natural resources. Land use authorizations would be rerouted to avoid these areas and would decrease development opportunities. Overall, this would have a minor adverse effect.

Cave and Karst Resources (minor adverse)
Under Alternative C, cave and karst management requirements would effect 13% of BLM surface in the planning area requiring a buffer around significant cave entrances. Generally, the BLM would not likely authorize land uses where there are known or likely cave and karst resources, the effect would be slight but detectable and ROW would be denied, rerouted or deferred which would decrease development opportunities. Therefore, this would have a minor adverse effect on the ROW program.

Minerals Resources

Locatable Minerals and Salable Minerals (negligible beneficial)
Alternative C would allow ROW projects in other minerals development areas where land uses would be compatible, and would locate projects to lands appropriate to meet other resource objectives and minimize conflicts with other development activities. Many of these improvements would benefit the ROW program by utilizing previously disturbed areas, or corridors, and roads. However, some activities may cause ROW projects to be modified, relocated, or denied, decreasing ROW development opportunities. Because foreseeable mineral development is estimated to disturb locatable minerals 1,455 acres of surface (less than 1% of the planning area), and salable minerals 2,090 acres (0.2%), therefore, mineral management and development activities would have a negligible, beneficial effect on the ROW program.

Leasable Minerals - Coal (negligible adverse)
The Alternative C reasonable surface disturbance prediction of 195,700 net acres of coal development (less than 1% of BLM-administered coal). This would decrease ROW development opportunities, and would have a negligible adverse effect on the ROW program.

Biological Resources

Vegetation – Grassland and Shrubland Communities (major beneficial)
Under Alternative C, the BLM would authorize native and non-native plant species for initial reclamation activities. This could have a major beneficial effect on ROW development by allowing the use of non-native species for interim or short-term reclamation. Alternative C management would increase the success of soil stabilization and vegetation recovery efforts and increase the probability of achieving long-term reclamation goals.

Vegetation – Riparian/Wetland Resources (minor adverse)
Under Alternative C, surface-disturbing and disruptive activities are allowed within 500 feet of riparian/wetlands systems, aquatic habitats, and floodplains consistent with other resource values. Proposed projects would not need to be rerouted to avoid these areas. ROW development opportunities would decrease when considering other resource values and ROW would be denied or rerouted. Overall, Alternative C water management actions would have a minor (2%) adverse affect on the ROW and corridor program.

Invasive Species and Pest Management (no effect)
Alternative C would take a conservative approach to managing invasive species. Under this alternative disturbances are predicted to affect approximately four percent of BLM acres, treating 10,000 acres (1.2%) of BLM surface in the planning area. This would not decrease or increase ROW development opportunities and therefore, would have no effect on the ROW program.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Alternative C would generally allow disturbances where resource objectives can be met in areas with fish and wildlife resources. Management of fish and wildlife habitat and special status species would effect uses administered by the ROWs associated with a ROW, through the implementation of mitigation measures designed to protect them. Implementing species-specific protective measures for sensitive plant and wildlife species and prohibiting actions that would affect Threatened or Endangered species could result in the denial or relocation of proposed public land uses, but those uses would generally be allowed. This would develop ROW opportunities and would have a minor adverse effect to the ROW development program.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Under Alternative C, protective measures for cultural resources would require avoidance and other mitigation measures for ROW development proposed near these resources. These measures could result in the relocation or redesign of proposed structures and infrastructure, and appropriate stipulations such as NSO and CSU to protect the setting. Because there are known cultural resources throughout the planning area, and because it is likely that additional cultural resources will be discovered, the effects would vary by degree throughout the planning area. Construction activities that disturb the ground surface and subsurface in ROW corridors, and which are the result of ROW approvals, associated with ROW development, would have the potential to directly effect cultural resources, particularly if the resources were not identified prior to the construction activity. It is relatively common for road and pipeline construction through culturally sensitive sediments to lead to subsurface prehistoric discoveries. Data recovery excavations that enhance understanding of prehistory could often mitigate the effect on discoveries. There would likely be considerable effects where undocumented NRHP-eligible archeological sites are affected but have not been recognized (and therefore are not being treated as a discovery). ROW actions that result in construction of structures visible on or above the surface (e.g., communication towers, compressor stations, tanks, and wind turbines) would have the potential to directly effect the visual integrity of those classes of cultural properties that derive their significance from natural settings and settings relatively devoid of modern intrusion. Overall, Alternative C cultural resource management would likely have a minor adverse effect on ROW program.

Paleontological Resources (minor adverse)
Under Alternative C, implementing protective measures for paleontological resources will require field surveys for PFYC Classes 4 and 5. The BLM would monitor those areas on a project specific basis and identify and designate casual collection areas for common invertebrate, plant, and petrified wood fossil collection by the public. Because there are known paleontological resources throughout the planning area, Class 5 total approximately 28,177 acres or approximately 3.6% of BLM surface, and because it is likely that additional paleontological resources would be discovered effects on the ROW program would vary by degrees throughout the planning area. ROW proposal would be denied, relocated or deferred to retain public lands with significant

paleontological values, decreasing development opportunities. This would have a minor adverse affects on the ROW program.

Visual Resources (minor adverse)
Under Alternative C, managing the planning area to meet visual objectives could affect the locations, routes, heights, and colors of proposed land uses and associated facilities. Renewable energy development or other resource use may be considered within the line-of-site of VRM classifications. Development of disturbance in forested areas could cause habitat fragmentation and visual effects. Additional effort would be required to design projects to meet the objectives of the specific VRM class designation of an area, where a use is proposed and utilize visual simulations on a project specific basis. Under Alternative C, VRI Class II areas would be managed as VRM Class II, and VRI Class III areas would be managed as VRM Class IV. Pumpkin Buttes is a significant visual resource management feature. All proposed land use actions within the viewshed of the Pumpkin Buttes would consider visual effects, although management under this alternative would allow those effects. Some additional project planning might be necessary for VRM Class III areas to ensure that the landscape is partially retained. Considerations for national energy priorities could lower VRM classifications. Alternative C management would consider intensive mitigation measures for ROW development actions but would not preclude authorizations in those areas, this would decrease development opportunity. This would likely effect less than 1% BLM surface in the planning area have a minor adverse effect on the ROW program.

Land Resources

Forest Products (negligible adverse)
Management under Alternative C would affect less than 1% of BLM surface resulting in a negligible adverse effect to the ROW program. ROW proposals would be denied or rerouted and decrease ROW develop opportunities.

Lands and Realty (major adverse)
Under this Alternative, management would not acquire state or private lands; or interests in lands. This would eliminate the agency's ability to gain access to some BLM-administered parcels, both large blocks, as well as small, isolated areas. This would inhibit BFO's ability to manage resources, multiple uses, and limit recreational opportunities. The consequences of this would be continued higher costs because of the difficulty and time consuming efforts required to obtain access through private lands for administrating multiple uses; management of natural resources; negotiating conflicts for activities and development with other land owners where federal actions cross ownership boundaries. Overall, Alternative C would have a major adverse effect on the ROW program.

Renewable Energy (major beneficial)
Management under Alternative C would exclude 28,551 acres or 4% of BLM-administrated surface and avoid 618,676 acres 79% of BLM surface where inconsistent with other resource values. Renewable-energy development would be allowed on 134,875 acres (17%) of BLM surface. Renewable-energy development at this scale would have a major beneficial effect on the ROW program, increasing ROW development opportunities.

Travel and Transportation Management (minor beneficial)
Alternative C travel and transportation management would open stock driveways to motorized vehicles, allow over-snow vehicle use, allow motorized vehicle use within habitat of special status

species consistent with travel management designations for that area, and would not close or reclaim existing routes in the vicinity of any new system roads but would close areas to motorized vehicle use to protect sensitive resources approximately 28,586 acres (3%). Motorized vehicle travel would be limited to designated road and trails on 723,497 acres, consistent with other resource values. Authorizations would provide reasonable access to other federally managed lands, state lands and privately owned lands and would likely increase the number of ROW. Appropriate signs would be placed where needed to minimize or avoid inadvertent trespass. This management would have a minor beneficial effect on the ROW program.

Recreation (minor adverse)
Under Alternative C, management would designate Burnt Hollow, Petrified Tree, Middle Fork Powder River, Mosier Gulch, Welch Ranch, Weston Hills, and Hole in the Wall as SRMAs that would be protected from development and land use authorizations. This would prohibit ROW actions on 30,570 acres (4%) of BLM surface in the planning area and would have a minor adverse affect on the ROW program.

Lands with Wilderness Characteristics (no effect)
Alternative C would not manage any areas within the planning area for wilderness characteristics, therefore there would be no effect.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways (no effect)
Under Alternative C, ROW actions would be allowed in accordance to management for surrounding management areas. There would not be any ACEC designations and no evaluation of roads within the planning area for National Back Country or Scenic Byway areas. These designations would therefore have no effect on ROW program.

Wild and Scenic Rivers (no effect)
Under Alternative C, if congress denies the Middle Fork Powder River WSR nomination, special provisions related to protection of free-flowing characteristics and outstanding value would not apply. This would have no effect to the ROW program.

Wilderness Study Areas (minor adverse)
Should congress act to designate or release WSAs, a plan amendment would take place. Overall, this would have a minor adverse effect on the ROW program.

4.6.4.6. Alternative D

Rights-of-Way and Corridors (major adverse)
Under Alternative D, ROW and corridors authorizations would be excluded from 101,081 acres (13%) and avoid 290,336 acres (37%) of BLM surface in the planning area, while allowing ROW and corridor authorizations on 390,685 acres (50%) of BLM surface use, but would be limited to existing ROW and other disturbed areas. Surface-disturbing activities could be allowed on soils with a severe erosion hazard, on slopes equal to greater than 25%, and on soils with poor reclamation suitability with an approved construction, stabilization and reclamation plan.

Identify and designate communication site areas and within management designated sites require additional communication sites to be co-located manage authorizations for communications sites in the Pumpkin Buttes area for cultural and visual resources, within designated areas,

require additional communication sites be co-located. Proposals outside designated areas will be evaluated on a project specific basis and collocate where possible. Limit new communication authorizations on the Pumpkin Buttes to existing towers, while prohibiting communication sites on North Middle Butte.

Under Alternative D, a total of 32,293 acres of BLM surface would be designated for use as major ROW corridors in cooperation with the State of Wyoming. Echeta road, Highway 14/16, Highway 59 North, Interstate 25, Interstate 90, Powder River and the Powder River Breaks corridors would be identified. Management actions would apply to the Powder River and Powder River Breaks corridor requiring all authorizations to be subsurface or buried. As well as lines must be buried within Greater Sage-Grouse Core Population Area, unless the line is within one mile of either side of 115 kilovolt (kV) or larger transmission line creating a corridor no wider than one mile wide.

Alternative D, ROW and corridor management would allow transmission lines and above ground facilities, such as compressor and electric distribution lines, within existing ROW and designated corridors when resource objectives can be met. This management would decrease development opportunities and have a major adverse effect on the ROW and corridor program.

Physical Resources

Air Quality (negligible adverse)
Under Alternative D, air quality monitoring would be required of ROW projects expected to approach or exceed ambient air quality standard emissions. Few ROW projects would likely be required to conduct monitoring and the monitoring would not prevent any ROW projects. The effect on ROW and corridor development would not be substantial, but would decrease opportunity for development having a negligible adverse effect.

Soil (moderate adverse)
Alternative D soils management activities would allow surface-disturbing activities on soils with a severe erosion hazard with an approved project construction plan and site specific reclamation plan to conserve the soil and meet reclamation and resource objectives.

Alternative D, would protect 215,496 acres or 28% of BLM surface in the planning area with soils with severe erosion hazard; 455,090 acres or 58% of BLM surface possessing soils without poor reclamation suitability with an approved reclamation plan; and on slopes less than 25% or greater (170,590 acres or 22% of BLM surface). Alternative D would avoid surface-disturbing activities by placing a CSU on areas containing LRP such as badlands, rock outcrops and slopes susceptible to mass movement (218,928 acres or 28% of BLM surface). See Appendix I (p. 1739).

Analyses and decisions for proposed ROW actions would include appropriate consideration for soil management and other related resource management objectives, and include construction, reclamation and stabilization plans, or CSU stipulations when warranted. This management action would increase costs and decrease development opportunities. Under Alternative D, soil management across the planning area has a moderate adverse effect on the ROW program.

Water Resources (minor adverse)
Alternative D would allow surface disturbance within 500 feet of springs, non-CBNG reservoirs, water wells, and perennial streams where water and other resource objectives can be met, based on management decisions for other resource values on 19,861 acres of BLM surface, allow on-channel reservoirs effecting natural stream flow regimes in consideration of other resource values.

Before they are authorized, land uses might be rerouted to avoid these areas, but this would not be required. Furthermore, although a water source is considered important to other natural resource discipline(s), the parcel could be disposed of if other conditions warrant the action (see discussion under Alternative D Lands and Realty). Additionally, surface discharges of produced water would be allowed from federal mineral development; and oil and gas wells could be converted to water supply wells in consideration of other resource values. Retaining these lands and avoiding disturbances that would adversely effect water resources would likely have a minor adverse effect on the ROW program by decreasing development opportunities.

Cave and Karst Resources (minor adverse)
Alternative D would require a CSU stipulation identifying a disturbance free buffer around cave entrances and passages of significant caves. This would prohibit ROW actions on 11 acres of BLM surface in the planning area. However, ROW and corridor actions would not be likely in cave and karst areas, so this management would have a minor adverse effect on the ROW program.

Mineral Resources

Locatable Minerals (negligible adverse)
Under Alternative D, most of the planning area would be available for locatable minerals development. However, because foreseeable locatable mineral development is predicted to disturb only an estimated 1,252 acres (less than 1%) area disturbed. These ROW are rare, therefore increasing costs and decreasing development opportunities, the effect on the ROW program would be negligible adverse.

Leasable Minerals - Coal (negligible adverse)
Reasonably foreseeable coal development would be localized and would likely occur on 195,700 net acres (less than 1% of BLM-administered coal area) located in central Campbell County and north-central Sheridan County. Coal leasing would be limited to high development potential areas of Campbell County and northern Sheridan County. ROW and corridors could be denied, relocated, or deferred if an active coal lease is in place, decreasing development opportunities. Overall, Alternative D would have a negligible adverse effect on the ROW development program.

Salable Minerals (negligible beneficial)
Salable management is considered on a project specific basis under Alternative D. Because foreseeable locatable mineral development is estimated to disturb 1,193 acres of surface (less than 1% of the planning area). Salable minerals projects are relatively rare, although infrastructure such as roads would be shared and would increase ROW development opportunities, effects on the ROW program would be negligible beneficial.

Biological Resources

Vegetation – Grassland and Shrubland Communities (major beneficial)
Under Alternative D, grassland and shrubland management objectives would allow desirable non-native plant species for short-term reclamation activities as a component in an authorized reclamation plan (followed up with planting of native species). Newly proposed powerlines and ground facilities would be allowed within existing ROW and other disturbance areas, increasing development opportunities. This action would provide opportunities for mitigating surface disturbance from approved ROW and corridor actions and would be located in greater than ten percent of all grassland and shrubland communities in the planning area. This would have a major beneficial effect on the ROW program.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Alternative D would allow surface disturbance within 500 feet of water sources that supply wetland and riparian conditions where resource objectives can be met; apply CSU stipulations; and based on management decisions for other resource values (e.g., soils). There are 23,831 acres (3%) of BLM surface in the planning within the riparian buffer. Before they are authorized, land uses might be rerouted to avoid these areas, but this would not be required. Newly proposed powerlines and ground facilities would be allowed within existing ROW and other disturbance areas, increasing development opportunities. Overall, this management would have a moderate beneficial effect on the ROW program.

Invasive Species and Pest Management (minor adverse)
Alternative D would take a moderate approach to managing invasive species. Under Alternative D, 12,000 acres (2%) of BLM surface are predicted to be treated. Newly proposed powerlines and ground facilities would be allowed within existing ROW and other disturbance areas. All these actions would limit spread of invasive species and pest where ROWs are limited or avoid proper ecological conditions, vegetative communities, and habitat types will remain intact limiting invasive species establishment and spread. Alternative D would help mitigate adverse effects on ROW corridors and decrease development opportunities. This would have a minor adverse effect on the ROW and corridor program.

Fish and Wildlife Resources – Fish (moderate adverse)
Alternative D would allow surface-disturbing activities within 0.25 mile of naturally occurring waterbodies containing native and desirable non-native fish species by applying a CSU stipulation; where fish resource objectives can be met. Design crossings of waterbodies identified as supporting fish would be designed to allow fish passage and restore important instream segments for fish habitat in accordance with WGFD priorities. The BLM would cooperate with WGFD in introducing or reintroducing native and desirable non-native in support of WGFD and BLM objectives.

Under Alternative D, the BLM BFO would maintain or enhance streams and riparian areas associated with Blue and Red Ribbon streams, Powder River, Tongue River, and other areas for desired fisheries potential and incorporate fisheries enhancement in reservoir design consistent with other resources. Overall, this would affect 51,745 acres (1%) of BLM surface in the planning area and have a moderate adverse effect on the ROW program.

Fish and Wildlife Resources – Wildlife (moderate adverse)
Under Alternative D, the BLM BFO would manage access to protect crucial habitats in cooperation with WGFD and other stakeholders and inventory, record, and report existing type, condition and location of BLM fences. Land use authorizations would require anti-perch devices on new high voltage powerlines to minimize raptor use of these poles and would prohibit above ground distribution powerlines unless identified in an approved distribution plan. Renewable energy projects would be prohibited in big game crucial winter range, elk calving areas, and identified big game priority travel corridors (Map 23). Surface disturbance and occupancy would be prohibited in the Ed O. Taylor, Kerns, Bud Love, and Amsden Creek winter ranges for big game and activity in crucial big game winter range, and in elk calving areas during specified dates (Map 23). This management would affect almost 13% of the planning area but would not prohibit ROW authorizations. Eighty five percent of existing security habitat would be retained and measured from roads within elk seasonal ranges (132,148 acres, or 17% of BLM surface in the planning area).

Although the acreages above suggest there would be a major adverse effect on the ROW program from Alternative D wildlife management, overall effect would be moderate. Interests for surface-disturbing activities in these areas would be constrained to the requirements identified above to alleviate potential adverse effects on the resource values. Most of the planning area would remain open for ROW interests and approvals.

Alternative D management would apply timing stipulations for surface-disturbing activities to protect sharp-tailed grouse. This would provide opportunities to authorize surface-disturbing activities, requiring users to adhere to specified requirements. Land use authorizations would require users to avoid surface disturbance or occupancy within 0.25 mile of the perimeter of occupied sharp-tailed grouse leks and avoid human activity between 6 PM to 8 AM from March 15 to May 31, and avoid areas within 2 miles from April 1 to July 31. This would effect less than one percent of the BLM surface in the planning area, and would have a minor adverse effect on the ROW program.

Alternative D would allow surface disturbance and occupancy within the USFWS recommended biological buffer zone around active nests of raptor species of conservation concern (Map 27) when nest productivity would not be harmed. This would affect 255,129 acres (33%) of BLM surface in the planning area. The BLM would prohibit surface-disturbing activities that could disrupt nesting raptors within the USFWS recommended buffer of an active raptor nest during specified periods. This management would have a moderate beneficial effect on the ROW program, because it would create use opportunities for the public while adhering to specified criteria to protect raptor species of conservation concern.

Overall, Alternative D wildlife management would have a moderate adverse effect on the ROW and corridor program.

Special Status Species – Plants (major adverse)
Alternative D would allow ROW development in habitat for special status plant species but not within known populations of such plants; after surveys establish site-specific botanic buffers, no surface-disturbing activities that could adversely effect special status plant species would be permitted.

This would affect 126,811 acres, 16% of BLM surface in the planning area, and have a major adverse effect on the ROW program by decreasing more potential for land use authorizations for the public.

Special Status Species – Fish (negligible adverse)
Alternative D would prohibit new surface-disturbing activities within 0.25 mile of any waters containing special status fish species (Map 22), unless the activities would benefit the species. Exceptions must demonstrate that potential adverse effects could be avoided and the proposed action is the least environmentally damaging alternative. In addition, the alternative would apply an NSO stipulation with 0.25 mile of any waters containing special status fish species and allow instream structures only where adverse effects on special status fish species and their habitat, can be avoided. This would affect less than one percent of BLM surface in the planning area and decrease development opportunities from denial of ROW proposals. This would have a negligible adverse effect on the ROW program.

Special Status Species – Wildlife (moderate adverse)
Alternative D special status wildlife species management would locate and manage facilities to mitigate the adverse effects of noise on special status species and maintain or enhance the

integrity of migration corridors, and identified special status wildlife species. This alternative would manage surface-disturbing and disruptive activities to mitigate adverse effects on special status wildlife species and their habitats as well as allowing surface-disturbing and disruptive activities within active prairie dog colonies on BLM surface that do not adversely impact suitable habitat. This management would have a moderate adverse effect on the ROW program.

Alternative D would apply the following surface-disturbing activities to the extent necessary to prevent unnecessary or undue degradation in Greater Sage-Grouse Core Population Area:

- Prohibit surface disturbing activities, disruptive activities, and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability).
- Allow on average no more than 1 mineral related disturbance and no more than 5% removal of sagebrush habitat disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance restricted to Core Population Area and Connectivity Corridor). Design facilities to prevent WNv, bury electrical distribution lines where possible, if not possible; locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards, prohibit electric overhead transmission lines unless within one-half mile either side of existing 115 kV or larger transmission lines creating a corridor no wider than one mile. Where technologically feasible, prohibit facilities with motion, light sources, noise (10 decibels above ambient), or height greater than 4.5 feet, and reduce visitation "manage by exception" approach. Locate new roads, used to transport products or waste, greater than 1.9 miles and other new, such as roads for site access, greater than 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks. Construct roads to minimum design standards needed.
- Restore disturbed sagebrush communities on BLM surface to full shrub density for all pre-disturbance shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.
- Prohibit surface disturbing and disruptive activities from March 15 to June 30 (independent of habitat suitability).
- Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas from December 1 to March 14.

Alternative D would apply the following to surface-disturbing activities within Greater Sage-Grouse Core Population Area and Connectivity Corridor:

- Prohibit surface-disturbing activities, disruptive activities and occupancy within 0.6 mile of the perimeter of occupied Greater Sage-Grouse leks (independent of habitat suitability).
- Allow no more than 5% total surface disturbance per 640 acres within the DDCT analysis area (4 mile buffer of occupied leks within 4 miles of proposed surface disturbance, restricted to Core Population Area and Connectivity Corridor). Design and manage facilities to prevent WNv transmission. Avoid overhead electric transmission lines and bury electric distribution lines where possible, if not possible: locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards. Locate new roads, used to transport products or waste, greater than 1.9 miles and other, new such as site access, greater than 0.6 miles from the perimeter of the occupied Greater Sage-Grouse leks. Construct road to minimum design standards needed, and facilities with motion, light sources, noise (10 decibels above ambient), with a height greater than 4.5 feet.
- Restore disturbed sagebrush communities on BLM surface to full shrub density for all pre-disturbance shrub species and 5% minimum canopy cover of sagebrush. A 90%

confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for at least two years.

- Prohibit surface disturbing and disruptive activities within 4 miles of occupied Greater Sage-Grouse leks from March 15 to June 30 (independent of habitat suitability, restricted to within Connectivity Corridor).
- Prohibit surface disturbing and disruptive activities within Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

Alternative D would apply the following to surface-disturbing activities within occupied Greater Sage-Grouse habitat outside of Core Population Area and Connectivity Corridor:

- Prohibit surface-disturbing and disruptive activities within 0.25 mile of the perimeter of occupied Greater Sage-Grouse leks. Reduce surface disturbance for authorizations within 0.25 miles of occupied Greater Sage-Grouse leks by prohibiting overhead transmission lines and where technologically feasible prohibit facilities with motion, light sources, noise (10 decimals above ambient), or height greater than 4.5 feet. Design and manage facilities to prevent WNv transmission, bury electric distribution lines where possible, if not possible; locate overhead lines at least 0.6 miles from the perimeter of occupied Greater Sage-Grouse leks and install raptor perch guards and reduce visitation "manage by exception" approach disruptive activities.
- Restore disturbed sagebrush communities on BLM surface to full shrub density for all pre-disturbed shrub species and 5% minimum canopy cover of sagebrush. A 90% confidence interval is required to demonstrate achievement of the standard. The standard must be demonstrated the last year of the responsibility period, and all planted shrubs shall have been in place for two years. This management action is recommended for all surface disturbing activities on BLM surface adjacent to Core Population Area and Connectivity Corridor, within or adjacent to lands involved in Greater Sage-Grouse conservation projects, or support an 85% Greater Sage-Grouse population density. BLM parcels less than 640 acres that only meet the population density factor may be excluded.
- Prohibit surface disturbing and disruptive activities within 2.0 miles of occupied Greater Sage-Grouse leks, from March 15 to June 30 and Greater Sage-Grouse winter concentration areas, from December 1 to March 14.

Management under Alternative D for raptors, establish a year round disturbance-free zone of at least 0.5 mile for the for the Clear Creek, Crazy Woman Creek, Piney Creek, Powder River, and Tongue River riparian bald eagle corridors. This buffer could be adjusted to 1.0 mile based on topographic features, visibility, disturbance and human activity levels, and other factors. This buffer zone restriction would be based on site specific information and coordinated with the USFWS Wyoming Field Office. This management would affect less than two percent of BLM surface in the planning area, and would have a minor adverse affect on the ROW program.

- Prohibit surface-disturbing and disruptive activities to nesting raptors using USFWS spatial recommendations for an active special status species raptor nest during established time periods (Map 27).

The ROW department assumes multiple potential uses that also could affect wildlife. Therefore, lands and realty personnel considering land use proposals would consult with fish and wildlife specialists before authorizing those uses.

Alternative D would allow surface-disturbing and disruptive activities within active prairie dog colonies on BLM surface, in accordance with identified criteria, that would not adversely effect suitable habitat for special status species that depend upon prairie dog colonies (Map 29). This would affect less than one percent of BLM surface in the planning area would have a minor adverse effect on the ROW program.

Alternative D for amphibians, reptiles and bats, require surveys for special status amphibian, reptile, and bat species prior to approving any project or activity that may impact the habitat for these species.

Overall, Alternative D special status wildlife management would have a moderate adverse effect on the ROW program.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Under Alternative D, the BLM would prohibit surface disturbance on the following sites Pumpkin Buttes, Cantonment Reno, Dull Knife Battlefield, Crazy Woman Battle, contributing and unevaluated segments of the Bozeman Trail, rock art sites, and all rock shelters.

The BLM would apply NSO stipulations and CSU stipulations (surface disturbance and infrastructure must either not be visible or would result in a weak contrast) to protect the setting within 3 miles of the Pumpkin Buttes, Cantonment Reno, Dull Knife Battlefield, Crazy Woman Battlefield, contributing and unevaluated segments of the Bozeman Trail, rock art sites, Native American burial sites for historic properties (Map 38).

Implementing protective measures for cultural resources would require analysis of a proposed land use to include cultural resource specialists during the scoping and analysis of a potential effects, and identify survey and monitoring activities for proposed uses. ROW proposals would be denied or rerouted to protect cultural resources, the predicted disturbance from ROW actions is 38,762 acres (4.96%) of BLM surface in the planning area, this would decrease development opportunities.

Overall, Alternative D cultural resources management would have a minor adverse effect on the ROW program.

Paleontological Resources (minor adverse)
Under Alternative D, implementing protective measures for paleontological resources would require surveys for PFYC Class 4 and 5. The BLM would monitor them as needed. This affects 98% of the planning area. However, these monitoring activities would have a negligible effect on the ROW program. These measures may result in the relocation or redesign of proposed use authorizations. Because known paleontological resources occur throughout the planning area, and because it is likely that additional paleontological resources would be discovered in the future, effects could occur in varying degrees throughout the planning area. The inclusion of paleontological and resource specialists during the scoping and analysis for potential effects, as well as identifying survey and monitoring activities for proposed uses would be included with each proposed land use analysis. There would be no casual collection areas designated. Areas containing paleontological resources of high quality or importance for special management, would be designated as they are needed. Overall there would not be significant effects to the ROW program, although development opportunities would decrease from the denial or deferment

of a proposal. Protecting paleontological resources would have a minor adverse effect on the ROW program.

Visual Resources (major adverse)
Under Alternative D, the BLM would manage VRI Class II areas (except Powder River Breaks and Fortification Creek) and special emphasis areas as VRM Class II (Map 44). This would affect 112,350 acres, or 15% of BLM surface in the planning area.

Under this alternative, the BLM would prepare visual simulations and design mitigation for all proposed actions in VRM Class I and II areas. Visual simulations and mitigation design could be required on a project specific basis for VRM Class III areas with high visual sensitivity. This management action would affect a total of 379,385 acres, or 48% of BLM surface in the planning area.

Proposed land use activities would be required to incorporate VRM requirements. Authorizations would incorporate mitigation requirements to alleviate adverse effects on visual resources in the planning area. The ROW program would be required to incorporate plans to minimize adverse effects on visual resources. Some proposed land uses could be denied if they would cause the VRM class to change.

Overall, Alternative D management of visual resources would have a major adverse effect on the ROW program.

Land Resources

Forest Products (negligible adverse)
Under Alternative D, Forest management areas within 200 feet of surface waters would be prohibited and affecting less than one percent of the planning area. ROW and corridors would be denied or relocated which would increase costs and decrease ROW development opportunities. The Lands and Realty staff will coordinate activities affecting forest products as necessary. This would have a negligible adverse effect on the ROW and corridor program.

Lands and Realty (major beneficial)
Under Alternative D priority would be given to acquiring land or interests in lands in areas adjacent to large blocks of BLM-administered lands.

Alternative D, management would pursue land tenure adjustment of all identified disposal lands. These parcels would be examined for the presence of high-value resources. There are approximately 120,722 (15%) acres currently identified for disposal. Lands containing high surface values would generally be retained, including those with agricultural potential. The BFO would pursue land tenure adjustment on lands identified for disposal having no natural resource values prior to pursuing lands identified for disposal having natural resource values, generally the management action would be to retain these lands identified for disposal until after the no natural resource value lands identified for disposal have been disposed. Actively disposing of identified disposal lands would have a major beneficial effect on the ROW program (Map 47, Appendix L (p. 1799)), consolidating lands would reduce the amount of trespass cases.

The BLM would pursue land adjustments related to custodial grazing allotments. Under Alternative D, disposing of these types of grazing lands would decrease the potential need for the public to request land use authorizations. It would therefore eliminate the need to monitor activities on these small, isolated parcels that are generally surrounded by private land. There

are 171,749 acres identified under custodial allotments (22%) of BLM-administered land in the planning area classified as custodial allotments.

Overall, Alternative D lands and realty management actions would have a major beneficial effect on the ROW program.

Renewable Energy (major adverse)
Under Alternative D, renewable-energy development ROWs would be excluded in the southern Big Horn Mountains, areas closed to mineral leasing (fluid and solid), areas closed to mineral entry (locatable and salable), ROW exclusion areas, areas within 3 miles and visible from historic properties that retain an intact setting, and all other areas where surface disturbance is prohibited, approximately 413,001 acres (53%) of BLM surface in the planning area identified with wind-energy potential. Renewable-energy development would be avoided on mineral leasing (fluid and solid) NSO, and CSU areas, ROW avoidance areas, areas greater than 3 miles from historic properties that retain and intact setting, and all other areas with surface disturbance restrictions, approximately 271,455 acres on BLM surface. Exclusion and avoidance at this scale would have a major adverse affect on the ROW and corridor program, by limiting ROW development opportunities.

Travel and Transportation Management (minor beneficial)
Alternative D travel and transportation management would allow motorized vehicle use on designated routes under a permit and within stock driveways; over-snow vehicle use would be consistent with motorized use designation when snow cover is sufficient to prevent resource damage; allow motorized vehicle use within habitat of special status species consistent with travel management designations for that area; allow travel not causing resource damage to go up to 300 feet off designated routes for dispersed camping and game retrieval. Close areas to motorized vehicle use to protect sensitive resources in Middle Fork Canyon, Cantonment Reno, Dry Creek Petrified Tree EEA, and apply a 500 foot buffer on designated non-motorized trails 31,536 acres (4%) of BLM surface. Appropriate signs would be placed where needed to minimize or prevent inadvertent trespass.

Alternative D travel and transportation management would protect winter big game by seasonally prohibiting motorized vehicle use within big game crucial winter ranges (Map 56), and protect big game calving areas.

This would not have a significant effect on the ROW program and would potential decrease trespass opportunities within designated routes. Overall, this management action would have a minor beneficial effect on the ROW program.

Recreation (moderate adverse)
Under Alternative D, the BLM would divide the planning area into eight ERMAs (totaling 349,663 acres) (Map 59), including Cabin Canyon ERMA (1,369 acres), Face of the Bighorns/North Fork ERMA (34,477 acres), Gardner Mountain ERMA (55,181 acres), Kaycee Stockrest ERMA (2,685 acres), North Bighorns ERMA (2,926 acres). PRB ERMA (224,483 acres), Southern Bighorns ERMA (25, 535 acres), and the Walk-in Area ERMA (3,007 acres). ERMA designations emphasize recreation opportunities and do not specifically prohibit ROW authorizations.

The BLM would designates the following SRMAs under Alternative D: Burnt Hollow (17,280 acres), Dry Creek Petrified Tree (2,567 acres), Middle Fork Powder River (10,083 acres), Mosier Gulch (1,026 acres), Welch Ranch (1,748 acres), Weston Hills (9,504 acres), and Hole-in-the-Wall

(11,952 acres), 7% of BLM surface in the planning area. The field office would consider additional lands for SRMA designation as appropriate. Surface disturbances in designated SRMAs would emphasize recreation opportunities and allow for administrative use only where consistent with other resource values. This management would have a moderate adverse effect on the ROW program.

Lands with Wilderness Characteristics (negligible adverse)
Under Alternate D the BFO would manage 6,864 acres of lands with wilderness characteristics (Map 62) to emphasize ecosystem health, natural values, and primitive recreational opportunities. The alternative prohibits surface-disturbing activities not compatible with retaining or enhancing wilderness characteristics by denying ROW proposals and decreasing development opportunity. LWC effects approximately 0.8 percent of BLM surface in the planning area and currently have a negligible adverse effect on the ROW program.

Special Designations

Areas of Critical Environmental Concern (moderate adverse)
Under Alternative D, the BFO would designate as appropriate, the following proposed ACECs: Fortification Creek Elk Area (32,602 acres) Pumpkin Buttes (1,733 acres), and Welch Ranch (1,116 acres) totaling 5% of BLM surface in the planning area. ROWs proposals, including new communication sites/locations on the Pumpkin Buttes, would be denied or have restrictive land uses under site specific management plans in the three ACEC areas, decreasing ROW development opportunities. Alternative D would have a moderate adverse effect on the ROW program.

Scenic or Back Country Byways (negligible adverse)
The BFO will evaluate roads and coordinate with the counties and other stakeholders for possible designations of National Back Country or Scenic Byways. Byway designation should not affect ROW authorization, but could adversely affect the perception of ROWs and therefore be a consideration in proposing ROWs along a designated byway, having a negligible adverse effect on the ROW program.

Wild and Scenic Rivers (negligible adverse)
If Congress denies the Middle Fork Powder River WSR nomination, management will continue to retain the free-flowing characteristics and outstanding resource values which would prohibit or restrict ROWs. Given the topography of the Middle Fork, ROW proposals are unlikely. Therefore the impact on ROW and corridor program would be negligible adverse.

Wilderness Study Areas (minor adverse)
Should congress act to designate or release WSAs, a plan amendment would take place. Alternative D prohibits all motorized and mechanized equipment in 28,931 acres (3%) of BLM surface. Overall, this would have a minor adverse effect on the ROW program.

4.6.4.7. Cumulative Impacts

Reasonably foreseeable development assumptions indicate oil and gas development would affect less than 39,000 acres (cumulatively), or less than five percent of BLM-administered planning area. Therefore, cumulative impacts from oil and gas development, and associated ROW's, would have a minor effect on renewable-energy development (see Appendix G (p. 1671)) In other words, invasive species, wildlife, paleontological, transportation, recreation, and livestock grazing would have a minor effect on the renewable-energy program since these RFD identified

disturbances effect less than five percent of the planning area. Oil and gas development activities would have a minor effect on the ROW and corridor program as far as authorizing ROW's in the planning area. In other words, substantial oil and gas development would not likely prohibit or preclude other ROW activities. ROWs associated with oil and gas development would be significant, considering the BFO is primarily an oil and gas office.

Cumulative effects would likely result from ongoing authorizations for multiple new surface-disturbing activities for oil and gas and renewable energy development (primarily wind towers); as well as ongoing mitigation activities for previously disturbed areas where reclamation is inadequate or failed. Furthermore, effects to VRM may be significantly effected by increasing structures on the surface. Requiring authorized users to develop and color structures to blend in with the landscape would help alleviate these effects. The majority of the basin holds opportunities for future carbon sequestration. If this activity occurs in the area, the ROW program would be significant affected by authorizing land use permits for surface and subsurface use, as well as ROW authorizations for linear disturbances ancillary to injection wells. This activity would benefit by utilizing those areas already effected by oil and gas development to limit new disturbances in the planning area. Current management (Alternative A) goals would likely result in adverse effects to resources across the planning area by allowing the authorized officer to waive restrictions to development activities without defining specific criteria to minimize effects to resources. Alternative B is very restrictive, minimizing opportunities for multiple uses. Management actions related to Alternative C would likely significantly compromise, destroy, or otherwise adversely affect wildlife and rangeland resources in the planning area. Opportunities for recreation would also be effected with increased development activities.

4.6.4.8. Conclusion

Table 4.66, “Summary of Impacts to Rights-of-Way and Corridors Program” (p. 1296) summarizes effects on the ROWs and corridors program by alternative.

Table 4.66. Summary of Impacts to Rights-of-Way and Corridors Program

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible adverse	Negligible adverse	Negligible beneficial	Negligible adverse
Soil	Moderate adverse	Major adverse	Major beneficial	Moderate adverse
Water Resources	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Cave and Karst Resources	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible beneficial	Negligible adverse
Leasable Minerals – Coal	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Fluids	Major beneficial	Major beneficial	Major beneficial	Major beneficial
Salable Minerals	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	Major adverse	Negligible adverse	Major beneficial	Major beneficial
Vegetation – Riparian/Wetland Resources	Minor adverse	Minor adverse	Minor adverse	Moderate beneficial
Invasive Species and Pest Management	No effect	Minor adverse	No effect	Minor adverse
Fish and Wildlife Resources – Fish	Negligible adverse	Minor adverse	Minor adverse	Moderate adverse
Fish and Wildlife Resources – Wildlife	Moderate adverse	Minor adverse	Minor adverse	Moderate adverse
Special Status Species – Plants	Negligible adverse	Major adverse	Major adverse	Major adverse
Special Status Species – Fish	Negligible adverse	Major adverse	Minor adverse	Negligible adverse
Special Status Species – Wildlife	Moderate adverse	Major adverse	Minor adverse	Moderate adverse
Heritage and Visual Resources				
Cultural Resources	Moderate adverse	Major adverse	Minor adverse	Minor adverse
Paleontological Resources	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Visual Resources	Moderate adverse	Major adverse	Minor adverse	Major adverse
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Lands and Realty	Minor beneficial	Major beneficial	Major adverse	Major beneficial
Renewable Energy	Minor beneficial	Minor adverse	Major beneficial	Major adverse
Rights-of-Way and Corridors	Minor beneficial	Major adverse	Minor adverse	Major adverse
Travel and Transportation Management	No effect	Major adverse	Minor beneficial	Minor beneficial
Recreation	No effect	Moderate adverse	Minor adverse	Moderate adverse
Lands with Wilderness Characteristics	No effect	Minor adverse	No effect	Negligible adverse
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	Major adverse	No effect	Moderate adverse
Scenic or Back Country Byways	No effect	Negligible adverse	No effect	Negligible adverse
Wild and Scenic Rivers	Negligible adverse	Negligible adverse	No effect	Negligible adverse
Wilderness Study Areas	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.5. Travel and Transportation Management

This section describes potential effects on the BLM's ability to acquire access across private lands, develop access across public lands, identify acquisition areas, and manage the transportation network in the planning area. Travel and transportation planning goes beyond motorized or OHV activities, and must address resource uses such as recreational, traditional, casual, authorized, commercial, and administrative, and accompanying modes and conditions of travel on the public lands. Travel and transportation management includes management of ROW for vehicular traffic and access to isolated parcels of public land. Acceptable modes of access and travel for each travel management area will be determined during the RMP implementation process. Travel management is further discussed in Appendix R (p. 2109).

The transportation network in the planning area continues to expand as new roads are constructed for energy development and other land use activities. Often these roads do not provide additional public access, but do provide administrative access for the BLM and authorized users under a permit. Additionally, an increase in OHV use for recreational activities has led to many user-created routes over BLM surface. Providing legal public access to portions of the planning area previously inaccessible to the public is considered a beneficial effect on the travel and access management program. These beneficial effects 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 exploration and development opens previously inaccessible parts of the planning area. Routine and emergency maintenance activities on roads and trails are considered inherent requirements of the travel and transportation management program, and would not represent an adverse effect on the program. Certain resource management actions could adversely affect the travel and transportation management program by placing limitations on transportation development.

The travel and transportation management program is a component of the Recreation Program rather than a stand-alone resource; however, travel and transportation management is considered multi-disciplinary and affects many programs including realty, lands and minerals, wildlife, livestock management, etc. The program assists in maintaining an adequate transportation system and providing public access. The following discussion of the effects on travel and transportation management focuses on the constraints and opportunities for public access (e.g., pipelines and roads). Specifically, the analysis determines whether the implementation of management actions for other resource programs would influence or modify the locations, sizes, or designs of travel and transportation proposals or, in some cases, would preclude a proposal from being approved. Such effects would primarily occur from the implementation of management actions designed to protect natural resources and limit adverse effects on those resources from surface-disturbing activities. Therefore, the types and degrees of limitations and restrictions on travel and transportation proposals depends on the locations of sensitive or high-value resources and the potential for environmental impacts to those resources.

4.6.5.1. Methods and Assumptions

This section describes the methods and assumptions used in the impact analysis for travel and transportation management.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, review of existing literature, and information provided by other agencies. Spatial analysis was performed using the ESRI ArcGIS Desktop 10 computer software. Effects

are quantified where possible. In the absence of quantitative data, best professional judgment was used. Effects are sometimes described using ranges of potential effects or in qualitative terms, if appropriate.

Removal of the Designation "Limited to Existing Roads and Trails"
Under the "Limited to existing roads and trails" designation, which appeared in the previous RMP, 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. An inventory of roads was not completed with the 1985 RMP, making it difficult for the BLM to determine what roads existed at the time of the RMP decision. A new set of vehicle tracks is often confused with an "existing" road and because these tracks attract use, new roads are made. Historically, this designation allows proliferation of unauthorized roads and associated effects on soils, vegetation, and the visual quality of the landscape. This slow process would have minor short-term effects, but over the long term, areas of interest to hunters and OHV enthusiasts could be changed to the point that roads would be a dominant feature on the landscape. The decision to remove this designation from the alternatives is consistent with management of adjacent lands (USFS) and with current travel and transportation guidance (Appendix R (p. 2109)).

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 and could be further limited by season. Such a limitation would be beneficial to soils and vegetation, but would have little 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 nonmotorized public access, nor would it diminish OHV opportunities (only specify where OHV use might occur). Furthermore, it would have little impact on other resource uses, such as mineral development, because under such a designation, roads are authorized as needed.

Lands in the "Limited" categories would be subject to a variety of impacts, depending on the terms and conditions of the designations. Motor vehicle use would be limited to a specific road and trail network established through collaboration with users, other agencies, and the general public. Unauthorized road proliferation would be curtailed, therefore extending protections to vegetation, wildlife habitat, livestock grazing, and visual resources.

Impacts from the Designation "Open to All Motor Vehicles"
"Open" designations often allow for unmanaged proliferation of roads, damage to or loss of vegetation, soil erosion, or degradation of the visual quality of the landscape. Such designations are often directly conflict with other resource values, including wildlife habitat and scenic quality. However, this designation benefits OHV users by providing an appropriate, managed place for concentrated motorized recreation considered inappropriate in most areas.

Impacts from the Designation "Closed to All Motor Vehicle Use"
Motor vehicle access is prohibited in Closed areas, limiting access to nonmotorized means (e.g., foot or horseback). This designation would be very beneficial to physical, biological, and heritage and visual resources because lands in this category would not experience adverse effects from motor vehicle use and would retain a more natural character. "Closed" designations can adversely affect uses that require road access, such as minerals resource development. Motorized activities would be excluded from such areas, making the areas unavailable to people who choose to access

the public lands exclusively by motor vehicle or those who are unable to travel by means other than motor vehicles.

Assumptions

- Demand for adequate access – the physical ability and legal right of the public, agency personnel, and authorized users to reach public lands - will remain constant or increase slightly in the foreseeable future.
- The travel network (i.e., highways, railways, and airports) in the planning area is essentially complete and no major travel infrastructure facilities are anticipated.
- Developing new roads for recreation access will be limited to providing access to large parcels of BLM-administered lands without adequate access.
- Consolidation of and access to public lands with prime recreational values would be pursued as opportunities arise.
- Additional roads will be developed, as needed, to support expanded oil and gas operations in compliance with the multiple use concepts of FLPMA; the travel management program could adopt some of these roads for specific uses, such as recreation access.
- Use of roads will increase based on anticipated increases in oil and gas activities. ROW applications for energy-related transportation facilities (e.g., roads and pipelines) are anticipated to increase.
- Road design and construction considers other resource programs to minimize adverse effects on those resources.
- This RMP does not affect existing ROW granted to other parties for access across the public lands.
- ROW actions are expected to generally correlate with minerals resource development, and the effects are assumed to be the same for both resources.
- Lands will be assessed by an interdisciplinary team before disposal. Lands that currently provide access to other public lands will not be disposed of without procuring alternative means of access.
- Users generally follow rules and regulations for motorized vehicle use; however, some users do not follow rules and unauthorized travel and OHV use in closed areas affects resources such as vegetation, soils, water, and wildlife and primitive recreation.
- Providing access to BLM-administered lands through the designation of routes will benefit travel management.
- Permanent or temporary road closures deemed unauthorized or that create substantial adverse effects to other resources are considered beneficial to travel and transportation management.
- Travel management planning generally improves travel management by limiting new roads to only those that are needed and increasing the efficiency of the roadway network by directing travel to preferred routes (e.g., utilizing roads that provide the shortest distance between two points or limiting travel on roads designated for specific purposes).
- Travel management plans will be developed with full public involvement.
- Reductions in road density have beneficial effects on some resources (e.g., big game and soils), but might require additional effort for users (e.g., longer travel routes).
- Disposal of mineral materials from BLM-administered lands will continue to be needed to support road construction and maintenance.
- OHV use encompasses many land use activities, including recreation and activities associated with livestock grazing and minerals 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 in 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, most recreational OHV users choose designated routes that minimize environmental degradation.
- The analysis assumes OHV designations are to be fully implemented five years after approval of this RMP.
- Any seasonal closures would not apply to tasks performed in support of current permits or authorizations issued by the BLM. However, these closures could affect the decision to issue permits in the future. In addition, other government entities that require entry to perform tasks related to management, maintenance, and control of wildlife would be exempt from the seasonal closure rule.
- Travel off designated routes for administrative purposes in an area closed to motor vehicle use will require written permission from the authorized officer.
- Lands outside of WSAs would be open to motor vehicle access for emergency purposes such as search and rescue and firefighting, regardless of the OHV designation.
- It is assumed that state and major county roads would continue to be maintained to current levels and that in general, county roads would not be abandoned. BLM facilities, mainly roads, would continue to be maintained, with priority given to those most heavily used by the public.

Significance Criteria

The scale of effects would be the same as identified in the Introduction of Chapter 4. In addition, an adverse effect on travel and transportation management as a result of project actions would be considered potentially significant if the following were to occur:

- An action would violate objectives associated with travel and transportation management, and its magnitude would be such that special mitigation would be warranted or it would persist indefinitely.

4.6.5.2. Impacts Common to All Alternatives

The travel and transportation program collaborates with other agencies to acquire access, initiates realty actions to provide access, and capitalizes on developments created under other resource programs as opportunities to meet access demand.

Each alternative designates areas in the planning area as Open, Closed, or Limited to designated roads and trails (see Glossary). These designations are specific to motorized use. While individual alternatives are addressed in their corresponding sections, this section describes general impacts that would result from motorized vehicle use designations.

Travel and Transportation Management (major beneficial)
Travel and transportation management is completed in response to competing demands for resource uses or protections. Travel proposals and subsequent decisions are most influenced by demands for administrative or recreational uses, to provide access for resource uses, and to mitigate wildlife management concerns. It should be noted that there would be little to no effect on legal public access from OHV designations. OHV designations in this RMP would not remove

the ability to access areas currently available to the public for recreation, though it may reduce motorized recreational opportunities.

Providing access to some areas could require multiple access routes, and multiple types of access (e.g., roads, pedestrian, or equestrian trails). Managing new roads would require routine and emergency maintenance. Consideration of other resources (e.g., cultural resources and special status species) could constrain routing alternatives, require that other routing alternatives be adopted, or increase costs, or may determine that access acquisition would not be feasible.

Wildlife are expected to benefit from OHV closures because they would be subject to fewer disturbances, particularly at critical times (e.g., elk calving). Recreational experiences (including hunting) would be significantly altered in areas closed to motorized vehicle use. This could enhance these experiences or detract from them, depending on the desires and attitudes of the affected recreationists. It is expected that the visitation in areas closed to motorized vehicle use will be less than a comparable area under a different motorized use designation. This could affect the ability of the WGFD to reach wildlife population targets for certain areas.

Land tenure adjustments could benefit the overall management of the travel and transportation program. These actions would help to facilitate the location of transportation systems by providing for a more contiguous public land base and encouraging such developments near communities. Negotiating with willing landowners to obtain access across non-BLM-administered lands to isolated public land parcels is critical to meeting the goal of providing accessibility across the planning area. Acquisitions and land exchanges would help the BLM provide seamless recreational opportunities and ensure long-term public access. Access acquisition would be primarily focused on larger parcels of BLM-administered lands (larger than 2 square miles) that are currently without public access. Increased access could result in a wider diversity of recreational opportunities. Access would be acquired only from willing landowners, and the preferred method would be via land exchange; therefore, anticipated effects on private land ownership would be minor.

Improved design and maintenance on BLM roads and easements would result in safer routes that reduce adverse effects on other resources. However, the cost of improved construction and maintenance could become a significant factor in the continued maintenance of routes. Planning for routes based on site-specific objectives would improve the BLM ability to maintain an operational transportation system. However, if the use of a route exceeds the design standards for that route, the road or trail would need to be reevaluated to ensure safety standards are met.

Establishing travel management areas (TMAs) and designating routes would result in a comprehensive travel network that provides access across the planning area while maintaining other resource values. Signs are the most efficient means of providing information to users until the travel and transportation management planning is complete. Restricting users to existing roads and trails until travel management planning is complete would result in a short-term continuation of problems with enforcing travel designations. Travel planning would result in the protection of a wide variety of resources while maintaining access across the planning area. While some roads, particularly user-created routes, might be closed, those retained for public use would be better maintained and the overall transportation system would preserve functionality and overall access.

Under historic transportation planning methods, travel was restricted through signs that posted prohibited uses in an area. These signs were often vandalized or removed and were costly to maintain. Marking or numbering designated routes, rather than posting non-designated routes

with prohibited uses, makes many signs obsolete, and other agencies have had success with this method.

Improved access for people with disabilities would benefit both transportation and recreation resources. Temporary closures are designed to protect the public and land resources. The effects would be localized and short-term, and would have a negligible adverse effect on travel and transportation program.

Implementing a designated route system is critical to protecting other resources while providing for access. Enforcement and management in areas classified as limited to existing routes is difficult, because user-created routes can legally be traveled by subsequent drivers so long as prohibited uses are not posted. Maintaining a transportation management system in cooperation with other agencies is essential to meet public and resource management needs. The effect of cooperation on the amount of accessible public lands would be major.

Physical Resources

Air Quality (negligible adverse)
Air quality management common to all alternatives could affect how transportation authorizations are stipulated to alleviate adverse effects on air quality. In general, stipulations would apply to permitted uses and are not expected to affect the general public. However, stipulations could be placed on pipeline or road ROW to reduce cumulative dust emissions and in some cases may impact the BLM's ability to provide access routes to public lands. The overall impact would be negligible.

Soil and Water Resources (negligible adverse)
Measures to protect soil and water resources could affect the placement of roads on a local level, but are not expected to reduce public access to public lands. Reclamation requirements related to protecting soil resources could slightly increase the costs associated with road construction, but would ultimately increase the sustainability of transportation projects. Overall, management actions for soil and water resources would have a negligible adverse effect on travel and transportation management.

Cave & Karst Resources (no effect)
The topography of areas with cave and karst resources, not specific management actions, constrain the placement of roads. Management of cave and karst resources would not affect travel and transportation management under any alternative and it will not be discussed further.

Mineral Resources (negligible beneficial)

The scale of impacts from mineral resource development is expected to be relatively the same across the various mineral resources. Thus, the section will be discussed as a whole, rather than as separate resources.

Continuing to develop solid and fluid minerals resources would affect the transportation network through a continued increase in roads for minerals development. Salable mineral development is often necessary to provide material for transportation systems, but the scale of impact is dependent upon whether the materials are developed on BLM mineral estate. Minerals management actions, because they are so numerous in specific parts of the planning area, could affect the locations of subsequent transportation systems. Increased minerals actions would contribute to an increase in

traffic on designated routes, with a resulting increase in the potential for litter, collisions with wildlife, and the spread of invasive plant species.

Historically, development of roads for oil and gas activities has not initiated a substantial change in the amount of public access to BLM-administered lands. However, roads created for minerals extraction purposes could be evaluated for inclusion in the designated route system, providing additional motorized recreational access for users. Areas closed to minerals leasing, having NSO stipulations, or otherwise identified as unsuitable for surface disturbance or occupancy would likely be managed as avoidance or exclusion areas for transportation.

Fire and Fuels Management (no effect)

Fire and fuels projects are generally short term and rarely require road construction. Actions from fire and fuels projects could leave temporary evidence of motorized vehicle use on the landscape (e.g., two-tracks), but are generally reclaimed and are not expected to have any effect on the travel and transportation program and will not be discussed further.

Biological Resources

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities and Invasive Species and Pest Management (no effect)
Specific alternatives related to forests and woodlands, grassland and shrubland communities, and invasive species and pest management may affect the placement or amount of use of roads and trails on a local level; however, there are no specific alternatives related to these resources that would directly impact the transportation program. These resources will not be discussed further.

Vegetation – Riparian/Wetland Resources, Fish and Wildlife Resources – Fish and Wildlife, and Special Status Species – Plants, Fish, and Wildlife (no effect)
Managing fish and wildlife habitat and special status species would affect uses administered by the travel and transportation program through the implementation of mitigation measures designed to protect species and wildlife habitat. Implementing species-specific protective measures for BLM sensitive plant and wildlife species and prohibiting actions that adversely affect Threatened and Endangered species could result in the relocation of proposed transportation systems to avoid these habitat areas. Effects would vary by alternative. However, implementation of the "common to all alternatives" for riparian/wetland, fish, wildlife, or special status species for fish, wildlife or plants would result in no effect to the travel and transportation resource.

Heritage and Visual Resources

Cultural Resources (no effect)
In general, implementing protective measures for cultural resources could require avoidance and other mitigation measures for transportation systems proposed near these resources. These measures could result in the relocation or redesign of the proposed transportation system. Because there are known cultural resources throughout the planning area, and additional resources will likely be discovered, there could be substantial effects on travel and transportation management to varying degrees throughout the planning area. In general, all effects would be at the local level. Implementation of the "common to all alternatives" for cultural would result in no effect to the travel and transportation resource, and would instead vary by alternative.

Paleontological Resources (no effect)
While discovery of important paleontological resources may affect the placement of roads and trails on a local level, there are no specific alternatives related to paleontological resources that would directly impact the transportation program. The resource will not be discussed further.

Visual Resources (negligible adverse)
Managing the planning area to meet VRM objectives could affect the locations and routes of proposed transportation systems. Additional effort would be required to design projects to meet the objectives of the designated VRM class in an area in which a transportation system is proposed. Because transportation systems would generally be compatible with Class IV objectives, this classification would allow for increased opportunities for such authorizations. This is also true for VRM Class III objectives; however, some additional project planning could be necessary for VRM Class III areas to ensure that the landscape is partially retained. Areas designated as VRM Class I in the planning area are addressed under Special Designations. Any transportation systems proposed in VRM Class I or Class II areas would be subject to intensive mitigation and, in some cases, could be precluded. Effects on the travel and transportation program would vary by alternative.

Land Resources

Forest Products (no effect)
There is some forestry activity within the planning area each year and this activity is generally concentrated on BLM-administered lands in the southern Big Horn Mountains. Under this RMP, the BLM would identify potential commercial harvest areas and high-interest personal use (e.g., firewood cutting and Christmas tree cutting) areas. Historically, timber harvests have not exceeded approximately 500 to 1,000 thousand board feet (mbf) per year, with little road construction. It is expected that a similar volume of harvest would occur in the foreseeable future. While no major road construction has occurred as a result of timber harvest, it is not inconceivable that temporary roads might be constructed to access parcels of timber in the future. Temporary roads or short access roads for small timber operations could provide new access for OHV use, although on an extremely localized scale. The implementation of any specific forest products alternative is expected to result in no effect to the travel and transportation program and the resource will not be discussed further.

Lands and Realty (negligible beneficial)
Measures to avoid the potential of inadvertent trespass by people accessing public lands though the use of appropriate signage and access authorizations will also benefit the travel and transportation program by providing information related to public access.

Renewable Energy (no effect)
While renewable-energy development may require additions to the transportation network to accommodate energy projects, the alternatives related to renewable energy have no effect on public access and will not be discussed further.

Rights-of-Way and Corridors (minor beneficial)
Alternatives for ROW, particularly related to coordination with other agencies to acquire easement and to meet public and resource management needs will be beneficial to the travel and transportation program. The overall benefit will be contingent on the success of coordination and will vary by alternative.

Recreation (negligible beneficial)
Development of RAMPs, recreational facilities and trails, and provision of recreation information will result in a net benefit to the travel and transportation program.

Lands With Wilderness Characteristics (no effect)
Evaluation of lands for wilderness characteristics would have no effect on the transportation system. However, measures to protect any existing wilderness characteristics would generally limit motorized vehicle use in areas with wilderness characteristics. This would have no effect on legal access, but would affect motorized travel at the local level and would vary by alternative.

Livestock Grazing Management (no effect)
Livestock grazing management often requires primitive road networks to access and maintain range improvements. The specific alternatives for livestock management are not expected to affect transportation management or access. Rather, roads on BLM-administered parcels without public access could be designated for administrative use, but this would have no effect on public access. Livestock management will not be discussed further in this section.

Special Designations

Potential effects from all special designations, whether existing or proposed, would usually be minor and vary by management prescriptions associated with each designated area. Intensive management of a special designation area could affect the travel and transportation program by altering the locations available for the placement of roads.

Areas of Critical Environmental Concern (negligible adverse)
Development of mitigation to protect relevant and important criteria may result in closure of access routes, or even closure to human presence. The impact to the travel and transportation program would be vary by ACEC and by alternative.

Scenic or Back Country Byways (negligible)
Designation and management of scenic and BCBs would improve public access through better information but could increase the amount of traffic on any designated routes. Increased traffic could increase maintenance needs on byways, litter, and the potential for dispersion of invasive plant species or collisions with wildlife. The effect on public access would be negligible.

Wilderness Study Areas (no effect)
WSAs cause restrictions on transportation management actions, because those areas would be closed to motorized travel. Transportation management is guided by Manual 6330 – Management of Wilderness Study Areas, and there would be no effect from common to all alternatives on provision of motorized access or on legal public access.

Wild and Scenic Rivers (no effect)
Designated WSRs generally include varying degrees of restrictions related to roads within a river corridor, with wild sections of rivers having the greatest restrictions and recreational sections the least. The topography of Middle Fork Canyon, not WSR-specific management actions, would constrain the placement of roads. There would be no effect on the travel and transportation program from WSR management and the resource will not be discussed further.

Socioeconomic Resources

There would be no effect on the travel and transportation program from Socioeconomic resources, Health and Safety and these resources will not be discussed further.

Table 4.67, "Estimated Acreage of Travel Designations by Alternative" (p. 1307) lists the estimated acreages of motorized travel designations under each alternative.

Table 4.67. Estimated Acreage of Travel Designations by Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
Open to motorized use	20,386	0	24,103	0
Closed to motorized use	3,704	312,561	28,931	31,536
Limited to Designated Routes	150,070[1]	451,077	723,497	620,252
Limited by season	29,011	18,464	6,839	18,464

Source: BLM 2012f

[1]Includes "Limited to Existing Routes" under Alternative A.

4.6.5.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. Under Alternative A, effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management (minor beneficial)
Under Alternative A, approximately 2.5% of the public lands in the planning area would be open to all motor vehicle use (Map 53). By continuing the Open designation for stock driveways and stock rests, the utilitarian purposes of the stock driveways would be preserved. In addition, stock driveways are often along county roads. In Open areas, vehicle travel would be permitted both on and off roads if the vehicle is operated responsibly and in a manner that would not be likely to cause significant undue damage to the environment. Even with a responsible use clause, there would be a high potential to significantly increase the number of user-created roads and trails above the number appropriate for protection of other resource values. Although this might benefit OHV enthusiasts, it would generally be detrimental to most other values and uses of the public lands except resource extraction.

At present, areas where OHV use is Closed constitute a small percentage (less than 0.5%) of the planning area. Travel in Middle Fork Canyon is largely prohibited due to the topographical constraints and would likely be prohibited under all alternatives due to steep slopes and other natural resource concerns. Dry Creek Petrified Tree and Cantonment Reno would be closed to motorized vehicle use to protect the respective paleontological and cultural resources at the sites. The effect of these closures on travel and transportation in the planning area would be negligible.

Areas where OHV use is limited to designated routes constitute approximately 20% of the planning area. When coupled with areas previously limited to existing routes, the amount of the planning area limited to designated routes is 92%. These areas will undergo a route inventory and a formal route designation plan following the ROD. Until formal designation and implementation, travel will be limited to existing routes. In much of the planning area, land tenure is the primary factor in accessibility, rather than the travel management designation. The effect of the travel restrictions on access in the planning area would be minor. In addition, less than five percent of

the planning area would be closed seasonally to protect biological resources. The effect of the travel restrictions on travel and transportation in the planning area would be minor and short-term.

Physical Resources

Air Quality (no effect)
Management actions related to air quality under all alternatives will not affect transportation or access and will not be discussed further.

Soil and Water Resources (minor adverse)
Prohibiting surface-disturbing activities includes limitations on construction of roads and could preclude motorized travel within 500 feet of certain water features, in areas of severe erosion hazard, areas with poor reclamation suitability, or on slopes equal to or greater than 25%. Alternative A could restrict the placement of certain roads on a local level. The effect on the travel and transportation program would be minor, but long-term. Under this alternative, restricting surface-disturbing activities, such as construction of a trail for nonmotorized travel, could still be considered if the authorized officer waives the prohibition.

Mineral Resources (negligible beneficial)

Under Alternative A, there could be effects on the travel and access program from foreseeable development of 2,731 oil and gas wells. This would affect travel and transportation management through the demand for authorizations for oil and gas facilities, including roads. An increased level of development associated with recovery of mineral resources could modify the road network, potentially providing additional routes for motorized access through the planning area. Historically, however, roads constructed for oil and gas initiatives are not available for recreational use and rarely provide legal public access to parcels that are currently inaccessible. Alternative A management of mineral resources would have a long-term negligible beneficial effect on the travel and transportation program.

Biological Resources

Vegetation – Riparian/Wetland Resources, Fish and Wildlife Resources – Fish and Wildlife, and Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Mitigation measures to protect riparian areas and wetlands, fish and wildlife resources, Threatened and Endangered species, and critical habitats can affect the travel and transportation program through seasonal closures and placement of roads. Seasonal closures would have minor short-term effects on transportation actions in sensitive areas such as the big-game crucial winter range and Greater Sage-Grouse lek buffer areas. Year-round restrictions, including NSO and CSU stipulations (for wildlife), would affect the locations of transportation actions over the long term. Sensitive wildlife habitats such as leks would be subject to NSO stipulations, thereby limiting the placement of transportation systems and access. These protected areas are typically small, transportation systems can usually be routed around them, resulting in a minor impact to transportation and access.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Under Alternative A, transportation actions are analyzed and mitigated on a case-by-case basis.

Road construction or placement could be prohibited or require special mitigation in areas of high cultural interest, which could result in the rerouting of transportation systems. The effect on travel and transportation would be negligible.

Visual Resources (minor adverse)
Most transportation systems would be compatible with VRM Class III (10% of the planning area) and Class IV (71% of the planning area). In VRM Class I and Class II areas (19% of the planning area), transportation actions would be limited and require mitigation to ensure that projects or surface disturbances would not attract the attention of the casual observer. The effect on the travel and transportation program would be minor.

Land Resources

Lands and Realty, Rights-of-Way and Corridors (minor beneficial)
The acquisition of lands from willing landowners would be considered on a project-specific basis. Continued authorizations of ROW and land and easement acquisitions could produce a minimal beneficial effect for travel and transportation on a localized scale given historic BLM acquisition trends.

Recreation (negligible beneficial)
Alternative A for recreation may support opportunities for motorized and nonmotorized access, but the benefit would be minimal.

Lands with Wilderness Characteristics (no effect)
Alternative A does not propose any special management for lands with wilderness characteristics, thus there would be no effect.

Special Designations

Areas of Critical Environmental Concern and Scenic and Back Country Byways (no effect)
Alternative A does not designate ACECs or scenic or BCBs, and management is considered sufficient to protect the values of proposed ACECs. Therefore, there would be no effect on travel and transportation from management of ACECs and scenic or BCBs.

Wilderness Study Areas (no effect)
BLM Manual 6330 – Management of Wilderness Study Areas directs the BLM to manage WSAs as nonmotorized use areas. Alternative A designates portions of these WSAs as "limited to designated routes." While motorized travel is currently, and would continue to be restricted in WSAs regardless of OHV designation, the Alternative A designation does not accurately reflect the management these areas. Alternatives B, C, and D clarify the closures to motorized access, but do not alter the status of legal public access. There is no effect to travel and transportation and the resource will not be discussed further in this section.

4.6.5.4. Alternative B

Alternative B would emphasize resource conservation. Alternative B effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management (moderate adverse)
Under this alternative, there would be no open areas for OHV use. Instead, all OHV use in all areas would be limited to designated routes or closed to motorized use. While this alternative would increase limitations on where motorized travel may occur, there would be no effect on legal public access.

Under Alternative B, the acreages in the "Limited to designated roads and trails" and the "Closed" categories would be increased (Map 54). The Closed areas would represent approximately 40% of the planning area. However, the closed areas in this analysis include lands with public roads. County roads, state highways, interstate highways, and roads with ROW or perpetual easements on BLM-administered lands must remain Open for motorized travel. Therefore, the actual acreage of lands in the Closed category would be less but the overall effect on the travel and transportation program would be significant and adverse. In "Limited" areas (58% of the planning area), management of motor vehicle access would be effective and the ability to enforce travel regulations would improve. Beneficial effects would include the ability to prevent the proliferation of roads and trails and protect the natural appearance of the landscape, wildlife habitat, and cultural resources. These benefits would be both short- and long-term.

In addition, the OHV designations under this alternative call for increased acreage with seasonal limitations on motorized access, whereby two percent of the planning area would have some form of seasonal OHV limitation to protect public land and resource values.

Under this alternative, travel off designated routes would be allowed only with a special use permit (e.g., grazing lessee or administrative use) in areas limited to designated routes. Special use permits would not grant the ability to travel in areas closed to motorized use (although emergency travel would be allowed with permission of the authorized officer). Travel off routes for "necessary tasks" would not be permitted. This alternative would have a beneficial effect on the ability to enforce travel regulations, while its adverse effect on the travel and transportation program would be negligible. The overall effect due to the reduced travel and transportation opportunities is moderate adverse.

Physical Resources

Soil and Water Resources (minor adverse)
Under Alternative B, prohibiting surface-disturbing activities would limit construction of roads and could preclude motorized travel in areas of severe erosion hazard, areas with poor reclamation suitability, or on slopes equal to or greater than 25%. This alternative could restrict the placement of certain roads on a local level. The same is true for restrictions within 500 feet of water features. The effect on the travel and transportation program would be minor, but long-term. Alternative B does not include a provision for waiver by the authorized officer, which would remove the potential for discretionary approval of transportation projects in areas with sensitive physical resources.

Mineral Resources (negligible beneficial)

Alternative B would increase restrictions on use and decrease development opportunities. This alternative would provide the least opportunity for minerals development and production (a predicted 101 CBNG wells and 7 conventional wells), thereby decreasing the demand for roads compared to Alternative A. Due to the land tenure patterns in the planning area, the effect on public access to public lands would be negligible.

Biological Resources

Vegetation – Riparian/Wetland Resources, Fish and Wildlife Resources – Fish and Wildlife, and Special Status Species – Plants, Fish, and Wildlife (moderate adverse)
Under Alternative B, mitigation measures to protect wildlife resources, Threatened and Endangered species, and critical habitats could affect the travel and transportation program through seasonal closures and restrictions on the placement of roads. Seasonal closures would have minor short-term effects on transportation actions in sensitive areas such as big-game crucial winter range and Greater Sage-Grouse buffer areas. Year-round restrictions, including NSO and CSU stipulations (for wildlife) would affect the locations of transportation actions over the long term. Sensitive wildlife habitats such as leks would be avoided to the extent possible, thereby limiting the placement of transportation systems and access.

Effects on the travel and transportation program from Alternative B wildlife and fisheries management would place an emphasis on habitat enhancement and protection and adds restrictions on surface-disturbing and disruptive activities. NSO areas and seasonal restrictions would affect the placement of transportation systems and affect the construction windows for building pipelines, roads, and the like. The overall effect due to the reduced travel and transportation opportunities is moderate adverse.

Heritage and Visual Resources

Cultural Resources (moderate adverse)
Alternative B cultural resources management would prohibit surface-disturbing activities, including most travel and transportation actions, in or near historic properties. Transportation actions would be prohibited or require special mitigation measures within 5 miles or the visual horizon (whichever is closer) of historic properties, which could result in the rerouting of transportation systems. The effect on access to public lands would be moderate.

Visual Resources (minor adverse)
Effects from VRM would be similar to those under Alternative A, except that Alternative B would designate approximately 218,178 acres as VRM Class II. This would increase the level of restrictions designed to protect visual resources and subsequently decrease opportunities for transportation authorizations. The effect on public access would be minor.

Land Resources

Lands and Realty (minor beneficial)
Under Alternative B, acquiring lands from willing landowners would be considered across the planning area. Land and easement acquisitions could have a minor beneficial effect on travel and transportation on a localized scale, given historic BLM acquisition trends.

Rights-of-Way and Corridors (minor adverse)
The effects from ROW on transportation will be similar to the effects from alternatives to protect soil resources. Under Alternative B, prohibiting ROWs would limit construction of roads and could preclude motorized travel in areas with slopes equal to or greater than 25%.

Recreation (moderate beneficial)
Under Alternative B, eight SRMAs (55,529 acres; 7.1% of BLM surface) would provide opportunities for intensive travel management (both motorized and nonmotorized) in

defined and manageable transportation planning areas. RAMPs for each SRMA would also specifically address travel management and public access to these areas. The overall effect due to the increased travel and transportation opportunities is moderate beneficial.

Lands with Wilderness Characteristics (minor adverse)
Effects of alternatives related to lands with wilderness characteristics would be limited to 12,237 acres (1.5% of BLM surface), an area where motorized travel is generally restricted due to topography rather than administrative prescriptions. Much of the areas under review lack legal or reasonable public access. However, it is anticipated that lands with wilderness characteristics that are managed to protect wilderness values would likely include additional restrictions to motorized travel. If these restrictions reduce legal or reasonable access to public lands, the impact to travel and transportation would be minor.

Special Designations

Areas of Critical Environmental Concern (moderate adverse)
Alternative B would designate eight ACECs (536,304 acres; 60% of BLM surface). The management emphasis for the ACECs would be to protect natural resources, which would likely restrict transportation. Resources would be further protected in ACECs through the development of implementation plans, and these areas and would be managed to meet the objectives of the specific ACECs (Appendix S (p. 2121)). In designated ACECs, future area-specific plans could further limit OHV use, including closures, limiting OHV use to designated trails, and seasonal restrictions on OHV use. The uncertainty of these future plans makes the effects on the travel and transportation program largely unknown. ACECs would likely be managed as transportation avoidance or exclusion areas, but there would be no effect on legal access. Given the retention of nonmotorized access, the overall effect due to reduced travel and transportation opportunities is moderate adverse.

Scenic and Back Country Byways (negligible beneficial)
Evaluating routes and roads within the planning area for designation as BCBs could increase opportunities for vehicle touring, public access to public lands and the presence of signage to protect natural resource values, negligible beneficial effects.

4.6.5.5. Alternative C

Alternative C would emphasize resource use. Alternative C effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management (major beneficial)
Under this alternative, approximately three percent of the public lands in the planning area would be open to all motor vehicle use (Map 55). By continuing the Open designation for stock driveways and rests, the utilitarian purposes of the stock driveways would be preserved. In addition, stock driveways are often along county roads. In Open areas, vehicle travel would be permitted both on and off roads if the vehicle is operated responsibly and in a manner that would not be likely to cause significant undue damage to the environment. Even with a responsible use clause, there would be a high potential to significantly increase the number of user-created roads and trails above the number appropriate to protect other resource values. Although this might benefit OHV enthusiasts, it would generally be detrimental to most other values and uses of the public lands, except resource extraction.

Under Alternative C, approximately four percent of the planning area would be closed to OHV use. The effect of these closures on access in the planning area would be minor. Less than one percent of the planning area would be closed seasonally to protect biological resources. The effect of these travel restrictions on access in the planning area would be minor and short-term.

Under Alternative C, OHV use would be limited to designated routes in 92% of the planning area. These areas would undergo a route inventory and a formal route designation plan following the ROD. Until formal designation and RMP implementation, travel would be limited to existing routes. In much of the planning area, land tenure, not the travel management designation, is the primary factor in accessibility. The effect Alternative C travel restrictions on public access to public lands in the planning area would be negligible.

Under this alternative, travel up to 300 feet off of designated routes for necessary tasks would be permitted. This management would have a adverse effect on the ability to enforce travel regulations. The overall effect due to the increased travel and transportation opportunities is major beneficial.

Physical Resources

Soil and Water Resources (negligible adverse)
Alternative C management of physical resources would reduce constraints on the construction or placement of many roads and trails. While measures to protect physical resources would still be in effect, the adverse effect from restrictions related to route development on the travel and transportation program from physical resources management under Alternative C would be negligible, but long-term.

Mineral Resources (negligible beneficial)

Alternative C effects from minerals management would be slightly more extensive and would involve a larger portion of the planning area than Alternative A, because Alternative C would decrease restrictions on use and increase development opportunities. This alternative would provide more opportunities for minerals development and production (a predicted 5,280 CBNG wells and 1,990 conventional wells), thereby increasing travel and transportation needs. Given the historic lack of public access provided through mineral development, the benefit to the travel and transportation program will be negligible.

Biological Resources

Vegetation – Riparian/Wetland, Fish and Wildlife Resources – Fish and Wildlife, and Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Very few restrictions related to fish and wildlife resources are proposed under Alternative C. For areas with habitat that supports sensitive species of plants, restrictions on development would limit the placement of transportation routes only in areas with known populations. Additional restrictions related to sensitive species of fish or wildlife will result in effects similar to Alternative A. These would either decrease opportunities for travel and transportation authorizations or increase the stipulations placed on such authorizations on a localized level.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Alternative C for cultural resources essentially removes strict restrictions on surface disturbance in areas with historic properties, however, some NSO and CSU stipulations may still exist. There will be little impact on the travel and transportation program.

Visual Resources (negligible beneficial)
Alternative C effects on the travel and transportation program from management of visual resources would be similar to effects under Alternative A, except that Alternative C would not designate any areas as VRM Class II. This would lead to an overall decrease in the level of restrictions designed to protect visual resources, and subsequently increase opportunities for travel and transportation authorizations. The effect on public access would be negligible beneficial.

Land Resources

Lands and Realty (major adverse)
Under Alternative C, the BLM would not pursue the acquisition of lands or easements from willing landowners, eliminating the ability to consolidate land where it would benefit public access. The inability to pursue adjustments in land tenure would have a major adverse effect on the travel and transportation program.

Rights-of-Way and Corridors (negligible beneficial)
ROWs would not be excluded on slopes exceeding 25% resulting in a negligible beneficial effect on transportation planning.

Recreation (moderate beneficial)
Six SRMAs (30,570 acres) would provide opportunities for intensive travel management (both motorized and nonmotorized) in defined and manageable transportation planning areas. RAMPs for each SRMA would specifically address travel management and public access to these areas. The overall effect due to the increased travel and transportation opportunities is moderate beneficial.

Lands with Wilderness Characteristics (no effect)
Alternative C does not propose any special management for lands with wilderness characteristics, thus there would be no effect.

Special Designations

Areas of Critical Environmental Concern and Scenic and Back Country Byways (no effect)
Alternative C does not designate ACECs or scenic or BCBs. Therefore, there would be no effect on travel and transportation from management of ACECs and scenic or BCBs.

4.6.5.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative. Alternative D effects on the travel and transportation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Travel and Transportation Management (major beneficial)
Under this alternative, there would be no open areas for OHV use. Instead, all areas would be limited to designated routes or closed to motorized vehicle use. While this alternative would increase limitations on where motorized travel may occur, there would be no effect on legal public access.

The acreage in the limited to designated roads and trails and the Closed categories would be increased (Map 56) under Alternative D. Approximately four percent of the planning area would be closed to motorized vehicle use. In Limited areas (79% of the planning area), management of motorized vehicle access would be effective and the ability to enforce travel regulations would improve. This management would prevent the proliferation of roads and trails and protect the natural appearance of the landscape, wildlife habitat, and cultural resources. The beneficial effects would be short-term and long-term.

In addition, the OHV designations under this alternative would increase acreage with seasonal limitations on motorized vehicle access, whereby 17% of the planning area would have some form of seasonal OHV limitation to protect public land and resource values.

Under this alternative, travel off designated routes would be allowed only under a special use permit (e.g., grazing lessee or administrative use) in areas limited to designated routes. Special use permits would not grant the ability to travel in areas closed to motorized vehicle use (although emergency travel would be permitted with permission of the authorized officer). Travel off routes for big game retrieval and dispersed camping would be permitted. Alternative D would have a beneficial effect on the ability to enforce travel regulations, while the adverse effect on travel management would be negligible. The overall effect due to the travel and transportation opportunities provided while protecting other resources and resource uses is major beneficial.

Physical Resources

Soils and Water Resources (minor adverse)
Alternative D management of physical resources would include constraints on the construction or placement of roads and trails. Allowing surface-disturbing activities on slopes equal to or greater than 25%, in areas of severe erosion hazard, and areas with poor reclamation suitability would allow flexibility in providing nonmotorized and motorized access in certain locations. Since measures to protect physical resources would be still be in effect, the adverse effect on the travel and transportation program would be minor, long-term.

Mineral Resources (negligible beneficial)

Alternative D would provide opportunities for minerals development and production (a predicted 2,721 CBNG wells and 1,773 conventional wells), resulting in continued demand for administrative roads. Due to the land tenure patterns in the planning area, the effect on public access to public lands would be negligible.

Biological Resources

Vegetation – Riparian/Wetland, Fish and Wildlife Resources – Fish and Wildlife, and Special Status Species – Plants, Fish, and Wildlife (moderate adverse)
Under Alternative D, mitigation measures to protect wildlife resources, Threatened and Endangered species, and sensitive habitats could affect the travel and transportation program

through seasonal closures and restrictions on the placement of roads. Seasonal closures would have short-term effects on transportation actions in sensitive areas such as big-game crucial winter range and Greater Sage-Grouse buffer areas. Year-round restrictions, including NSO and CSU stipulations (for wildlife) would affect the locations of transportation actions over the long term. Sensitive wildlife habitats such as leks would be subject to restrictions, thereby limiting the placement of transportation systems and access. The overall effect due to the reduced travel and transportation opportunities is moderate adverse.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Alternative D cultural resources management would prohibit surface-disturbing activities, including travel and transportation actions, in or near defined historic properties. Special mitigation would apply to actions proposed on or near these historic properties, which could result in the denial or modification of future additions to the transportation system. The effect on access to public lands would be minor.

Visual Resources (negligible adverse)
Effects from management of visual resources would be similar to effects under Alternative A, except that 379,385 acres would be categorized as VRM Class III under Alternative D. The effect on public access would be negligible.

Land Resources

Lands and Realty (minor beneficial)
Under Alternative D, the BLM would consider acquiring lands from willing landowners across the planning area. Land and easement acquisitions could have a minor beneficial effect on travel and transportation on a localized scale, given historic BLM acquisition trends.

Rights-of-Way and Corridors (negligible adverse)
Alternative D management of ROWs would slightly increase constraints on issuing ROWs on slopes greater than 25% or highly erodible soils. Allowing some ROWs would provide flexibility in transportation planning. Measures to avoid steep slopes will produce a negligible adverse effect on the travel and transportation program.

Recreation (moderate beneficial)
Under Alternative D, seven SRMAs (54,160 acres; 7.1% of BLM surface) would provide opportunities for intensive travel management (both motorized and nonmotorized) in defined and manageable transportation planning areas. RAMPs for each SRMA would specifically address travel management and public access to these areas. The overall effect due to the increased travel and transportation opportunities is moderate beneficial.

Lands with Wilderness Characteristics (minor adverse)
Effects of alternatives related to lands with wilderness characteristics would be limited to 12,237 acres (1.5% of BLM surface), an area where motorized travel is generally restricted due to topography rather than administrative prescriptions. Much of the areas under review lack legal or reasonable public access. However, it is anticipated that lands with wilderness characteristics that are managed to protect wilderness values would likely include additional restrictions to motorized travel. If these restrictions reduce legal or reasonable access to public lands, the impact to travel and transportation would be minor.

Special Designations

Areas of Critical Environmental Concern (minor adverse)
Under Alternative D, there would be three designated ACECs (35,451 acres; 4.5% of BLM surface). The emphasis of the ACECs would be to protect natural resources, which would likely restrict travel and transportation. Resources would be further protected in ACECs through the development of implementation plans, and these areas and would be managed to meet the objectives of the specific ACECs (Appendix S (p. 2121)). In designated ACECs, future area-specific plans could further limit OHV, use including closures, limiting OHV use to designated trails, and seasonal restrictions on OHV use. The uncertainty of these future plans makes the effects on the travel and transportation program largely unknown. ACECs would likely be managed as transportation avoidance or exclusion areas. ACECs would likely be managed as transportation avoidance or exclusion areas, but there would be no effect on legal access.

Scenic and Back Country Byways (negligible beneficial)
Evaluating routes and roads within the planning area for designation as BCBs could increase opportunities for vehicle touring, public access to public lands, and the presence of signage to protect natural resource values, negligible beneficial effects.

4.6.5.7. Cumulative Impacts

Most cumulative impacts to travel and transportation in the planning area would result from actions that restrict land uses. When the combined natural and cultural resource (physical resources, biological resources, heritage and visual resources, and special designations) protection measures are considered for each alternative, the severity of cumulative effects increases. Such restrictions would reduce the potential to acquire access easements and limit the locations available for road development, which would have overall adverse cumulative effects on the travel and transportation program that would vary from minor to moderate, depending on alternative. However, adverse effects would not be considered significant because opportunities to acquire access easements, develop roads, and provide reasonable public access could still be available.

If current trends persist, use of OHVd would continue and increase throughout the planning area as population and the popularity of motorized sports increases. Limitations on cross-country travel on public land (which are specifically provided for under alternatives B, C, and D) could increase cross-country OHV use on private land. As transmission lines, pipelines, and transportation routes are developed off of BLM surface, access roads to these linear facilities for operations and maintenance also could be used by the public for recreational access. If this occurs, it could trigger a proliferation of access throughout the area, including on BLM surface.

Past Actions
Since the 1985 RMP was approved, public access has been acquired in conjunction with the land acquisitions at Burnt Hollow and Welch Ranch. OHV registrations and use have increased substantially in the planning area over the past 10 years, in some cases resulting in a proliferation of routes, particularly during fall when hunters pursue big game.

Present Actions
OHV use also is a popular recreational activity, and under current management motorized travel is allowed to varying degrees on BLM surface. Other public lands in the planning area provide additional areas for motorized recreation, including lands managed by the USFS Bighorn National Forest, the USFS Thunder Basin National Grassland, the State of Wyoming, and the

WGFD. Often, routes that cross lands managed by other agencies provide legal public access to BLM-administered lands. Additional OHV use is expected to occur on private lands to support hunting and livestock management operations, and resource extraction activities.

Reasonably Foreseeable Future Actions
Population growth in the planning area and the surrounding region could lead to increased demand for motorized recreational opportunities. Such demand would increase both the need for designated areas and trails to recreate as well as provisions for mitigating the effects of increased motorized recreation. The ability to incentivize land exchanges or easements may be more feasible as not-for-profit organizations in northeastern Wyoming take interest in public access issues.

4.6.5.8. Conclusion

Alternative D would have the most overall beneficial effect on the travel and transportation program by balancing resource protection with legal public access and motorized vehicle access. Alternative B would impose the greatest restrictions on the program, and Alternative C the least. Alternative A would not adequately address the effects of limiting travel to existing routes. By improving trail and OHV management through land use planning, the BLM would minimize adverse effects on wildlife habitat; reduce the introduction and spread of invasive plant species; decrease conflicts among various motorized and nonmotorized recreation users; and prevent damage to cultural resources from the expansion of roads and trails on public lands. Moving toward a system of a designated network of roads and trails through transportation and travel management planning would protect, rather than inhibit, access to recreation on public lands. In support of transportation and travel management, roads, trails, byways, and other routes must be identified and/or designated to provide for public access and travel across the planning area. Actual route designation would take place during after the ROD for this RMP and EIS. Table 4.68, "Summary of Impacts to Travel and Transportation Management" (p. 1318) summarizes impacts to the travel and transportation program.

Table 4.68. Summary of Impacts to Travel and Transportation Management

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Minor adverse	Minor adverse	Negligible adverse	Minor adverse
Water Resources	Minor adverse	Minor adverse	Negligible adverse	Minor adverse
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Leasable Minerals – Coal	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Leasable Minerals – Fluids	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Leasable – Other Solid Leasables	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Salable Minerals	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Fish and Wildlife Resources – Wildlife	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Special Status Species – Plants	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Special Status Species – Fish	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Special Status Species – Wildlife	Minor adverse	Moderate adverse	Minor adverse	Moderate adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Moderate adverse	Negligible adverse	Minor adverse
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Minor adverse	Minor adverse	Negligible beneficial	Negligible adverse
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	Minor beneficial	Minor beneficial	Major adverse	Minor beneficial
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	Minor beneficial	Minor adverse	Negligible beneficial	Negligible adverse
Travel and Transportation Management	Minor beneficial	Moderate adverse	Major beneficial	Major beneficial
Recreation	Negligible beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
Lands with Wilderness Characteristics	No effect	Minor adverse	No effect	Minor adverse
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	Moderate adverse	No effect	Minor adverse
Scenic or Back Country Byways	No effect	Negligible beneficial	No effect	Negligible beneficial
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.6. Recreation

The BLM will ensure the continued availability of public lands for a diversity of outdoor recreation opportunities, while maintaining its commitment to manage public lands as a national resource in harmony with the principle of balanced multiple use (BLM 2007b). The Recreation and Visitor Services (R&VS) program may designated discrete units of public land in RMAs. RMAs are either a SRMA or an ERMA. SRMAs are administrative units where recognize unique and distinctive recreation values and are managed to enhance a targeted set of activities, experiences, benefits, and recreation setting characteristics (RSC), which becomes the priority management focus. Within a SRMA, R&VS management is recognized as the predominant LUP focus, where specific recreation opportunities and RSCs are managed and protected on a long-term basis.

ERMAs recognize existing recreation use, demand, or R&VS program investments and are managed to sustain principal recreation activities and associated qualities and conditions of the ERMA, commensurate with the management with other resources and resource uses. Some public lands, particularly those without legal public lands or of insufficient size to support recreational activities, may not be designated as an RMA. Recreation is not emphasized on these lands; however, recreation activities may occur unless the lands are either permanently or temporarily closed to public use to protect resource values or human health and safety. The R&VS are managed to allow recreation uses that are not in conflict with the primary uses of these lands.

Table 4.69, "Proposed SRMAs by Alternative" (p. 1327) lists the acreages of SRMAs proposed under each alternative. These SRMAs represent areas in which recreation management is the predominant management focus. Recreation management matrices in Appendix T (p. 2135) identify the primary market strategy, niche, recreation management objective, targeted outcomes, prescribed setting character, and implementation strategies and actions for each proposed SRMA(BLM 2011b).

4.6.6.1. Methods and Assumptions

Assumptions and methods used in this analysis might include, but are not limited to:

- Lands within the BFO are open to public recreational use unless they are closed through management alternatives in this LUP or in accordance with guidance for Temporary Closures and Restrictions under 43 CFR Subpart 8364 (Closures and Restrictions); for Temporary Closures Mandated by 43 CFR Subpart 8341 (Conditions of Use); or for emergency actions under 40 CFR 1506.11.
- The designation of SRMAs is assumed to provide additional benefits to the recreation program compared to managing the planning area as one or more ERMAs.
- Each SRMA will be managed for the management objectives, prescribed setting character, and activity planning framework specified in Appendix T (p. 2135) and in the development of individual RAMPs following the ROD for this RMP.
- RAMP will be prepared for each SRMA and ERMA within five years of the completion of the RMP revision. A site-specific analysis will be performed on the ground as RMP decisions are implemented. RAMPs may be combined with TMPs where appropriate.
- Traditional recreational uses of planning area lands will continue, despite any new recreational activities in the planning area based on new technologies. New and traditional recreational uses will be accommodated where they are determined to be appropriate to support the achievement of resource goals.

- The demand for hiking, fishing, floating, camping, horseback riding, OHV use, and recreation based on advancing technology is expected to increase. The number of hunters will fluctuate with the size of the game populations and other indirect factors, but because younger generations are exhibiting less interest in hunting, the number of hunters will likely decrease during the planning period.
- The incidence of resource damage and conflicts between OHV users and nonmotorized recreationists will increase as OHV use increases.
- Visitation throughout the planning area will continue to increase as resource availability and conditions allow. As the populations of neighboring states and the local area continue to grow, the need or search for less crowded or more remote recreational opportunities will continue to bring more people to public lands in Wyoming.
- ERMA designations are largely based on the availability of legal public access. Should additional public access be acquired, an ERMA may be created or expanded to reflect the changing conditions through an amendment to this RMP.
- For purposes of this analysis, short-term effects occur within five years of a given management action. Long-term effects continue beyond five years or take more than five years to materialize.

Beneficial effects on recreation resources would result from 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 effects would result from actions that adversely affect the recreational setting, detract from the recreational experience opportunities of users, or decrease benefits from recreational uses. Adverse effects most often occur when resource development actions (e.g., mineral resources recovery and livestock grazing management) displace recreational uses from a given area.

Significance Criteria

Opportunities for recreation are generally related to access to public lands, except for activities under a special recreation permit on lands controlled by adjacent landowners. The true value of the recreation resource is measured in human experiences and satisfaction, rather than in acres available for recreation. Satisfaction is directly related to the balance between expectations and actual experiences (Olshavsy and Miller 1972). Visitor surveys provide the best measure of visitor satisfaction in the planning area. The scale of potential effects is based on a variety of factors, including public access, anticipated visitor satisfaction, and the ability to provide diverse recreational opportunities based on management of other resources. In cases where quantitative information is not available, best professional judgement is used. The scale of effects would be the same as identified in the Introduction of Chapter 4. In addition, an adverse effect on R&VS management as a result of project actions would be considered potentially significant if the following were to occur:

- An action would violate objectives associated with recreation resource management, and its magnitude would be such that special mitigation would be warranted, or it would persist indefinitely.
- In a SRMA, an action would negate the ability to manage for the prescribed recreational setting.
- In ERMAs, an action would deprive the public of the ability to access a contiguous block of BLM-administered public land for which there was historic legal access.
- An action would negates the ability to manage BLM-administered public lands according to the Recreation Opportunity Spectrum.

- Long-term visitor satisfaction surveys for SRMAs show continually decreasing satisfaction levels.

4.6.6.2. Impacts Common to All Alternatives

Recreation (major beneficial)
Designating SRMAs would increase the ability to apply for funding and recreation-related construction. Designating SRMAs also would refocus attention on emerging public demands for recreation identified in recent years, and during the public scoping process for this RMP. Natural resource-dependent recreation is promoted through the allowance of casual use of public lands for dispersed recreation. Some restrictions, such as prohibiting camps within 200 feet of surface water, are consistent with outdoor ethics principles and could result in the closure or relocation of site-specific recreational opportunities. Cooperation with other entities would ensure provision of a wide variety of recreational opportunities to meet the demands of a multitude of user groups. Such cooperation also could increase public access, opening a larger portion of the planning area to recreation use. Existing facilities would be maintained for consistency with the recreational setting, improving the visitor experience and often reducing the maintenance workload in the planning area. Minimizing noise and light pollution that would affect recreation facilities and sites would improve the visitor experience at these sites and help realize many of the beneficial outcomes intended for each recreation management zone. Timely completion of RAMP would provide clear direction for recreation management in SRMAs, while opportunities for revision would allow flexibility as unforeseen issues arise.

Imposing a stay limit on camping prevents singular use of portions of BLM-administered public lands. By ensuring that one party would not have long-term exclusive use of a campsite, opportunities for recreation would be extended on a more just and fair basis. Providing information at recreation sites would help prepare visitors for local conditions, inform users of interpretive and regulatory information, and prevent inadvertent trespass onto adjacent lands. Promoting Americans with Disabilities Act compliance at BLM-administered recreation sites would help meet national goals and provide recreational opportunities for a wider segment of the American population.

Physical Resources

Air Quality, Soil, Water Resources, and Cave and Karst Resources (negligible adverse)
Managing recreational uses to reduce adverse effects on soil or water quality could affect the placement of recreation facilities, but should have a negligible and localized adverse effect on recreation resources. Proper mitigation of the adverse effects of recreation projects would provide recreational opportunities while preserving riparian and wetland systems and the waterways they adjoin. Such management would provide quality habitat to support wildlife for recreational use, and the viewsheds that enhance the quality of recreational setting and subsequent experiences. The degree of adverse effects to the recreation program from soil and water management actions would vary by alternative. Cave Management Plans would balance resource protection with recreational use. Some caves could be closed to human presence in consideration of other resource values. The adverse effect on recreation resources from physical resources management common to all alternatives would be negligible. However, the air quality resource will not produce measurable impacts by alternative and will not be discussed further in this section.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal and Fluids, and Salable Minerals (major adverse)
The scale of impacts from mineral resource development is expected to be similar across the various mineral resources. Thus, the section will be discussed as a whole, rather than as separate resources. Minerals leasing operations and development would likely alter the recreational setting of any undeveloped areas. The construction of facilities and ROW for pipelines, transmission lines, communications lines, and oil and gas development generally would adversely affect recreation resources. Land clearing, grading, construction, and drilling activities would create dust and noise, and increase traffic. These activities would have an adverse effect on traditional recreational uses because they would be visibly and audibly apparent during the recreational experience. The significance of any effect on recreationists would depend on proximity to the development and compatibility with the recreation setting for a particular activity. Users would be inconvenienced if such construction impedes access to recreational activities. The visual intrusion of these structures would be site-specific and would not affect the recreational setting outside the viewshed of each facility. Minerals activities, on BLM-administered lands in the planning area would be subject to plans of development and stipulations, which also could alter recreational settings, restrict recreation access to certain areas, and change the availability of recreation resources to the public.

Areas not withdrawn from minerals entry would continue to be susceptible to disturbances from exploration and potential development, which could affect recreational uses in any given area. Continuing to develop solid and fluid minerals resources in areas with legal public access would affect recreation resources through decreased visitor satisfaction with recreational experiences. Management actions that limit development activities (e.g., NSO stipulations and prohibitions on leasing) and minerals withdrawals could benefit recreation by protecting recreation facilities and providing long-term assurance that areas traditionally used for recreational purposes would not be affected by future development activities. Prohibiting surface-disturbing activities related to mineral resources recovery in areas with high recreational value would protect the visitor experience and prevent conflicting uses.

Fire and Fuels Management (negligible beneficial)

Fire promotes vegetation and wildlife diversity, which can enhance opportunities for recreation over the long term. Opportunities for wildlife viewing or hunting could be enhanced by the growth of new vegetation and improved habitat quality. The adverse effects of fire on recreation are generally negligible and short-term, and are directly related to the effect of fires on specific resources used in recreation, such as recreation facilities. The effects on visual resources, wildlife, and vegetation from fire would be immediate and localized for such resources as camping, sightseeing, and hunting.

Biological Resources

Vegetation – Forests and Woodlands, Grassland and Shrubland Communities, and Riparian/Wetland Resources and Fish and Wildlife Resources (negligible adverse)
Measures to promote wildlife and fisheries habitat, including maintenance of sustainable forage levels, habitat improvement projects, mitigation for disruptive activities associated with wildlife habitat management, and restoration of certain species would improve opportunities for wildlife-dependent recreation. Working with stakeholders to provide public access to waters and fisheries and to promote outreach and education would increase opportunities for recreation in the

planning area. Conversely, avoiding riparian habitat would have a negligible adverse effect on access to recreation, especially fishing. Proper planning and mitigation can provide opportunities for quality recreation while minimizing adverse effects on riparian areas.

Similarly, managing recreational uses to reduce adverse effects on vegetation would have a negligible effect on access to recreation. Proper mitigation of the effects of recreation projects would provide opportunities for quality recreation while preserving native vegetation. The presence of healthy vegetation benefits the recreation program because it increases the visual appeal of the setting and benefits wildlife-dependent recreation. The grassland and shrubland resource will not produce measurable impacts by alternative and will not be discussed further in this section.

Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Specific limits on the ability to issue special recreation permits, provide motorized use and access, or allow campsite occupancy in areas with special status species could affect recreation resources. Proposed or permitted uses would be analyzed through a NEPA document and measures implemented if special status species were encountered or known to be affected. If recreation use would affect special status species, the use often can be relocated to areas where a given species is not likely to be encountered. Land tenure will play the greatest role in determining whether recreation uses can be relocated. In the case of special recreation permits, the timing limitations for special status species such as Greater Sage-Grouse do not currently coincide with the highest-use season, autumn big-game hunting season, and any effects should be negligible. The degree of effects on recreation resources from biological resources management would vary by alternative.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible beneficial)
Management of cultural and paleontological resources would provide for the protection of resources of interest to the recreating public, and would provide public education and outreach designed to enhance public appreciation and respect for these resources. Adaptive re-use of historic properties, provided for under Section 110 of the NHPA, would provide opportunities for additional interpretive sites. While the presence of historic properties can affect the placement of recreation facilities or the issuance of special recreation permits, mitigation would be localized and alternative sites for recreation facilities or use would likely be found in the local area.

Visual Resources (minor beneficial)
Scenic values are consistently identified as one of the most important values for visitors to public lands. Measures to protect visual resources would generally have a beneficial effect on recreation resources.

Land Resources

Under all alternatives, surface-disturbing activities related to development or resource extraction generally result in adverse effects 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, and to improve roads.

Forest Products (negligible adverse)
While most forestry actions in the planning area take place in the southern Big Horn Mountains,

an area with high recreational value, the two resource uses have historically coexisted with little effect on one another. If forestry actions exceed historic limits, there could be a adverse effect on the recreation resource due to reduced scenic quality. Current levels of firewood cutting, and other permitted special uses (e.g., Christmas tree cutting) on BLM-administered lands have little effect on recreation and could even be considered recreational activities.

Lands and Realty (minor beneficial)
Considering R&PP applications can benefit the provision of recreational opportunities. Examples of R&PP leases include trail systems and shooting ranges. Additionally, avoiding potential for inadvertent trespass through signage and education will ensure that visitors have a quality and legal recreational experience.

Renewable Energy (negligible adverse)
Wind-energy development would be allowed except in areas made administratively unavailable to renewable energy. Renewable-energy projects would generally produce an adverse impact to traditional recreational opportunities within the viewshed. The scale of impacts would vary by alternative.

Rights-of-Way and Corridors and Travel and Transportation Management (minor beneficial)
Maintaining a transportation system in cooperation with other entities to meet public and resource management needs is essential to providing recreational opportunities. Acquisition of easements and ROW is largely contingent on permission from private landowners. Motorized vehicle use would continue to be the greatest source of conflict among recreation users in the planning area. Limiting OHV use to designated trails in many areas would provide additional areas were recreation users could avoid encounters with OHV. Conversely, there could be areas recreation users have difficulty accessing due to the lack of designated trails. Those who enjoy motorized recreation could perceive limitations on motorized vehicle use in areas where it has been historically supported as an injustice. While route designations could restrict movement in an area, such restrictions would not preclude legal access to contiguous blocks of BLM-administered lands with current public access. These restrictions, coupled with closures, would lead to a more primitive type of recreational experience that certain segments of the population would enjoy. The restrictions also could affect hunter success rates because while OHV use displaces game animals, OHV access also provides the recreation user a larger geographic area in which to pursue game. Overall, these management actions would be minor beneficial.

Lands with Wilderness Characteristics (minor beneficial)
Evaluating areas with potential wilderness characteristics would help in the development of RAMP for those areas and help identify areas that offer opportunities for primitive and unconfined recreation, a minor benefit.

Livestock Management (minor adverse)
Managing livestock grazing would have a minor effect on recreational use of the public lands, sometimes temporarily displacing recreational activities from areas where there is intensive livestock grazing. Backcountry areas that might accommodate activities such as fishing or camping would be similarly affected by intensive livestock grazing, rendering those areas undesirable for periods of time, especially along streams that would normally be attractive to recreationists. These effects are typically short-term, but often cyclic, depending on the grazing management system (i.e., issues return when the grazing rotation places cattle back in those locations). Conversely, the presence of commercial "dude ranch" operations also provides unique recreational opportunities in certain areas that might decrease in availability if livestock

operations were not authorized in the planning area. Closing areas with developed recreation facilities or high recreational potential to livestock grazing would prevent conflicts between users and livestock, and damage to the recreation facilities by trampling, rubbing, etc. Only the developed portions (e.g., picnic areas, campgrounds, potable water sources, trailheads, and parking lots) would be subject to closure.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Designation of ACECs in areas with recreational value could protect the recreation setting and values associated with the relevant and important criteria. The anticipated level of benefit is minor as few ACECs are protected for their associated recreational opportunities.

Scenic and Back Country Byways (minor beneficial)
The designation of scenic or BCBs can identify appropriate areas for visitors to enjoy vehicle touring and sightseeing. Providing additional information along these routes would increase visitor awareness of multiple uses and land stewardship in the area, which often results in increased visitor satisfaction. Byways would not be anticipated to greatly effect recreation use and therefore their level of effect would be minor.

Wild and Scenic Rivers and Wilderness Study Areas (minor beneficial)
Continued protection of the Middle Fork Powder River (eligible and suitable for WSR designation) would provide blue-ribbon fishing opportunities. Middle Fork Canyon also contains unique and abundant cultural resources and cave and karst systems.

Managing WSAs (28,931 acres) would provide unique opportunities for a primitive and unconfined type of recreation. The benefit to the recreation program would be moderate and long-term. The designation and required management of WSAs for protection of wilderness values provides some assurance of locations where primitive and semi-primitive recreational opportunities would remain available (unless Congress releases the WSAs from further consideration as wilderness). All three WSAs in the planning area have limited public access and lack developed trail systems, which limits the amount of recreational use in the core of those areas, and therefore a minor beneficial effect.

Socioeconomic Resources (negligible beneficial)

Identifying and mitigating hazards to public health and safety would improve the recreational experience of the visitor by ensuring a safer environment. Mitigating the adverse effects of coal seam fires would improve the BLM's ability to provide safe recreational opportunities and reduce potentially dangerous incidents. The extent of this management is currently limited to the Welch Ranch Management Area. The Bureau of Labor Statistics predicts a 19% increase in recreation-related jobs between 2010 and 2020 (Bureau of Labor Statistics 2012c). Many recreation-related jobs depend on public lands, including BLM-administered lands. Protecting recreation resources would benefit the future of the recreation and tourism industry. Though socioeconomic resource management may vary by alternative, the effects to the recreation program would not likely vary by alternative and will not be discussed further in this section.

Table 4.69, “Proposed SRMAs by Alternative” (p. 1327) lists the estimated acreages of SRMAs under each alternative.

Table 4.69. Proposed SRMAs by Alternative

	Alternatives (acres)			
SRMA	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
Burnt Hollow	0	17,280	17,280	17,280
Cabin Canyon	0	1,369	0	0
Dry Creek Petrified Tree	0	2,567	2,567	2,567
Hole-in-the-Wall	0	11,952	0	11,952
Middle Fork Powder River	0	10,083	1,294	10,083
Mosier Gulch	0	1,026	868	1,026
Welch Ranch	0	1,748	1,748	1,748
Weston Hills	0	9,504	9,504	9,504
Totals	**0**	**55,529**	30,570	**54,160**

Source: BLM 2012f

SRMA Special Recreation Management Area

Table 4.70, "Proposed ERMAs by Alternative" (p. 1327) lists the estimated acreages of ERMAs under each alternative.

Table 4.70. Proposed ERMAs by Alternative

	Alternatives (acres)			
ERMA	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
Buffalo	782,102	597,812	0	0
Cabin Canyon	0	0	0	1,369
Face of the Bighorns/North Fork	0	0	0	34,477
Gardner Mountain	0	0	0	55,181
Kaycee Stockrest	0	0	0	2,685
Northern Bighorns	0	0	0	2,926
Powder River Basin	0	0	0	224,483
Southern Bighorns	0	128,761	0	25,535
Walk-In Area	0	0	0	3,007
Totals	**0**	**726,573**	**0**	**349,663**

Source: BLM 2012f

ERMA Extensive Recreation Management Area

4.6.6.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. Alternative A effects on the recreation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation (moderate adverse)
Camping is limited to 14 days at any one spot to avoid resource damage and prevent exclusive use of public lands. However, Alternative A lacks clarity on how far visitors must move after the 14-day limit is reached and when they may return to an original campsite. Alternative A would not designate any lands as SRMAs. Designated SRMAs enjoy increased eligibility for construction funding, while ERMAs normally do not. Managing the entire planning

area as an ERMA would place a lower priority on recreation management, management actions would be custodial in nature, and recurring needs would not be as frequently addressed. The absence of designated SRMAs could result in a decreased ability to respond to changing recreation demands for diverse recreation opportunities and prescribed settings within the planning area. Most recreation areas are currently open to minerals development, however, Mosier Gulch has been closed to leasing and an NSO is in effect for lands within 0.5 mile of Dry Creek Petrified Tree. Recreational (target) shooting is generally allowed on BLM-administered lands that have not been administratively closed. Several recreation areas, including Burnt Hollow and Welch Ranch have been closed to target shooting. Thunder Basin National Grassland has closed the USFS administered surface at Weston Hills to target shooting and the BLM issued a supportive joint decision that resulted in a temporary closure of the area in 2008. Additionally, all developed recreation sites, including the developed facilities at Mosier Gulch and Dry Creek Petrified Tree, are closed to target shooting per 43 CFR 8365.2-5(a) to protect public health and safety.

Physical Resources

Soil (minor adverse)
Under Alternative A, prohibiting surface-disturbing activities in areas with severe erosion hazard, on soils with poor reclamation suitability, and on slopes equal to or greater than 25% could affect the development of trails for nonmotorized travel in areas with steep slopes. Several proposed or existing trails in the planning area exceed 25% side slope. However, under this alternative, the authorized officer may waive the prohibition. Prohibiting surface-disturbing activities in areas with sensitive soil resources could affect the provision of motorized recreational opportunities in some places. The effect on the recreation program would be minor, but long-term.

Water Resources (negligible adverse)
Restrictions on surface disturbance along waterways may affect the viability or design of recreation projects in or near river corridors or reservoirs, but may be waived by the authorized officer, and therefore a negligible impact.

Cave and Karst Resources (no effect)
Under Alternative A, no previous decisions have been made related to cave and karst management and Cave Management Plans would not be initiated nor special management prescribed. Thus, there would be little to no effect on recreation from cave and karst resources.

Mineral Resources (minor adverse)

Under Alternative A, continuing to develop solid and fluid minerals resources affects the recreation program through decreased visitor satisfaction with traditional recreational activities. If development in the planning area continues as predicted (see Appendix G (p. 1671)), there would be a minor, long-term adverse effect on the recreation program, as typically less than five percent of surface acres would be impacted by mineral development.

Fire and Fuels Management (negligible beneficial)

Overall, the use of unplanned and prescribed fire under Alternative A would benefit the recreation program by protecting developed recreation sites and minimizing of risk of wildfires. Suppressing wildfires in developed recreation sites would be a priority, and would benefit the recreation

program. The effect is anticipated to be beneficial as fire is typically be a short-term effect and doe not influence long-term recreation use.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Under Alternative A, most forest and woodland projects would be managed on a project specific basis. However, vegetation projects would be designed to protect or improve biodiversity and water quality, which would indirectly benefit recreation resources and therefore a negligible benefit.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Effects from alternatives related to riparian and wetland resources would be the same as water resources. This resource will not be discussed further in this section.

Fish and Wildlife Resources – Fish and Wildlife (minor beneficial)
Under Alternative A, measures to promote wildlife and fisheries habitat, including maintenance of sustainable forage levels, habitat improvement projects, mitigation for disruptive activities associated with wildlife habitat management, and restoration of certain species would improve wildlife-dependent recreational opportunities. Wildlife and fish habitat management actions would continue to provide opportunities for recreational uses, including fishing, hunting, wildlife viewing and photography, and influence the public's preferred camping locations and travel patterns.

Special Status Species – Plants, Fish, and Wildlife (negligible adverse)
Under Alternative A, there are no identified areas with high recreation value that have been limited or restricted from public use due to special status species; therefore, there would be little to no effect on the recreation program under this alternative. Proposed or permitted uses would be analyzed through the NEPA process and mitigation measures implemented if special status species were encountered or were known to be affected. Effects on the recreation program would be limited to recreation areas that overlap areas with special status species timing or surface occupancy stipulations. For areas without public access, the effects would be limited to recreation in conjunction with a special recreation permit. In areas with public access, alternative routes or camping areas would be designated where possible during periods of seasonal restrictions. Areas where recreation would be affected would be small and therefore a negligible effect.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Under Alternative A, recreation sites in areas subject to Cultural Resource Management/Protection Plans could be subject to additional prohibitions related to facility development and visitor use in the area, creating an adverse effect on the recreation resource. Protection of cultural resources also benefits the recreation program by preserving the natural character of the landscape. However, because recreational opportunities may be limited the overall effect is negligible adverse.

Paleontological Resources (no effect)
No management decisions have been issued in the current RMP related to paleontological resources. Projects would be considered on a case by case basis and there would be no measurable effect on the recreation resource.

Visual Resources (minor adverse)
Alternative A categorizes the majority of the planning area as VRM Class IV (559,674 acres), and the minority of the acreage in the more protective VRM Class II (127,594 acres) and Class III (63,717 acres). Alternative A VRM classifications would not adequately address the protection of scenic qualities, which indirectly affects the recreation setting in areas with high recreational value. Several RMAs are currently classified as VRM Class IV (Dry Creek Petrified Tree, Hole-in-the-Wall, Burnt Hollow, Weston Hills, and portions of Mosier Gulch), which allows the greatest amount of change to the landscape. Alternative A management of visual resources would have a minor adverse effect on the recreation program.

Land Resources

Forest Products (minor adverse)
Basing timber harvest on a desired production level could adversely affect recreation resources by producing an unsustainable level of forestry activity. The overall adverse impact on the recreation program would be limited to areas with marketable timber and would be minor. A size limitation on individual clear-cuts would benefit recreation resources by restricting the amount of vegetation removal on a local scale.

Lands and Realty (minor beneficial)
Under Alternative A, priority is given to acquisition of parcels in areas with recreational value such as the southern Big Horn Mountains and easements will be pursued for recreation purposes, a minor benefit to the recreation resource. Negotiating access across non-BLM-administered lands to isolated public land parcels from willing landowners is critical to meeting the goal of providing accessibility across the planning area. Acquisitions and land exchanges would help the BLM provide seamless recreational opportunities and ensure long-term public access to recreation. Increased access could result in a wider diversity of recreational opportunities.

Renewable Energy (negligible adverse)
Renewable energy development projects are considered on a case by case basis. If a renewable energy project were approved, it could affect traditional recreational values within the viewshed of the project. However since recreational opportunities probably would not be reduced the impact would be negligible.

Rights-of-Way and Corridors (minor adverse)
Effects from alternatives related to ROWs and corridors would be the same as soil resources. This resource will not be discussed further in this section.

Travel and Transportation Management (minor beneficial)
Travel and transportation management under Alternative A would designate the most surface area open for motorized vehicle use compared to any of the other alternatives. Motorized travel in other areas would be managed as limited to designated routes. It should be noted that legal public access to approximately half of BLM surface in the planning area is controlled by owners of adjacent private land. Designating such areas as available to public motorized vehicle use would, in many cases, allow only the owners of adjoining private property, and anyone with their permission, to legally travel on many of those routes. In areas previously designated as limited to existing routes (150,070 acres), the process of designating or closing routes would likely prevent the use of motor vehicles on some previously available roads. This would increase opportunities for solitude and quiet recreation in the planning area, but would reduce opportunities for motorized recreation. It also would make game retrieval more difficult by eliminating roads that

might otherwise be legally traveled to recover game. Although motorized hunting access might be reduced, game animals might also return to areas no longer accessible to motorized vehicles.

Seasonal motorized vehicle restrictions (29,011 acres) under this alternative are primarily the result of wildlife management concerns, and would continue to contribute to the viability of these populations, which are important to the recreating public. Less than five percent of the planning area would be seasonally closed to motorized vehicle use. Travel limitations could limit the public's ability to access certain areas of public lands seasonally; however, seasonal closures are designed to protect the wildlife resources and indirectly benefit recreation resources.

Closing or limiting OHV use in certain areas (3,704 acres) would limit the availability of lands for motorized forms of recreation, while maintaining opportunities for traditional forms of recreation. The effect of closures on access in the planning area would be negligible because nonmotorized access would still be provided. Limiting OHV access to designated routes in the planning area could concentrate motorized vehicle use on these routes. However, comprehensive travel management would provide adequate opportunities for motorized recreation, while preserving other resource values. The overall beneficial effect of the travel management alternatives on the diversity of recreation opportunities in the planning area would be minor.

Lands with Wilderness Characteristics (no effect)
Alternative A would not propose special management related to wilderness characteristics. There would be no effect from lands with wilderness characteristics alternatives on the recreation resource under Alternative A.

Livestock Management (moderate beneficial)
Opportunities in developed recreation sites and certain activities (e.g., fishing near riparian areas) sometimes conflict with livestock grazing management. Alternative A would prohibit livestock grazing on less than two percent of BLM surface in the planning area, however, there is significant overlap between the areas currently closed to livestock grazing and areas with high recreation value. At present, the limitations apply to certain areas in the southern Big Horn Mountains (~ 4,000 acres), including Middle Fork Canyon, and several developed recreation sites, including Dry Creek Petrified Tree (22 acres exclosed), Mosier Gulch (~800 acres closed or unsuitable), Outlaw Cave campground (~10 acres), and the parking areas at Burnt Hollow (~5 acres). These limitations benefit the recreation program, but the relative effect on the program is minor as an estimated 4,840 acres within proposed SRMAs is closed, constituting approximately 8.7% of high value recreation resources. Dispersed recreation in Wyoming has historically been compatible with livestock operations except in areas of intensive grazing, developed recreation sites, or in riparian areas with public stream access.

Special Designations

Areas of Critical Environmental Concern, Scenic and Back Country Byways, and Wild and Scenic Rivers (no effect)
Alternative A would not designate or prescribe special management related to ACECs, BCBs, or WSRs and would therefore produce no effect on the recreation resource.

Wilderness Study Areas (minor adverse)
Automatically leasing WSAs if Congress releases them from designation would adversely affect the availability of primitive recreation opportunities, specifically in the Fortification Creek area.

4.6.6.4. Alternative B

Alternative B would emphasize resource conservation. Alternative B effects on the recreation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation (major beneficial)
Alternative B would designate 55,529 in eight SRMAs (7.1% of the planning area). Though the RSCs within SRMAs would be recognized for the unique value and distinctiveness, protection of natural and cultural resources would be emphasized over provision of consumptive recreational opportunities where conflicts arise. Accordingly, the BLM would be able to respond to the need for more intensive management efforts in SRMAs. Recreation management activities under this alternative would include additional emphasis on addressing crowding issues and maintaining the quality of recreational experiences on public lands. Management of the southern Big Horn Mountains, in coordination with adjacent BLM field offices (Casper and Worland), would provide additional opportunities for seamless recreation, including multiple-use trails. However, limiting development of additional recreation facilities to SRMAs and other high-use areas could reduce the opportunity to construct or designate trails in remote areas. Evaluation of fees for access to high-use areas under the Federal Lands Recreation Enhancement Act could provide additional funding for improvements in SRMAs. However, fees can exclude those unable to afford fees and could displace recreationists to non-fee sites.

Alternative B would restrict minerals resource development and other surface-disturbing activities in designated SRMAs unless the disturbance would benefits recreation resources (i.e., a campsite or trail construction) and be compatible with natural and cultural resource protection. Similarly, salable minerals development in SRMAs would be allowed only for the benefit of the recreation program (i.e., procuring gravel for access roads and parking areas) where development resulted in a net benefit to other public land resources. Restrictions on mineral development would benefit the provision of traditional recreational opportunities, particularly nonmotorized activities. However, even motorized recreation would benefit from closures through a reduction of conflicts between recreational traffic and industrial traffic.

Campers would be required to relocate 5 miles away after reaching the 14-day stay limit. Due to land tenure and topography, this would likely preclude visitors from camping within the same SRMA or general area once the stay limit is reached. All SRMAs (7% of the planning area) would be closed to recreational shooting, which would reduce noise, user conflicts between shooters and other recreationists, and would improve safety in areas without proper backdrops. Because the SRMAs and other developed recreational facilities are often the most easily accessible lands within the planning area, there would likely be a substantial reduction in opportunities for target shooting on BLM-administered lands. However, target shooting opportunities are readily available on other public lands in the planning area and at several private shooting ranges.

Designation of SRMAs (55,529 acres) would prioritize recreation resources and natural and cultural resource protection in areas experiencing high recreation use and demand. ERMA designation on the remaining 726,573 acres of BLM administered surface would ensure consideration of recreation resources and values on all BLM administered lands in the planning area. The diversity of recreation opportunities provided by Alternative B would be a major benefit to non-motorized and non-consumptive recreational opportunities. Opportunities for motorized and/or consumptive recreation could be substantially constrained under Alternative B.

Physical Resources

Soil (moderate adverse)
Under Alternative B, prohibiting surface-disturbing activities in areas with a severe erosion hazard, on soils with poor reclamation suitability, and on slopes equal to or greater than 25% could affect the development of trails for nonmotorized travel use in areas with steep slopes. Several proposed or existing trails in the planning area exceed a 25% side slope. Prohibiting surface-disturbing activities in areas with sensitive soil resources could affect the provision of motorized recreational opportunities in some places. The overall effect of these limitations would be moderate.

Water Resources (minor adverse)
Prohibitions on surface disturbance along waterways may affect the viability or design of recreation projects in or near river corridors or reservoirs. The effect on the recreation program would be minor as recreation facilities are typically located to protect water resources while providing for recreational opportunities.

Cave and Karst Resources (negligible beneficial)
Human activity in caves with significant resources, including recreational activity, would be managed under a Cave Management Plan. Such plans may imposed additional restrictions on recreationists, but would also protect the recreation setting by preserving significant resources that draw these recreationists. The effect on the recreation resource would be negligible beneficial.

Mineral Resources (negligible adverse)

Under Alternative B, increasing restrictions on minerals development would reduce adverse effects on recreation settings and available recreation opportunities by limiting the areas available for minerals resource development. SRMAs, ACECs, WSAs and WSR corridors, and LWCs, areas with the highest recreational value in the planning area, would all be closed to mineral development under this alternative. This would reduce the intensity of the adverse effect on the recreation program over the long term, resulting in a negligible adverse effect overall.

Fire and Fuels Management (negligible beneficial)

Under Alternative B, the use of full protection strategies and tactics in the WUI and developed recreation sites could increase the adverse effects on visual resources from fire and fuels management in these areas. Generally, the short-term adverse effects from fire and fuels management lead to long-term beneficial effects on visual resources, vegetation, wildlife, and recreation settings.

Biological Resources

Vegetation – Forests and Woodlands (minor beneficial)
Under Alternative B, management of forest and woodlands would specifically emphasize recreation, which would benefit recreation resources in forest and woodland environments, creating a beneficial effect to the recreation resource. However, allowing insect, disease and wildland fire (see Fire and Fuels Management Section) to run their natural course would reduce scenic values and could disrupt recreational opportunities over the long term. The combination of these actions would produced a minor beneficial effect.

Fish and Wildlife Resources – Fish and Wildlife and Special Status Species – Fish and Plants (minor beneficial)
Fish habitat management under Alternative B would include more emphasis on actions to improve blue-ribbon trout fisheries and fish habitats for special status fish species. Improving fish habitats and fisheries, especially sport fisheries, would expand and diversify fishing opportunities for recreational anglers. Other wildlife management activities under this alternative would provide for enhanced opportunities for wildlife viewing and bird watching by improving habitats for all birds and sensitive wildlife species. While increased restrictions on surface disturbance may affect the ability to construct or maintain recreational facilities, the protection of suitable wildlife habitat would result in a net benefit to the recreational resource to a minor degree.

Special Status Species – Wildlife (moderate adverse)
Under this alternative, additional restrictions would be applied to areas that contain special status species. Effects on the recreation program limited to areas that overlap areas with special status species timing or occupancy restrictions. For areas without public access, the effects would be limited to recreation in conjunction with a commercial special recreation permits. In areas with public access, alternative routes or camping areas could be designated where possible during seasonal restrictions. Wildlife prohibitions could limit recreation facility construction within SRMAs and therefore recreational opportunities to a moderate degree.

Heritage and Visual Resources

Cultural Resources (major adverse)
Prohibiting surface disturbance in areas containing historic properties, or within five miles of the visual horizon, would adversely impact the ability to develop recreational facilities in all SRMAs. There would be a major adverse impact to the recreation program.

Paleontological Resources (negligible adverse)
Under Alternative B, special management for areas with high-quality paleontological specimens would likely cause a negligible adverse effect on facility development for the Dry Creek Petrified Tree SRMA. Casual collection areas would not be identified.

Visual Resources (moderate beneficial)
VRM class designations under this alternative would place emphasis on maintenance of the scenic values by managing 259,594 acres as VRM Class IV, and moving most of the acreage into the more protective VRM Class II (218,178 acres) and VRM Class III (275,315 acres). Management actions, including VRM Class II designation for all SRMAs, to preserve the scenic character in PRB viewsheds would ensure long-term enjoyment for recreationists and residents in the area.

Land Resources

Forest Products (minor beneficial)
Limiting timber harvests to 5 acres per select harvest group and designing timber projects to have meandering boundaries, follow topography, and avoid natural barriers would help mitigate adverse effects on recreation resources.

Lands and Realty (negligible beneficial)
Realty management activities under Alternative B would establish “acquisition criteria” for lands and public access easements that would increase opportunities for recreational use of public lands. The amount of actual change would depend on the availability of “willing parties” during the

planning period. While acquisition of access and easements is provided for under Alternative B, priority would no longer given to areas with high recreational potential. While there is a possibility that all available funding could be used to procure access in other areas, it is not likely that such an action would have a substantial effect on the recreation program. The overall impact to the recreation program from the lands and realty program would be negligible and beneficial.

Renewable Energy (major beneficial)
Renewable energy would be excluded from SRMAs under Alternative B, a major beneficial impact on the recreation resource.

Travel and Transportation Management (minor beneficial)
Travel management under Alternative B would not designate any BLM-administered lands as open to motorized travel and would close a substantial portion of the planning area (312,561 acres). With almost half the planning area closed to motorized travel (with the exception of public roads), motorized recreational opportunities would be severely limited. Alternative B would limit motorized travel to designated routes on 451,077 acres. Approximately 18,464 acres of the planning area would be seasonally closed to motorized vehicle use. The adverse effect of the travel management alternatives on the diversity of recreation opportunities in the planning area would be moderate.

The 1985 RMP does not address issues related to over-snow travel. While most of the planning area currently receives very little over-snow vehicle use due to insufficient snow cover, the southern Big Horn Mountains (predominantly on USFS-administered lands) attract snowmobilers during winter. While several areas of BLM-administered lands in the planning area might be appropriate for over-snow vehicle use (consistent with travel management designations), other parcels have resource values that would inconsistent with such use. Officially closing those areas to over-snow vehicle use would guarantee future opportunities for quiet winter recreation use, such as cross-country skiing, snowshoeing, winter camping, and wildlife-viewing, provided compliance and enforcement of the closure was effective. Because nonmotorized recreation is often displaced by the presence of motorized recreation, where the inverse is generally not true, maintaining suitable areas with official closures to motorized recreation would ensure the long-term protection of the diversity of recreation opportunities in the planning area. These management actions combine to create an overall minor beneficial effect for the recreation resource.

Lands with Wilderness Characteristics (minor beneficial)
Considering and protecting areas with wilderness characteristics would ensure the continued availability of primitive recreational opportunities. A 12,237 acre area would be managed for wilderness characteristics. This represents 1.5% of BLM surface within the planning area and therefore a minor beneficial effect.

Livestock Management (moderate beneficial)
Limiting or prohibiting livestock grazing where it has been determined to be incompatible with other resource values, particularly in the riparian area of Welch Ranch SRMA, would beneficially affect the recreation program. Areas with developed recreation facilities and trails could selectively reduce opportunities for grazing to reduce conflicts between users and livestock. Similarly, prioritizing any permanent increases in forage allocations for wildlife habitat and watershed protection, rather than livestock grazing, would indirectly benefit wildlife-dependent recreational opportunities. Opportunities in developed recreation sites and certain activities (e.g., fishing near riparian areas) sometimes conflict with livestock grazing management. Public

comments have indicated a preference for reduction of grazing opportunities in the riparian area at Welch Ranch SRMA. Alternative B would prohibit livestock grazing on 372 acres of the Welch Ranch SRMA, in addition to the developed sites already closed in Alternative A. The total acreage within SRMAs excluded from livestock management would total approximately 5,210 (9.3% of SRMAs). Excluding livestock from the riparian area at Welch would be a major benefit at the site-specific level, but the overall beneficial effect on the recreation program across the planning area would remain within the moderately beneficial threshold.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Under Alternative B, the BLM would designate eight ACECs (536,304 acres). Resource values would be afforded additional protections, and wildlife-dependent recreational opportunities and the scenic values that comprise the recreation setting would likely increase. Four of the ACECs would also be SRMAs (Burnt Hollow, Dry Creek Petrified Tree, Hole-in-the-Wall, and Welch Ranch). Measures to protect the relevance and importance of resources in these areas also would benefit the recreation settings in these areas. In designated ACECs, future area-specific plans could further limit OHV use, including closures, limiting to OHV use to designated trails, and seasonal restrictions on OHV use. The uncertainty of these future plans makes the effects on recreation largely unknown and therefore a minor benefit.

Scenic and Back Country Byways (negligible beneficial)
Considering routes for Scenic and BCB designation could promote opportunities for vehicle touring in the planning area. Use would not be anticipated to increase substantially and therefore the benefit would be negligible.

Wild and Scenic Rivers (minor beneficial)
If Congress releases the Middle Fork Powder River from consideration for designation as a WSR, Alternative B would retain the free-flowing conditions and outstanding resource values. Because the Middle Fork Powder River is a destination for anglers in the region, protection of WSR values would be beneficial to the recreation program.

Wilderness Study Areas (no effect)
Should Congress act to designate or release WSAs, a plan amendment would take place. There would be no effect on the recreation resource for the life of this plan. Prohibiting mechanized equipment in WSAs would displace any potential opportunities (which are limited at best) within these areas, but would improve nonmechanized recreational opportunities in those areas. Overall, the decision to limit mechanized use in WSAs would have little to no effect on the ability to provide diverse recreational opportunities across the planning area.

4.6.6.5. Alternative C

Alternative C would emphasize resource use. Alternative C effects on the recreation program would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation (major adverse)
Alternative C would designate six SRMAs (30,570 acres). The BLM would be able to respond to the need for more intensive management efforts in these areas. Alternative C would not restrict mineral resources development and other surface-disturbing activities in

designated SRMAs, which would likely result in conflicts between industrial uses and recreational opportunities. It is feasible that extractive actions would be proposed within the boundaries of SRMAs, which would have an adverse effect on the recreation settings in those areas.

Allowing recreation facilities in areas where they are supported by recreational use and are consistent with other resource values would expand the BLM ability to provide recreational opportunities outside SRMAs. Failure to evaluate areas under the Federal Lands Recreation Enhancement Act could restrict the ability to provide additional funding for improvements in SRMAs. Campers would be required to relocate 1-mile away after reaching the 14-day stay limit. Due to land tenure and topography, this could preclude some visitors from camping within the same SRMA or general area once the stay limit is reached but would generally allow them to continue camping in the planning area. The ability to camp in the same general area would benefit recreationists, particularly during hunting season. Under Alternative C, the entire planning area would be open to target shooting. This would likely increase user conflicts between shooters and other recreationists, particularly in areas with easy access, and result in a moderate adverse affect to the recreation program.

Alternative C would not designate any ERMAs. Approximately 751,532 acres of BLM administered lands would not be designated within an RMA. Legal public access is unavailable to approximately 296,320 acres in the field office and the effects of recreation management would likely be negligible on lands outside of RMAs. Recreational use may still occur on lands outside of RMAs that are open to public use, but the BLM would not prioritize recreation resources in these areas and recreation may or may not be considered an affected resource in subsequent site-specific analyses. For the approximately 455,212 acres outside of RMAs that do have public access, failure to designate recreation management objective would reduce the ability to protect RSCs and promote R&VS, creating a major adverse effect on recreation resources.

Physical Resources

Soil, Water Resources, and Cave and Karst Resources (negligible beneficial)
Under Alternative C, surface-disturbing activities in areas with severe erosion hazard, on soils with poor reclamation suitability, steep slopes or water features would be allowed. This could benefit the development of nonmotorized vehicle trails and provision of visitor services in certain areas. However, this alternative also could adverse affect the recreation program by allowing projects for resource development in areas with recreational values that would not be allowed under other alternatives. The effect on the recreation program would be negligible, but long-term. Human activity in caves with significant resources, including recreational activity, would be managed under a Cave Management Plan. Such plans may imposed additional restrictions on recreationists, but would also protect the recreation setting by preserving significant resources that draw these recreationists. The effect on the recreation resource would be negligible.

Mineral Resources (moderate adverse)

Under Alternative C, continuing to develop solid and fluid minerals resources would affect recreation resources by decreasing visitor satisfaction with traditional recreation activities. SRMAs, ACECs, and LWC would not be closed to mineral resource development. Alternative C would expanding the areas available for mineral resource development would increase adverse effects on recreation settings and available recreation opportunities. If minerals development

in the planning continues as predicted (see Appendix G (p. 1671)), the adverse effect on the recreation program would be moderate and long-term.

Fire and Fuels Management (negligible beneficial)

Under Alternative C, the use of full protection strategies could increase adverse effects on visual resources in affected areas. Generally, the short-term adverse effects of fire and fuels management actions lead to long-term beneficial effects for visual, vegetation, and wildlife resources and recreation settings.

Biological Resources

Vegetation – Forests and Woodlands (minor adverse)
Under Alternative C, management of forest and woodlands would emphasize the forest resource. Utilizing intensive management tactics such as clear cuts would reduce scenic values and could disrupt recreational opportunities over the long term. The adverse impact to the recreation program would be minor.

Fish and Wildlife Resources – Fish and Wildlife (negligible beneficial)
Alternative C measures to promote wildlife habitat would be less proactive than under Alternative B. While Alternative C special status species management would be is similar to management under Alternative A, but often to a lesser extent given the flexible language. The limited fish and wildlife protections result in a negligible beneficial effect for recreation opportunities.

Special Status Species – Plants, Fish, and Wildlife (negligible beneficial)
Alternative C would incorporate restrictions in areas with special status species. Effects on the recreation program would be limited to areas that overlap with areas with special status species timing or occupancy limitations. In addition, this alternative would apply a timing restriction to Greater Sage-Grouse winter concentration areas, which might coincide with big-game hunting seasons in some areas. These restrictions would prohibit surface disturbing activities and thus prevent displacement not only of special status species but of big-game as well, a negligible benefit.

Heritage and Visual Resources

Cultural Resources (no effect)
Alternative C does not propose any special provisions or restrictions on surface disturbance related to cultural resources. There would be no effect on recreation resources related to the cultural resource.

Paleontological Resources (negligible adverse)
Under Alternative C, designating casual collection areas for common invertebrate, plant, and petrified wood fossil collection could help meet public demand for such activities. However, identifying collection areas could concentrate use and reduce the presence of paleontological specimens, which are often an attraction for non-consumptive recreationists. The adverse effect would likely be negligible.

Visual Resources (minor adverse)
VRM class designations under this alternative would place limited emphasis on maintenance of scenic values by managing 167,334 acres as Class III, and assigning most of the acreage in the

planning area the less protective Class IV (584,500 acres). SRMAs would be managed as VRM Class III. The impact to the recreation resource through the reduction of scenic values would be minor and adverse.

Land Resources

Forest Products (minor adverse)
Under Alternative C, allowing timber harvests without limits on the sizes or shapes of harvest areas could adversely affect recreation resources. The overall adverse impact on the recreation program would be limited to areas with marketable timber and therefore would be minor.

Lands and Realty (major adverse)
Under Alternative C, the BLM would not consider the acquisition of lands or easements from willing landowners, which would prevent the consolidation of land where it would be beneficial for public access. This would have a major adverse effect on the recreation program.

Renewable Energy (moderate adverse)
Renewable energy would be allowed within the planning area where consistent with other resource values. Recreation resources would be considered in renewable energy project development, but protection of recreation values could not be guaranteed. The overall effect to the recreation program would be adverse and moderate.

Travel and Transportation Management (minor beneficial)
Travel management under Alternative C would designate 24,103 acres as open to motorized vehicle use. Motorized travel in other areas would be managed as limited to designated routes (718,704 acres), except where areas are closed to motorized travel. Closing certain areas to OHV use (28,931 acres) would limit the availability of lands for motorized forms of recreation, while maintaining opportunities for traditional forms of recreation. The effect of closures on access in the planning area would be negligible because nonmotorized access would still be provided. Approximately 6,839 acres of the planning area would be seasonally closed to motorized vehicle use. The beneficial effect of the travel management alternatives on the diversity of recreation opportunities in the planning area would be minor.

Few areas in the planning area have enough snowfall to make over-snow travel practical. However, there are parcels, particularly in the southern Big Horn Mountains, that could be appropriate for over-snow vehicle use (consistent with travel management designations). Opening such areas to over-snow vehicle use could offer a unique opportunity for over-snow travel on BLM-administered lands. This would benefit motorized recreationists, but would be detrimental to human-powered winter recreational activities.

Lands With Wilderness Characteristics (no effect)
Alternative C would not propose special management related to wilderness characteristics. There would be no effect from wilderness characteristics alternatives on the recreation resource under Alternative C.

Livestock Management (minor beneficial)
Effects of livestock management on recreation under Alternative C would be largely the same as Alternative A. Authorizing permanent increases in forage allocations to livestock grazing, rather than to wildlife habitat and watershed protection, would negate any potentially beneficial effects on wildlife-dependent recreational opportunities. The overall adverse impact to the recreation resource for forage allocation would be negligible to minor. Coupled with the overall objectives

for accommodating uses of public lands other than recreation, the overall benefit of livestock management alternatives in Alternative C would be minor beneficial.

Special Designations

Areas of Critical Environmental Concern, Scenic and Back Country Byways, and Wild and Scenic Rivers (no effect)
Under Alternative C, the BLM would not designate any ACECs. In general, resource values would be afforded less protection and wildlife-dependent recreational opportunities and the scenic values that comprise recreation settings could decrease without the protective measures offered by these designations. Under this alternative, the BLM would not consider designating Scenic or BCBs and would not expend additional effort on promoting vehicle touring on potential routes. Alternative C would not prescribe special management related to WSR and would therefore produce no effect on the recreation resource.

Wilderness Study Areas (no effect)
Should Congress act to designate or release WSAs, a plan amendment would take place. There would be no effect on the recreation resource for the life of this plan. Mechanized equipment would not be prohibited in WSAs, which would improved any potential opportunities (which are limited at best) within these areas, but could displace nonmechanized recreational opportunities in those areas. Overall, the decision to limit mechanized use in WSAs would have little to no effect on the ability to provide diverse recreational opportunities across the planning area.

4.6.6.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative. Alternative D effects on the recreation program would be similar to effects described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Recreation (major beneficial)
Alternative D would designate seven SRMAs comprising 54,160 acres (6.9% of the planning area). Accordingly, the BLM would be able to respond to the need for more intensive management efforts in SRMAs to protect the RSCs and recreation management objectives. Recreation management activities under this alternative would include additional emphasis on addressing crowding issues and maintaining the quality of recreational experiences on public lands. Management of the southern Big Horn Mountains, in coordination with adjacent BLM field offices (Casper and Worland), would provide additional opportunities for seamless recreation, including multiple-use trails. However, limiting development of additional recreation facilities to SRMAs and other high-use areas could reduce the opportunity to construct or designate trails in remote areas. Evaluation of fees for access to high-use areas under the Federal Lands Recreation Enhancement Act could provide additional funding for improvements in SRMAs. However, fees can exclude persons unable to afford such fees and could displace recreationists to non-fee sites.

Alternative D would apply restrictions on mineral resources development and other surface-disturbing activities in six of the SRMAs unless the disturbance would benefit recreation resources (i.e., campsite or trail construction). In the Weston Hills SRMA, limited minerals development activity would compatible with the recreation setting. Salable minerals development

in all SRMAs would be allowed only for the benefit of the recreation program (i.e., procuring gravel for access roads and parking areas). Restrictions on mineral development would benefit the provision of traditional recreational opportunities, particularly nonmotorized activities. However, even motorized recreation would benefit from closures through a reduction of conflicts between recreational traffic and industrial traffic.

Campers would be required to relocate 1-mile away after reaching the 14-day stay limit. Due to land tenure and topography, this could preclude some visitors from camping within the same SRMA or general area once the stay limit is reached, but would generally allow them to continue camping in the planning area. The ability to camp in the same general area would benefit recreationists, particularly during hunting season. Welch Ranch and Burnt Hollow SRMAs (19,028 acres, 2.4% of the planning area surface) would be permanently closed to recreational shooting, which would reduce noise, user conflicts between shooters and other recreationists, and would improve safety in areas without proper backdrops. Closures in both areas are supported by the public. A recreational shooting closure for Burnt Hollow was recommended by an interagency and public Coordinated Resource Management team; a closure was analyzed and selected as the preferred alternative in the 2005 Burnt Hollow Management Plan. A closure was analyzed and selected as the preferred alternative in the 2005 Welch Ranch Management Plan as well. Target shooting opportunities are readily available on other public lands in the planning area and at several private shooting ranges. In five other SRMAs and three ERMAs, target shooting would be addressed through education, encouragement of minimum impact skills (i.e. Respected Access campaign) and enforcement of violations of CFRs during the implementation of this RMP. If over the mid term conditions related to target shooting do not improve, such as the shooting and explosives vandalism at Weston Hills, temporary or permanent closures may be necessary. The USFS-managed portions of Weston Hills are permanently closed to recreational shooting. Any subsequent permanent closures would require a land use plan amendment.

Alternative D would designate 349,663 acres in eight distinct ERMAs. In ERMAs, recreation would be recognized as an important resource value and would likely be considered in impact analyses in subsequent site-specific analyses.

Approximately 378,275 acres of BLM administered lands would not be designated within an RMA. Legal public access is unavailable to approximately 296,320 acres in the field office, and these lands comprise the majority of the lands outside of RMAs. For the approximately 82,000 acres outside of RMAs that do have public access, the majority of the parcels are too small to manage for high quality recreational opportunities or located far enough away (3 or more miles) from public roads that reasonable public access is not available. Recreational use may still occur on lands outside of RMAs that are open to public use, but the BLM would not prioritize recreation resources in these areas and recreation may or may not be considered an affected resource in subsequent site-specific analyses. The overall effect of Alternative D recreation management alternatives will result in a major benefit to recreation resources. Appendix T (p. 2135) includes objectives for each SRMA and ERMA.

Physical Resources

Soil and Water Resources (negligible adverse)
Alternative D would slightly increase constraints on the construction or placement of recreational facilities and trails compared to Alternative A. This alternative would allowing surface-disturbing activities in areas of severe erosion hazard, on soils with poor reclamation suitability, on slopes equal to or greater than 25% if they adequately conserve the soil and water resource. This

would allow flexibility in providing nonmotorized and motorized access in certain locations. While measures to protect physical resources would still be in effect, the adverse effect of this management on the recreation program would be negligible and long-term.

Cave and Karst Resources (negligible beneficial)
Human activity in caves with significant resources, including recreational activity, would be managed under a Cave Management Plan. Such plans may impose additional restrictions on recreationists, but would also protect the recreation setting by preserving significant caves that draw these recreationists. The effect on the recreation resource would be negligible.

Mineral Resources (minor adverse)

Under Alternative D, continuing to develop solid and fluid minerals resources would affect recreation resources by decreasing visitor satisfaction with traditional recreation activities. However, Alternative D would increase restrictions on minerals development, which would reduce adverse effects to recreation settings and available recreation opportunities by limiting the areas available for mineral resources development Most SRMAs, ACECs and LWC would be closed to mineral development under this alternative. This would reduce the intensity of the adverse effect on the recreation program, resulting in a minor adverse effect overall.

Fire and Fuels Management (negligible beneficial)

Alternative D effects from fire and fuels management will be generally the same as effects under Alternative B. Use of full protection strategies and tactics in the WUI and developed recreation sites could increase adverse effects on visual resources in these areas. Generally, the short-term adverse effects from fire and fuels management actions tend to have long-term negligible beneficial effects on visual, vegetation, and wildlife resources and recreation settings.

Biological Resources

Vegetation – Forests and Woodlands (negligible adverse)
Under Alternative D, management of forest and woodlands would emphasize multiple resource values, which would include recreation. Utilizing intensive management tactics (which may include clear cuts), which would reduce scenic values and could disrupt recreational opportunities over the long term. The adverse impact to the recreation program would be negligible.

Fish and Wildlife Resources – Fish and Wildlife (minor beneficial)
Fish habitat management under Alternative D would place more emphasis on actions to improve blue-ribbon trout fisheries and fish habitats for special status species. Improvements in fish habitats and fisheries, especially sport fisheries, would enhance recreational fishing opportunities through expanding and diversifying fishing opportunities for recreational anglers. Other wildlife management activities under this alternative would provide for enhanced opportunities for wildlife viewing and bird watching by improving habitats for all birds and sensitive wildlife species, a minor beneficial effect.

Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Under this alternative, restrictions would be applied in areas with special status species. Effects on the recreation program would be limited to areas recreation potential would overlap areas with special status species timing or occupancy limitations. In addition, this alternative would impose a seasonal disturbance prohibition for Greater Sage-Grouse winter concentration areas. For areas

without public access, the effects would be limited to recreation in conjunction with a commercial special recreation permit. In areas with public access, alternative routes or camping areas could be designated where possible during seasonal restrictions. If the timing limitation reduced opportunities for big-game hunting, which is one of the predominant recreational activities in the planning area, that could not be mitigated through alternative means of access, the effect on the recreation program would be minor.

Heritage and Visual Resources

Cultural Resources (minor adverse)
Prohibiting surface disturbance in certain areas containing historic properties, specifically rock art shelters/sites or Native American burial sites could adversely impact the ability to develop recreational facilities in affected areas. Some SRMAs, specifically in the southern Big Horn Mountains, may be slightly affected, but the overall adverse impact to the recreation program would be minor.

Paleontological Resources (negligible adverse)
Under Alternative D, special management for areas with high-quality paleontological specimens would likely cause a negligible adverse effect on facility development for the Dry Creek Petrified Tree SRMA. Casual collection areas would not be identified.

Visual Resources (moderate beneficial)
VRM class designations under this alternative would place emphasis on maintenance of scenic values by managing 260,265 acres in VRM Class IV, and moving most of the acreage into the more protective VRM Class III (379,385 acres) and Class II (112,350 acres). Management actions, including VRM Class II designation for all SRMAs, to preserve the scenic character of these areas would ensure moderate beneficial long-term enjoyment for recreational users and local residents.

Land Resources

Forest Products (negligible adverse)
Forest products sales would remain within ecologically sustainable limits while maximizing economic return and projects would consider other resource values, including recreation. The harvest area size, which may include clear-cut areas, would not be limited, but the design would incorporate recreation resource values. The overall impact to the recreation resource from forest products is expected to be adverse, but negligible.

Lands and Realty (negligible beneficial)
Realty management activities under this alternative would establish acquisition criteria for lands and public access easements that would increase opportunities for recreational use of public lands. The degree of actual change would depend on the availability of willing parties during the planning period. While Alternative B provides for acquisition of access and easements, Alternative D would not give priority to areas with high recreational potential. While there is a possibility that all available funding could be used to procure access in other areas, it is not likely that such an action would have any substantial effect on the recreation program.

Renewable Energy (major beneficial)
Renewable energy would be excluded from the southern Big Horn Mountains and excluded or avoided in SRMAs under Alternative D, a major beneficial impact on the recreation resource.

Travel and Transportation Management (moderate beneficial)
Travel management under Alternative D would not designate any BLM-administered lands as open to motorized travel and would close 31,536 acres (4% of the planning area). The combined effect on motorized recreation opportunities would be minor (620,252 acres would be limited to designated routes). Big-game crucial seasonal ranges would be seasonally closed to motorized vehicle use. Effects from over-snow travel under Alternative D would be the same as effects under Alternative B. The overall beneficial effect of travel management alternatives on the diversity of recreational opportunities in the planning area would be moderate.

Lands with Wilderness Characteristics (negligible beneficial)
Under Alternative D, 6,864 acres would be managed for wilderness characteristics and would ensure the continued availability of primitive recreational opportunities. The overall impact to the recreation program would be negligible, 0.87% of the BLM surface.

Livestock Management (moderate beneficial)
Allowing livestock grazing except where it has been determined to be incompatible with other resource values would not be likely to have additional beneficial effects on the recreation program when compared with Alternative A. Areas with developed recreational facilities and trails could still selectively reduce opportunities for grazing to reduce conflicts between users and livestock. Allowing livestock grazing within the riparian area of Welch Ranch SRMA (372 acres), would require intense coordination between the recreation program and livestock management to minimize user conflicts within the area. The total acreage within SRMAs excluded from livestock management would be approximately 4,840 acres (8.9% of SRMAs under Alternative D). The overall beneficial effect on the recreation program across the planning area would remain within the moderately beneficial threshold.

Special Designations

Areas of Critical Environmental Concern (minor beneficial)
Alternative D would designate three ACECs (35,451 acres). Resource values would be afforded additional protections, and wildlife-dependent recreational opportunities and the scenic values that comprise the recreation setting would likely increase. Two of the proposed ACECs also would be SRMAs (Dry Creek Petrified Tree and Welch Ranch). Measures to protect the relevance and importance of resources in these areas also would benefit recreation settings in these areas. In designated ACECs, future area-specific plans could further limit OHV use, including closures to OHV use, limiting OHV use to designated trails, and seasonal restrictions on OHV use. Areas that could be Limited or Closed to OHV use would enhance recreational experiences for those seeking a primitive nonmotorized experience. The effect of these ACECs on recreation would be minor beneficial.

Scenic or Back Country Byways (negligible beneficial)
Considering routes for scenic or BCB designation would promote opportunities for vehicle touring in the planning area. Use is not anticipated to increase substantially, therefore a negligible benefit.

Wild and Scenic Rivers (minor beneficial)
If Congress releases the Middle Fork Powder River from consideration for designation as a WSR, Alternative D would retain the free-flowing conditions and outstanding resource values. Because the Middle Fork Powder River is a destination for anglers in the region, protection of WSR values would be beneficial to the recreation program.

Wilderness Study Areas (no effect)
Should Congress act to designate or release WSAs, a plan amendment would take place. There would be no effect on the recreation resource for the life of this plan. Prohibiting mechanized equipment in WSAs would displace any potential opportunities (which are limited at best) within these areas, but would improve nonmechanized recreational opportunities in those areas. Overall, the decision to limit mechanized use in WSAs would have little to no effect on the ability to provide diverse recreational opportunities across the planning area.

4.6.6.7. Cumulative Impacts

Past Actions
The BLM has developed campgrounds and other recreation facilities in several locations throughout the planning area. OHV registrations have increased substantially in the planning area over the last 10 years, in some cases resulting in a proliferation of routes, particularly during fall and winter when hunters pursue big game.

Present Actions
Recreation opportunities in the planning area are provided on BLM-administered lands and in the Bighorn National Forest, Thunder Basin National Grassland, three game ranges managed by the WGFD, and lands managed by the State of Wyoming. Recreation activities include developed recreational sites for hunting, fishing, camping, picnicking, and other activities; OHV use areas; and primitive settings for backpacking and wildlife viewing. There is a variety of opportunities for both developed and dispersed recreation. Hunting licenses are managed by the WGFD; data available between 1990 and 2009 show an increase in hunting as a recreational use.

Walk-in areas are private lands for which the WGFD has leased rights for public hunting access. Walk-in areas provide access to public lands that otherwise have no legal public access. This reduces hunter concentrations on contiguous federal lands, which are preferred by many hunters because landowner permission is no longer a requirement. Hunters displaced by oil and gas development could increase the use of walk-in areas that have not experienced as much development. The WGFD has several projects underway that would improve wildlife habitat. These include vegetative treatments, livestock grazing management, and native fish restoration. All of these projects, when combined with similar BLM actions on federal lands, would maintain or improve the quality of habitat and visual resources, and therefore recreation settings.

Reasonably Foreseeable Future Actions
Increased tourism and population growth in the planning area and the surrounding region could lead to increased demand for recreational opportunities. There could be effects if the prescribed recreation setting is degraded or the visitor experience diminished because of greater use. Increased demand for a variety of recreation uses also would increase the possibility of user conflicts. Actions on lands managed by other government agencies that alter travel patterns, runoff, visitation, or environmental conditions could affect the recreation settings on adjacent BLM-administered lands. Potential effects on recreation would result primarily from surface disturbance, energy development, and other industrial activities on federal and non-federal lands. Such activities would reduce the quality of most recreational experiences because of increased roads, night lighting, industrial traffic, noise, and the degradation of visual resources associated with development.

Current oil and gas development projects in the PRB have had substantial effects on recreational resources and settings. Large portions of the PRB are dominated by roads, well pads, tanks,

and drill rigs that impact the natural character of the landscape, resulting in displacement of recreationists to other areas. These development areas are no longer desirable for dispersed primitive to semi-primitive recreational activities such as hiking, camping, backpacking, wildlife viewing, or hunting because of the long-term industrial setting. This is a long-term elimination of recreational use in these areas, and therefore a major effect on recreation resources. Wind-energy facilities could affect recreational settings because of the visibility of the turbines, the presence of roads, road closures, safety restrictions, and noise. Large-scale wind-energy developments would greatly detract from the typical middle- to front-country Recreation Opportunity Spectrum settings by creating obvious and dominating visual intrusions on the horizon that would displace some recreationists from the area. Forest product harvests on private or state lands are expected in the southern Big Horn Mountains and could affect recreation resources and visitor experiences with erosion, new roads, ROW, sedimentation, habitat fragmentation, noise, traffic, and dust.

4.6.6.8. Conclusion

Selection of Alternative D will have the most overall beneficial impact to recreation resources by balancing resource protection with opportunities for diverse recreational experiences. Alternative B results in similar effects to recreation resources, but increased restrictions for natural resource protection and travel management result in difficulty in providing diverse recreational opportunities. Alternative A does not designate SRMAs, resulting in one of the greatest restrictions to recreation management compared with other alternatives. Alternative C includes the least restrictions on development, which might facilitate recreation site development, but also includes the least protection for natural resources and viewsheds. Table 4.71, "Summary of Impacts to Recreation" (p. 1346) summarizes effects on the recreation program by alternative.

Table 4.71. Summary of Impacts to Recreation

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Minor adverse	Moderate adverse	Negligible beneficial	Negligible adverse
Water Resources	Negligible adverse	Minor adverse	Negligible beneficial	Negligible adverse
Cave and Karst Resources	No effect	Negligible beneficial	Negligible beneficial	Negligible beneficial
Mineral Resources				
Locatable Minerals	Minor adverse	Negligible adverse	Moderate adverse	Minor adverse
Leasable Minerals – Coal	Minor adverse	Negligible adverse	Moderate adverse	Minor adverse
Leasable Minerals – Fluids	Minor adverse	Negligible adverse	Moderate adverse	Minor adverse
Salable Minerals	Minor adverse	Negligible adverse	Moderate adverse	Minor adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Planed Fire (Prescribed Fire)	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Negligible beneficial	Minor beneficial	Minor adverse	Negligible adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	Negligible adverse	Minor adverse	Negligible beneficial	Negligible adverse
Fish and Wildlife Resources – Fish	Minor beneficial	Minor beneficial	Negligible beneficial	Minor beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Minor beneficial	Negligible beneficial	Minor beneficial
Special Status Species – Plants	Negligible adverse	Minor beneficial	Negligible beneficial	Minor adverse
Special Status Species – Fish	Negligible adverse	Minor beneficial	Negligible beneficial	Minor adverse
Special Status Species – Wildlife	Negligible adverse	Moderate adverse	Negligible beneficial	Minor adverse
Heritage and Visual Resources				
Cultural Resources	Negligible adverse	Major adverse	No effect	Minor adverse
Paleontological Resources	No effect	Negligible adverse	Negligible adverse	Negligible adverse
Visual Resources	Minor adverse	Moderate beneficial	Minor adverse	Moderate beneficial
Land Resources				
Forest Products	Minor adverse	Minor beneficial	Minor adverse	Negligible adverse
Lands and Realty	Minor beneficial	Negligible beneficial	Major adverse	Negligible beneficial
Renewable Energy	Negligible adverse	Major beneficial	Moderate adverse	Major beneficial
Rights-of-Way and Corridors	Minor adverse	Moderate adverse	Negligible beneficial	Negligible adverse
Travel and Transportation Management	Minor beneficial	Minor beneficial	Minor beneficial	Moderate beneficial
Recreation	Moderate adverse	Major beneficial	Major adverse	Major beneficial
Lands with Wilderness Characteristics	No effect	Minor beneficial	No effect	Negligible beneficial
Livestock Grazing Management	Moderate beneficial	Moderate beneficial	Minor beneficial	Moderate beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Minor beneficial	No effect	Minor beneficial
Scenic or Back Country Byways	No effect	Negligible beneficial	No effect	Negligible beneficial
Wild and Scenic Rivers	No effect	Minor beneficial	No effect	Minor beneficial
Wilderness Study Areas	Minor adverse	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.7. Lands with Wilderness Characteristics

Because the presence of wilderness characteristics is defined by a lack of indicators of human presence, any surface-disturbing activities or placement of aboveground structures can adversely affect the lands with wilderness characteristics resource. Wilderness characteristics, including naturalness, solitude, and primitive and unconfined recreation are expected to remain in demand from local residents and visitors who want to experience the primitive nature of portions of the southern Big Horn Mountains and the PRB. Businesses that depend on natural landscapes (e.g., ecotourism, guided hunting, and fishing) will benefit from the protection of areas that possesses wilderness characteristics. Recreationists who seek back country experiences will prefer lands with wilderness characteristics. Following the wilderness characteristics inventory for the BFO, the one unit was determined to comprise the lands with wilderness characteristics resource.

4.6.7.1. Methods and Assumptions

To allow for a consistent analysis, the full wilderness characteristics unit proposed under Alternative B (12,237 acres) is used as the area of analysis for all alternatives. The BLM analyzed impacts to wilderness characteristics on the management actions listed in Chapter 2. For example, the BLM would not manage any lands for wilderness characteristics under Alternative C. However, to ensure the analysis is comparable across alternatives, Alternative C analyzes effects to wilderness characteristics for the same geographic area as the other alternatives.

Analysis assumptions may include, but are not limited to:

- Parcels that are determined to lack wilderness characteristics under Washington Office Instruction Memorandum 2011–154 (BLM 2011e) will not be considered as "lands with wilderness characteristics" (unless new information is presented). Lands that do not contain wilderness characteristics are not subject to the alternatives related to the *Lands with Wilderness Characteristics* resource.
- Lands with wilderness characteristics in the planning area that are outside WSAs are not subject to BLM Manual 6330 – Management of Wilderness Study Areas (BLM 2012c) or other policies or guidance applicable to WSAs or Wilderness areas.
- The 12,237 acres unit containing wilderness characteristics is subject to the range of alternatives described in Chapter 2 - Resource Management Alternatives for Lands with Wilderness Characteristics.

Significance Criteria

An adverse effect on wilderness characteristics as a result of project actions would be considered potentially significant if:

- An action would violate objectives associated with wilderness characteristics resource management and its magnitude would be such that it could not be mitigated.
- A parcel with wilderness characteristics would be affected to the point that the wilderness characteristics would be removed.

4.6.7.2. Impacts Common to All Alternatives

Lands with Wilderness Characteristics (no effect)
The only management action common to all alternatives is to inventory acquired parcels, a

component of the BLM policy to maintain the wilderness characteristics inventory. However, the inventory requirement in itself would not affect management of lands with wilderness characteristics.

Physical Resources (negligible beneficial)

Generally, management actions that protect physical resources without creating a need for surface disturbance (related to monitoring or reclamation) would have a beneficial effect on the wilderness characteristics resource.

Mineral Resources (major adverse)

Construction and operation of mines or oil and gas wells and associated support facilities, including roads, surface and buried pipelines, powerlines, and compressor stations would disturb soil and vegetation, and would introduce structures that would degrade the natural characteristics of lands with wilderness characteristics. In addition to site-specific surface disturbance, the cumulative number of wells would change the appearance of naturalness. Noise from construction and operation of producing wells or mines, including the presence of work crews, vehicles, and equipment, would degrade opportunities for solitude and conflict with primitive recreational opportunities near industrial development. As recreational visitors move away from the sources of development, the effects of sights and sounds related to development would diminish. However, it can be expected that sights and sounds from development would reduce opportunities for solitude and primitive and unconfined recreation up to 1 mile beyond the direct loss of natural character.

Minerals resource activities would affect areas with wilderness characteristics that are not withdrawn from mineral entry or not closed to oil and gas leasing. Effects from mineral extraction would vary depending on the methods used and size of operations. There is no coal potential within the LWC unit. Oil and gas development is not likely within the southern Big Horn Mountains, however impacts to wilderness characteristics may result from locatable or salable minerals activities.

Fire and Fuels Management (minor beneficial)

Firefighting activities and prescribed fire may affect wilderness characteristics. Lightning-caused wildland fire is a naturally occurring phenomenon. Wildland fire can be visually intrusive, but is natural and considered a part of the wilderness characteristics of the landscape. Prescribed fire may potentially affect the natural landscape. However, hazardous fuels reduction projects and environmental restoration efforts involving fire often benefit wilderness characteristics by restoring the landscape to desired condition classes. The degree of beneficial or adverse effects to lands with wilderness characteristics from fire and fuels management would depend heavily on the methods and mitigation measured implemented at the project level.

When persons are physically present during fire and fuels management activities, or when persons leave evidence of their presence (burn piles), there may be an effect on solitude, and to a lessor degree, on primitive and unconfined recreation. Such effects on solitude and primitive and unconfined recreation would likely be short-term. However, changes to naturalness due to fire lines and vehicle use could be long-term. Overall, fire is beneficial to wilderness characteristics; the fire and fuels management actions considered together produce a minor benefit. The impacts

would not vary across the alternatives; therefore, fire and fuels management is not further discussed in this section.

Biological Resources (minor beneficial)

Mechanical vegetation manipulation in lands with wilderness characteristics would likely affect the natural character of these lands and opportunities for solitude and primitive and unconfined recreation. While restoring native vegetative communities would benefit the natural character of lands with wilderness characteristics, the use of equipment such as chain saws and bulldozers to accomplish the objective may leave an obvious imprint of human activity on the land, which would diminish its natural character. Also, over the short term, the presence and noise of people and equipment would eliminate opportunities for solitude and primitive forms of recreation near treatment areas. Over the long term, a setting clearly manipulated by humans would reduce opportunities for solitude and primitive recreation. Conversely, efforts to curb infestation caused by invasive species could retain the primeval character of the landscape. The degree of beneficial or adverse effects to lands with wilderness characteristics from vegetation manipulation would depend heavily on the methods and mitigation measured implemented at the project level. Similarly, the control of invasive plant species would have beneficial and adverse effects on wilderness characteristics, depending on the method of control.

Management alternatives that improve habitat for wildlife populations would enhance the natural character of lands with wilderness characteristics. Furthermore, sustainable and healthy wildlife populations would expand opportunities for primitive and unconfined recreational opportunities, including wildlife viewing, hunting, and natural history study. The biological resources management actions when considered together have a minor beneficial effect on wilderness characteristics.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (negligible beneficial)
The BLM may provide for legitimate field research by qualified scientists and institutions. These activities could involve temporary surface-disturbing activities like digging and excavation. If these activities occurred in areas with wilderness characteristics, they would create a loss of naturalness and temporarily disturb opportunities for solitude and primitive recreation in the immediate area. Over the long term, however, gaining knowledge about the cultural and paleontological resources of an area, interpreting the resource appropriately, and viewing cultural or paleontological resource sites in the lands with wilderness characteristics would add to the enjoyment of these areas for primitive recreational purposes. Protecting heritage resources also adds to the character of settings that support these recreational opportunities. These management actions provide a negligible benefit as they do not prohibit surface-disturbing activities. Paleontological management by alternatives centers on protecting resources of high quality or importance, presently none are known within the LWC area; therefore paleontological resources will not be discussed further in this section.

Visual Resources (moderate beneficial)
Land use planning decisions to designate and manage areas under VRM Class I or II objectives would preserve the characteristic landscape. At present, only WSAs and WSR are managed under VRM Class I. VRM Class II objectives would retain the characteristic landscape, allowing for minor changes to the landform and vegetation. This objective would generally protect the

natural condition of lands with wilderness characteristics. The objective of VRM Class III is to partially retain the existing character of the landscape, allowing for moderate changes to land and vegetation. This objective is not compatible with preserving the natural character of lands with wilderness characteristics. VRM Class IV objectives allow major modification of the landscape, and is clearly incompatible with preservation of the natural character of lands with wilderness characteristics. In keeping with VRM Class I and II objectives, preserving the natural character of the non-WSA lands with wilderness characteristics also would preserve the undeveloped settings needed to support opportunities for solitude and primitive forms of recreation. Because VRM Class III and IV objectives would not preserve undeveloped settings, naturalness and opportunities for solitude and primitive recreation would be diminished. The visual resources management actions when considered together have a moderate beneficial effect on wilderness characteristics.

Land Resources (moderate adverse)

Impacts from land use authorizations include ROW such as pipelines and utilities and communication sites. Aboveground structures would diminish the naturalness of the immediate area, and in the surrounding areas solitude and primitive and unconfined recreation would be reduced. Burying lines would temporarily affect the naturalness of an area on a localized scale, and through maintenance actions for belowground facilities.

Allowing cross-country motorized travel in lands with wilderness characteristics would disturb soils and vegetation, which would alter the landscape and diminish the natural character of such lands. Designations that permanently or seasonally close areas to motorized travel would have a beneficial effect on the wilderness characteristics resource. Additionally, lands with wilderness characteristics where motorized travel was previously limited to existing routes would now limited motorized travel to designated, which would have a beneficial effects on the wilderness characteristics resource.

Recreation activities such as development of recreational facilities or motorized vehicle use would affect the naturalness, solitude, and recreation setting in undeveloped areas where there are wilderness characteristics. However, some facilities (e.g., trailheads and parking lots) might be necessary on the periphery of an area with wilderness characteristics to provide adequate access and opportunities for recreational use of areas with these characteristics. Proper design and construction techniques can reduce adverse effects on visual resources from adjacent recreation facilities and help maintain a more natural appearing landscape.

Livestock grazing is guided by livestock objectives set in the *Wyoming Standards for Health Rangelands*. Proper levels of livestock use are guided by these standards; therefore, it is not anticipated that livestock grazing would affect lands with wilderness characteristics under any alternative because meeting these standards would promote healthy rangelands. When livestock grazing use is properly managed, it would not affect the appearance of naturalness. While there could be some visual evidence of livestock use in the areas (e.g., presence of livestock, feces, trampling of soil, fences, and consumption of vegetation), rangeland health and riparian conditions would be maintained through proper management under the standards and guidelines assessments, and the appearance of a natural condition in these areas would be maintained. For some visitors, the presence of livestock would be an adverse effect on the desired experience (connection with the natural world and experiences of solitude). However, this effect would be seasonal. At other times of the year, livestock would not be present, and soils and vegetation would recover, decreasing effects on the visitor experience.

The BLM is required to evaluate newly acquired lands and other parcels that meet the size and naturalness requirements for wilderness characteristics in accordance with FLPMA section 201 and Secretarial Order 3310. Evaluating such characteristics is critical to the protection of the wilderness characteristics resource.

The land resources management actions, when considered together, have a moderate adverse effect on wilderness characteristics. There are no discernible effects across alternatives from the lands and realty, recreation, and livestock grazing management actions, and therefore, these resources will not be discussed further in this section.

Special Designations (no effect)

Designation of an ACEC or WSR in an area with wilderness characteristics benefits the resource. However, there are no proposed ACECs in the LWC unit and the area is not contiguous to a WSA or WSR. Therefore, there would be no effect from ACECs, WSAs or WSR. Designating scenic or BCBs in an area with wilderness characteristics could be detrimental to the resource due to the increased motorized use vehicle use associated with such a designation and the subsequent effect on naturalness and opportunities for solitude. Currently, no roads within the LWC unit are being considered for BCB designation, therefore there would be no effect to the lands with wilderness characteristics resource. Special designations will not be considered further in this section.

Socioeconomic Resources (no effect)

There are no discernible effects from socioeconomic or health and safety management actions common to all alternatives or across the alternatives; therefore, these resources will not be discussed further in this section.

4.6.7.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. Alternative A effects on the wilderness characteristics resource would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Lands with Wilderness Characteristics (major adverse)
Alternative A does not allocate lands with wilderness characteristics outside of the WSAs, protection of this natural resource would not be provided.

Physical Resources (negligible beneficial)

The LWC area contains sensitive soils, water resources, and caves. Restrictions to manage physical resources would provide some protection of wilderness characteristics. Due to the rough topography and general lack of mineral resources within the LWC area, the forecasted development is low. Because the physical resource protections could be waived by the authorized officer and the low development forecast, the benefit to the wilderness characteristics resource is negligible.

Mineral Resources

Locatable Minerals and Leasable Minerals – Fluids (negligible adverse), and **Salable Minerals** (moderate adverse)
The potential for fluid or locatable mineral development is very low and is not reasonably foreseeable. However, sand and gravel or other salable minerals are present in the LWC unit. Development associated with salable mineral activity, such as the construction of roads and pits would reduce the naturalness and opportunities for solitude within the unit. The impact to the wilderness characteristics resources would be moderate and adverse. The impact from locatable and fluid mineral development would be negligible.

Biological Resources (minor beneficial)

The LWC area contains a diversity of vegetation, fish, wildlife, and special status species resources. Restrictions on surface-disturbing activities to manage biological resources would provide some protection of wilderness characteristics. Due to the rough topography and general lack of mineral resources within the LWC area the forecasted development is low. Because many of the biological resource protections could be waived by the authorized officer and the low development forecast the benefit to the wilderness characteristics resource is minor.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Present cultural resource management protects individual cultural sites and would not prohibit surface-disturbing activities within the LWC unit. Due to the rough topography and general lack of mineral resources within the LWC area the forecasted development is low. However, even a low level of development could destroy wilderness characteristics if no 5,000 acre blocks of BLM surface remain. The benefit that cultural management actions would provide for wilderness characteristics is negligible.

Visual Resources (minor adverse)
Under Alternative A, the LWC unit would be classified as VRM Class II on the western portion of the unit and VRM Class IV on the eastern side of the unit. Areas with wilderness characteristics that overlap VRM Class II areas would receive the greatest protections for visual resources, while areas in VRM Class IV would receive inadequate protection, resulting in a minor adverse impact to the lands with wilderness characteristics resource.

Land Resources (moderate adverse)

Motorized use, commercial woodcutting, ROW grants, renewable-energy development and related surface-disturbing activities would not be prohibited under Alternative A. Given the steep topography, extensive development of the LWC unit is not reasonably foreseeable. However, the development of roads and other linear features to support ROW grants or timber sales would reduce the naturalness and opportunities for solitude within the unit. Therefore, there would be a moderate adverse effect from the management actions for forest products, renewable energy, rights-of-way and corridors or travel and transportation management resources to the LWC unit.

4.6.7.4. Alternative B

Alternative B would emphasize resource conservation. Alternative B effects on the wilderness characteristics resource would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Lands with Wilderness Characteristics (major beneficial)
Under Alternative B, managing lands with wilderness characteristics (Map 61) to emphasize ecosystem health, natural values, and primitive recreational opportunities would benefit the wilderness characteristics resource. All 12,237 acres of the LWC unit will be managed to protect wilderness characteristics. Management of the LWC unit would include closing the area to motorized use; managing the area as VRM Class II; closing the area to mineral leasing (fluid and solid); recommending withdrawal to locatable mineral entry; closing the area to salable mineral development; excluding ROW development; prohibiting commercial woodcutting unless it is a byproduct of an environmental restoration effort, and prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's natural values. The protection of an additional 12,237 acres of lands with wilderness characteristics would be a major beneficial impact to the lands with wilderness characteristics resource.

Physical Resources (major beneficial)

The LWC area contains water resources and is within karst formations which are predominantly composed of sensitive soils. Prohibitions on development for physical resources, in particularly karst formations and sensitive soils, would provide protection of wilderness characteristics from surface-disturbing activities, a major benefit to the wilderness characteristics resource.

Mineral Resources (major beneficial)

Mineral development within the LWC unit would be prohibited under Alternative B protecting the wilderness characteristics resource. Salable minerals are likely the only mineral resource of interest within the unit. Prohibiting disturbance is a major benefit as only a few sand and gravel mines could potentially fragment the wilderness characteristics unit so that no 5,000 acres portion of BLM surface remained. Locatable and fluid mineral impacts would be negligible.

Biological Resources (major beneficial)

The LWC area contains a diversity of vegetation, fish, wildlife, and special status species resources. Prohibitions on development for biological resources (such as near fish-bearing streams, within elk security habitat and special status plant habitat) would provide protection of wilderness characteristics from surface-disturbing activities, a major benefit to the wilderness characteristics resource.

Heritage and Visual Resources

Cultural Resources (major beneficial)
A prohibition on surface-disturbing activities within five miles of certain cultural sites would protect approximately half of the LWC unit, a major benefit to the wilderness characteristics.

Visual Resources (moderate beneficial)
Under Alternative B, areas with wilderness characteristics would be protected under VRM Class II management. This would benefit wilderness characteristics by maintaining the natural values of the landscape. However, since development would not be prohibited the benefit would be moderate.

Land Resources (major beneficial)

Motorized use, commercial woodcutting, ROW grants, renewable-energy development and related surface-disturbing activities would be prohibited under Alternative B. Therefore, there would be a major benefit to wilderness characteristics, as they would be protected from forest products, renewable energy, rights-of-way and corridors or travel and transportation management activities within the LWC unit.

4.6.7.5. Alternative C

Alternative C would emphasize resource use. Alternative C effects on the wilderness characteristics resource would be similar to those described under Impacts Common to All Alternatives, and would include the effects described in the paragraphs below.

Lands with Wilderness Characteristics (major adverse)
Special provisions related to protection of wilderness characteristics would not be imposed on lands with wilderness characteristics. There would be a major adverse impact to the wilderness characteristics resource.

Physical Resources (major adverse)

The LWC area contains sensitive soils, water resources, and caves. However, Alternative C does not provide restrictions on surface-disturbing activities for the protection of physical resources. Due to the rough topography and general lack of mineral resources within the LWC area, the forecasted development is low. However, even a low level of development could destroy wilderness characteristics if no 5,000 acre blocks of BLM surface remain. Because the physical resource are not protected and there could be development within the wilderness characteristics unit the impact would be major.

Mineral Resources (moderate adverse)

The potential for mineral development of coal and fluid mineral resources is very low and is not reasonably foreseeable. However, sand and gravel or other salable minerals are present in the LWC unit. Development associated with salable mineral activity, such as the construction of roads and pits would reduce the naturalness and opportunities for solitude within the unit. The impact to the wilderness characteristics resources would be moderate and adverse.

Biological Resources (major adverse)

The LWC area contains a diversity of vegetation, fish, wildlife, and special status species resources. The lack of restrictions on surface-disturbing activities would provide for development and therefore impacts to wilderness characteristics. Due to the rough topography and general lack of mineral resources within the LWC area the forecasted development is low. However, even a

low level of development could destroy wilderness characteristics if no 5,000 acre blocks of BLM surface remain. Because the physical resource are not protected and there could be development within the wilderness characteristics unit the impact would be major.

Heritage and Visual Resources

Cultural Resources (negligible adverse)
Cultural resource management actions would not prohibit surface-disturbing activities within the LWC unit. Due to the rough topography and general lack of mineral resources within the LWC area, the forecasted development is low. However, even a low level of development could destroy wilderness characteristics if no 5,000 acre blocks of BLM surface remain. The lack of cultural protections would provide for a negligible adverse effect on wilderness characteristics.

Visual Resources (minor adverse)
Under Alternative C, the LWC unit would be managed under VRM Class III. This would reduce protections for scenic values in the LWC area. The effect on the wilderness characteristics resource would be minor and adverse.

Land Resources (moderate adverse)

Motorized use, commercial woodcutting, ROW grants, renewable-energy development and related surface-disturbing activities would not be prohibited under Alternative C. Given the steep topography, extensive development of the unit is not reasonably foreseeable. However, the development of roads and other linear features to support ROW grants or timber sales would reduce the naturalness and opportunities for solitude within the unit. Therefore, there would be a moderate adverse effect from the management actions for forest products, renewable energy, rights-of-way and corridors or travel and transportation management resources to the LWC unit.

4.6.7.6. Alternative D

Alternative D may allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

Lands with Wilderness Characteristics (moderate beneficial)
Under Alternative D, managing lands with wilderness characteristics (Map 62) to emphasize ecosystem health, natural values, and primitive recreational opportunities would benefit the wilderness characteristics resource.

Several factors affect potential manageability of lands with wilderness characteristics, including the configuration of the unit and the interspersion of summer homes at the northern tip of the unit. The narrowness of the unit (0.25 mile in some areas) presents difficulty in managing the southern and western portion of the unit as BLM-administered lands essentially subdivide private lands and lands owned by the State of Wyoming. In this area, the BLM must consider the needs for potential access or services by adjacent landowners. The practicality of managing a narrow strip of land for protection of wilderness characteristics is tenuous. Additionally, lands along the Billy Creek Access road are located within the WUI and forest management activities are desirable to decrease fuel loads in this region. Additionally, defining the boundaries by section and township lines creates a clear legal description of the unit that is easily identifiable and manageable. The

portions of the LWC unit meeting manageability criteria (6,864 acres) will be managed to protect lands with wilderness characteristics.

Management of the unit would include closing the area to motorized use; managing the area as VRM Class II; closing the area to mineral leasing (fluid and solid); recommending withdrawal to locatable mineral entry; closing the area to salable mineral development; excluding ROW development; prohibiting commercial woodcutting unless it is a byproduct of an environmental restoration effort, and prohibiting all other surface-disturbing activities not compatible with retaining or enhancing the area's natural values. The remaining acres within the unit will be managed for multiple use and no special management related to LWC will be applied. Overall, these management actions will produce a moderate beneficial effect on the wilderness characteristics resource.

Physical Resources (minor beneficial)

The LWC area contains sensitive soils, water resources, and caves. Restrictions on surface-disturbing activities would provide some protection of wilderness characteristics. Due to the rough topography and general lack of mineral resources within the LWC area the forecasted development is low. However, even a low level of development could destroy wilderness characteristics if no 5,000 acre blocks of BLM surface remain. Because the physical resource protections would not fully protect the wilderness characteristics the benefit to the wilderness characteristics resource is minor.

Mineral Resources (minor adverse)

Mineral development within the LWC unit would be prohibited on 6,864 acres under Alternative D and there would be no effect to the lands with wilderness characteristics resource in the protected area. The remaining lands with wilderness characteristics would not have a prohibition on mineral development and there would be a minor adverse effect to the lands with wilderness characteristics resource given the low mineral potential.

Biological Resources (minor beneficial)

The LWC area contains a diversity of vegetation, fish, wildlife, and special status species resources. Restrictions on surface-disturbing activities provide some benefit to wilderness characteristics; however development is not prohibited and therefore impacts to wilderness characteristics are likely to occur. Due to the rough topography and general lack of mineral resources within the LWC area the forecasted development is low. However, even a low level of development could destroy wilderness characteristics if no 5,000 acre blocks of BLM surface remain. Because the biological resource protections would not fully protect the wilderness characteristics the benefit to the wilderness characteristics resource is minor.

Heritage and Visual Resources

Cultural Resources (negligible beneficial)
Cultural resource management actions would restrict, but may not prevent, surface-disturbing activities within 3 miles of certain cultural sites which would include much of the LWC unit. Due to the rough topography and general lack of mineral resources within the LWC area the forecasted development is low. However, even a low level of development could destroy

wilderness characteristics if no 5,000 acre blocks of BLM surface remain. The benefit that cultural management actions would provide for wilderness characteristics is negligible.

Visual Resources (moderate beneficial)
Under Alternative D, the entire LWC unit, including the portion that did not meet manageability criteria, would be protected under VRM Class II management. This would benefit wilderness characteristics by maintaining the natural values of the landscape. However, since development is not prohibited the benefit would be moderate.

Land Resources (minor adverse)

Motorized use, commercial woodcutting, ROW grants, renewable-energy development and related surface-disturbing activities would be prohibited on 6,864 acres under Alternative D. The remaining lands with wilderness characteristics would not have specific prohibitions on production of forest products or granting of ROW and there would be a minor adverse effect to the lands with wilderness characteristics resource.

4.6.7.7. Cumulative Impacts

The LWC unit is a located in a remote area with steep topography. The majority of the LWC unit is unsuitable for grazing due to steep slopes and the area has very low development potential for minerals. While timber blowdown events have occurred in the past, harvesting of commercially valuable timber has been limited to the periphery of the LWC unit, adjacent to the existing road network. Currently, no other projects in the vicinity have been identified.

4.6.7.8. Conclusion

Selection of Alternative D will result in a balanced approach to management of lands with wilderness characteristics resources by focusing protection of wilderness characteristics in areas where such management is most feasible and allowing limited development in areas near existing roads and allowing for protection of residences in the WUI. Alternative B results in the most protection of lands with wilderness characteristics resources, but increased restrictions for natural resource protection and travel management result in difficulty in providing quality forest management. Alternative A does not address lands with wilderness characteristics. Alternative C includes the least restrictions on development, which would produce adverse effects on the lands with wilderness characteristics resource.

Table 4.72, “Summary of Impacts to Wilderness Characteristics” (p. 1358) summarizes impacts to the wilderness characteristics resource.

Table 4.72. Summary of Impacts to Wilderness Characteristics

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	Negligible beneficial	Negligible beneficial	Negligible beneficial	Negligible beneficial
Soil	Negligible beneficial	Major beneficial	Major adverse	Minor beneficial
Water Resources	Negligible beneficial	Major beneficial	Major adverse	Minor beneficial
Cave and Karst Resources	Negligible beneficial	Major beneficial	Major adverse	Minor beneficial
Mineral Resources				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Locatable Minerals	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Leasable – Coal	No effect	No effect	No effect	No effect
Leasable – Fluids	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial
Leasable – Other	No effect	No effect	No effect	No effect
Salable Minerals	Moderate adverse	Major beneficial	Moderate adverse	Minor adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Vegetation – Grassland and Shrubland Communities	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Vegetation – Riparian/Wetland Resources	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Invasive Species and Pest Management	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Fish and Wildlife Resources – Fish	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Fish and Wildlife Resources – Wildlife	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Special Status Species – Plants	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Special Status Species – Fish	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Special Status Species – Wildlife	Minor beneficial	Major beneficial	Major adverse	Minor beneficial
Heritage and Visual Resources				
Cultural Resources	Negligible beneficial	Major beneficial	Negligible adverse	Negligible beneficial
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Minor adverse	Moderate beneficial	Minor adverse	Moderate beneficial
Land Resources				
Forest Products	Moderate adverse	Major beneficial	Moderate adverse	Minor adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Moderate adverse	Major beneficial	Moderate adverse	Minor adverse
Rights-of-Way and Corridors	Moderate adverse	Major beneficial	Moderate adverse	Negligible adverse
Travel and Transportation Management	Moderate adverse	Major beneficial	Moderate adverse	Negligible adverse
Recreation	No effect	No effect	No effect	No effect
Lands with Wilderness Characteristics	Major adverse	Major beneficial	Major adverse	Moderate beneficial
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.6.8. Livestock Grazing Management

This section describes potential effects on livestock grazing from management actions for other resource programs. Existing conditions concerning livestock grazing management are described in Chapter 3. Management actions and allowable uses that prohibit, limit, or reduce livestock grazing or reduce AUMs in the planning area are would have an adverse effect on livestock resources. Deterioration in rangeland health also would be adverse to livestock grazing. Restrictions on livestock grazing or AUM to protect resource values would have an adverse effect. Conversely, beneficial effects on livestock grazing include allowable uses or actions that would improve rangeland health, increase AUM, or decrease restrictions on and costs for livestock grazing operations. For purposes of this analysis, short-term effects on livestock grazing would result from activities that change the AUM allocations or rangeland health within five years of when the activity occurs. Long-term effects remain or occur after five years. Livestock grazing can have beneficial and adverse effects on the health and productivity of vegetative communities in rangelands. Native grasslands evolved with grazers and many grass species respond positively to leaf removal by propagating, which increases vegetative cover. Other beneficial effects of grazing include reduced competition by removing encroaching woody plant cover; hoof action that keeps topsoil loose, increases litter and precipitation penetration, and incorporates seeds into soil; nutrient recycling; removal of wildfire fuels; and control of invasive plant and weed species with properly timed grazing rotations and species (e.g., goats). Adverse effects include direct mortality of native plants through trampling or herbivory, soil compaction and erosion, changes in plant community composition and structure, and increased invasive species spread. Prolonged grazing during the growing season or summer could result in reduced vigor of desired species, changes in species richness, and increased potential for invasion by annual grasses and invasive plant species. Areas where rangeland health is most likely to be adversely affected are areas where livestock congregate. These include areas with water, shade, and more palatable forage. Therefore, rangeland management often is geared toward improving the overall distribution of livestock within an allotment. This is accomplished through implementing BMPs, and developing AMPs or coordinated resource management plans, changing grazing systems, and implementing range improvement projects (i.e., fencing, water-development projects, and salt and mineral licks). A recurring effect on livestock grazing is surface-disturbing activities as they relate to energy development. Where allowed, these disturbances would have an direct adverse effect on livestock grazing through vegetative forage removal for the duration of the project or permit, usually over the long term (10 or more years). Reclamation could require short-term (2 to 5 years) removal of livestock on all or a portion of project areas to help achieve reclamation objectives.

4.6.8.1. Methods and Assumptions

Land use activities in the planning area affect livestock grazing management. Effects on livestock grazing are generally the result of activities that affect management of forage levels for individual grazing allotments. This impact analysis and its conclusions are based on interdisciplinary team knowledge of resources and the planning area, review of existing literature, and information provided by specialists within the BLM or other agencies. Effects are quantified where possible. In the absence of quantifiable data, best professional judgment was used.

Assumptions

To determine potential effects on livestock grazing management, certain assumptions were made concerning the level of land use activities, resource conditions, and resource responses, as follows:

- Livestock grazing will continue on public lands in the planning area. Allotments will be managed to improve ecological site condition in coordination and cooperation with other resource uses, including but not limited to, special status species, crucial wildlife habitats, and riparian and wetland systems.
- The Wyoming Standards for Healthy Rangelands (Appendix P (p. 2091)) provide standards and guidelines designed to maintain or improve rangeland health. The BLM will continue to use these standards and guidelines to assess rangeland health and determine appropriate management actions.
- Lands currently designated for stock driveways will remain as designated for that purpose.
- Reserve allotments will serve as a tool in the management of timber sales, unplanned and prescribed fires, and drought.
- Range improvement projects would continue to be used to achieve management goals.
- Disposal of Category custodial (C) allotments is a priority to reduce administrative requirements. Disposing of these parcels of public land should not substantially affect the overall available AUM.
- The BLM works with grazing lessees to identify and accomplish management objectives.
- Management of invasive plants and pests will continue on the rangelands.
- Minerals development, and its associated surface-disturbing activities, special status species habitats, and the continued expansion of annual bromes will have the greatest future effects on rangelands.
- Allowable uses and management actions that could impact livestock grazing include surface-disturbing activities, fire and fuels management, recreational opportunities, restrictions to protect resource values, restoration and reclamation projects and success, invasive plant and pest management, specials status species management, and proactive livestock grazing management. These uses and actions are anticipated to result in short- or long-term changes to rangeland health and AUM allocation.

Significance Criteria

Adverse effects on livestock grazing would be considered potentially significant if the following were to occur:

- Resource management actions substantially reduce or eliminate the availability of public land for grazing.

4.6.8.2. Impacts Common to All Alternatives

Livestock Grazing Management (minor beneficial)
Livestock grazing would continue in most of the planning area under all alternatives. Overgrazing by livestock would have a major adverse effect on vegetative communities, primarily grasslands and shrublands because this is the land type where the majority of grazing occurs. Riparian and wetland systems are also very vulnerable to overgrazing by livestock and wildlife. Grazing strategies, including implementing the Wyoming Standards for Healthy Rangelands, AMP and grazing agreement implementation, proper livestock management, and installation of range improvement projects, are designed to help achieve appropriate levels of forage consumption by livestock and wildlife. AMP and grazing agreements include defined rotations, deferments, periods of rest from grazing, manipulation of season of use, and grazing intensity. These have the ability to alter the amounts and types of vegetation present on the landscape; therefore, they can be used as tools to directly and indirectly manipulate and improve plant community composition, plant structure, plant cover, and vigor of vegetation for over the short and long terms.

Range improvements would result in localized short-term disturbances, including the flattening or loss of vegetative cover due to construction activities. Placement of water, salt or other supplements results in trampling and small bare areas of vegetation around these livestock concentration sites. In locations where containers are not used, there would be changes in soil chemistry that would delay long-term recovery of vegetation. Construction of reservoirs, wells, troughs and pipelines to provide water will assist in dispersing grazing use. The grazing lessee or other cooperator will be required to maintain water in some troughs located on public land during the frost-free period (April through October) for wildlife. Long-term loss of vegetation would occur near water troughs, pits, and reservoirs, and along fence lines where there are roads or animal trails. However, overall plant composition and vigor would potentially be improved as a result of newly available water sources, fences, and grazing management.

Physical Resources

Air Quality (no effect)
There are no air quality management actions common to all alternatives or that would vary by alternative that would have an effect on livestock grazing management. Therefore, this section does not further address air quality.

Soil (major beneficial)
Using soil surveys and onsite investigations would ensure proper use of soil resources. Soils management actions common to all alternatives would have a major beneficial effect on livestock grazing.

Water Resources (moderate beneficial)
Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, including reducing channel and bank erosion, providing “off-source” water supply in locations where the source is fenced out, and managing water to meet Wyoming Standards for Healthy Rangelands. These actions are designed to reduce or prevent soil erosion and improve water quality across the entire planning area, and therefore would have a moderate beneficial effect on livestock grazing management.

Cave and Karst Resources (no effect)
Inventorying, mapping and determining significance of caves and karsts will have no effect on livestock grazing management.

Mineral Resources

Locatable Minerals, Leasable Minerals – Coal and Fluids, and Salable Minerals (moderate beneficial)
Rangeland health and forage production can be directly and indirectly affected by surface disturbance by all four types of mineral development through the loss of forage, spread of invasive plant species, and soil erosion.

Even though few areas are withdrawn from development of locatable minerals, the acres that would be realistically affected is minor (less than 5% of the acres open to livestock grazing). Coal and oil and gas development are anticipated to cause the most long-term surface disturbance and, therefore, the greatest adverse effect on livestock grazing in the planning area. The degree of effect would depend on the rate of development, production success, and how quickly disturbed areas are reclaimed. The effect on AUM allocations could be substantial for individual allotments, but the overall effect of disturbance from oil and gas development on AUMs in the planning area should be moderate. In some cases, oil and gas development can benefit livestock and wildlife by increasing the number of water wells available for livestock watering, thereby improving livestock distribution in an allotment. As with locatable mineral development, the majority of the planning area is open to salable mineral developments. However, it is anticipated that development will only occur on less than 5% of the acres available for livestock grazing. Therefore, the effects would be a minor adverse. Given the extent of the coal, oil and gas development the overall the effects of mineral resources development on livestock grazing management will be moderate adverse. Overall, the management actions requiring treatment and the use of certified weed seed-free products will have a moderate beneficial effect on livestock grazing.

Fire and Fuels Management (minor adverse)

Fire can have beneficial and adverse effects on livestock grazing management. Over the short term, fire and fuels management actions reduce canopy and forage that livestock depend on and can damage facilities such as fences. This damage can have a substantial adverse economic effect on grazing operations by requiring leasing of additional pasture, supplemental feeding of livestock for longer periods, building or repairing fences, and reducing herd size. Long-term, direct, and adverse effects include "livestock grazing strategies on vegetative areas generally include rest the first year following treatments and deferment of livestock grazing the second year" (BLM 2001a). Another long-term and direct effect is that fire could improve the quality and quantity of forage, thereby improving flexibility in managing livestock. This would have a beneficial effect.

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 livestock distribution or removing dense stands of brush. Both wildland and prescribed fire can increase the likelihood of invasive species establishment and spread on the site(s), including cheatgrass. This effect would be long-term, direct, and adverse. The long-term effect of continuous fire suppression is the buildup of hazardous fuels and the increased risk of severe or catastrophic wildland fires. Overall, the effect of fire and fuels management on livestock grazing management would be minor adverse.

Biological Resources

Vegetation – Forests and Woodlands (no effect)
There are no forest and woodlands management effects on livestock grazing common to all alternatives or that would vary by alternative. Therefore, forest and woodlands management is not further addressed in the Livestock Grazing Management section.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Management of vegetative communities, includes determining rangeland health in accordance with the Wyoming Standards for Healthy Rangelands and applying an integrated management approach (e.g., mechanical, chemical, and biological treatments, prescribed fire, and grazing management techniques) to maintain, restore, and enhance the health and diversity of plant communities to achieve resource or multi-resource objectives. These applications to maintain or improve vegetative health would have indirect, beneficial, and long-term effects on livestock grazing. Managing to protect, preserve, or enhance plant communities, including habitat for special status species, could have long-term, indirect, adverse and beneficial effects on livestock grazing because these areas could be protected from surface-disturbing activities. This could benefit livestock grazing management, or could have an adverse effect if these areas become no longer available for grazing.

Managing the siting of facilities and related infrastructure to reduce the number of disturbed sites and acres would result in less disturbance. This would have a direct beneficial effect on livestock grazing management over the long term.

Developing a contingency plan to address catastrophic natural events such as drought, wildfires, and large-scale pest infestations by incorporating strategies that best protect vegetative resources would have a direct adverse effect on livestock grazing over the short term of the events, and an indirect beneficial effect over the long term once sustainable levels of vegetation were reestablished.

Overall, the management actions that are common to all alternatives for grassland and shrubland vegetation communities would have a major beneficial effect because they would maintain or improve the health, vigor and diversity of the vegetation community.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Developing and implementing activity plans to manage riparian systems to be at or above, or continue to be improving toward, PFC while achieving the Wyoming Standards for Healthy Rangelands would benefit livestock grazing. Managing riparian and wetland systems to enhance forage conditions and improve water quality, and to prevent degradation, loss, or destruction of riparian/wetland habitat also would indirectly benefit livestock grazing over the long term. Riparian areas are more susceptible to the effects of grazing during the hot season (July and early August). Livestock are naturally attracted to areas with water and thermal cover, which requires intensive management to reduce the potential for overgrazing. The use of livestock exclosures to protect seeps and springs would preclude livestock grazing, but would not necessarily stop other animals from grazing in these areas. Developed water sources on uplands would be used to improve distribution of livestock in riparian/wetland areas. This would help to improve species composition, plant densities, and plant vigor in riparian/wetland habitat.

Overall, the management actions that are common to all alternatives for riparian/wetland vegetation communities would have a minor beneficial effect.

Invasive Species (major adverse) **and Pest Management** (negligible to moderate adverse, depending on size and distribution of infestations)
One of the primary indirect and adverse effects on rangeland health and productivity from surface disturbances is the spread of invasive plant species. Surface-disturbing activities typically include mechanical disturbance, mining, and vegetative treatments. Invasive species can out compete native vegetation for water, space, and soil nutrients. These invasive plants can lessen the amount and quality of native forage. They usually are less palatable and less nutritious thereby reducing livestock weight and condition. Managing invasive species and pests to minimize their adverse effects on native plants is a direct benefit to livestock management.

Pest species such as grasshoppers can be have an adverse effect on native forage species. Pest directly consume native plants for nutrition and when pest populations exceed their natural threshold, natural and economic injury can occur. This has an indirect adverse effect on livestock grazing by reducing the quantity of forage, and the nutrient content and palatability of the native plants over the short term of the infestation or that year's growing season. Managing invasive species and pests to minimize their adverse effects on native plants can keep forage healthy and available for grazing by livestock and wildlife. This is a direct benefit to livestock management.

Fish and Wildlife Resources – Fish (negligible adverse)
Improving fish habitat and the health of associated riparian and wetland systems could have a direct adverse effect on livestock grazing over the long term by limiting or excluding livestock grazing in those areas to meet management objectives. However, the acres of fish habitat in grazing allotments within the planning area is less than 1%, therefore a negligible adverse effect.

Fish and Wildlife Resources – Wildlife (minor adverse)
Mitigation for surface-disturbing and disruptive activities associated with wildlife habitat management could have an indirect beneficial or adverse effect livestock grazing over the long term, depending on the types, degrees, and locations of the mitigation.

Maintaining or improving important wildlife habitats through vegetative manipulations, habitat improvement projects, and livestock grazing strategies would directly affect livestock. Effects could be adverse or beneficial depending on the type of project, the rest prescription following the treatment, and the types and extents of livestock strategies implemented; effects would be long-term. Exclusions or rest from grazing would be adverse; rotational or deferred grazing could be beneficial. Providing, to the extent possible, suitable habitat and forage to support wildlife population objectives as defined by the WGFD could be adverse if forage demands to support wildlife population objectives and habitat requirements would make less forage available for livestock grazing. Overall, the management actions that are common to all alternatives for wildlife resources would have a minor adverse effect because of the greater limitations to livestock grazing.

Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Livestock grazing could maintain or create habitat for sensitive plants by reducing vegetation competition. However, livestock grazing could reduce the occurrence of some species through trampling, consumption, and general site degradation. Implementing actions in recovery plans, conservation measures, terms and conditions, and appropriate BMPs and reasonable and prudent measures in biological opinions for Threatened and Endangered plant species could be adverse or beneficial to livestock grazing. Adverse effects from implemented actions would include, but not be limited to, limiting, restricting, or excluding livestock grazing, and decreased stocking rates. Beneficial effects could include, but not be limited to, improving forage quality and quantity.

Special considerations for the management of special status species as they are discovered, or if critical habitat is designated, could affect livestock grazing. Limiting the placement or timing of constructing range improvement projects would have a direct adverse effect on livestock grazing by encumbering management flexibility over the long term. Permanent water sources may have to be treated to reduce carriers of WNv; this could increase costs and management. Overall, the effects of special status species management on livestock grazing would be minor adverse.

Heritage and Visual Resources

Cultural (minor adverse)
Avoiding cultural resource sites eligible for listing or listed on the National Register, or applying protection provisions to areas adjacent to historic trails could limit the ability to construct rangeland improvement projects that would facilitate improved management of livestock. In addition, cultural resources management could delay construction of range improvement projects by requiring additional surveys and design changes for projects to avoid important cultural sites. These constitute minor adverse effects.

Paleontological Resources (no effect)
Retaining lands with significant paleontological resources will have no effect on livestock management.

Visual Resources (no effect)
Management actions common to all alternatives for visual resources will have no effect on livestock management. Grazing livestock and range improvements typically do not attract the attention of casual observers, and therefore are compatible with visual resource management. The differences in visual resources management by alternative will have no discernible effects on livestock grazing management, and therefore, will not be discussed further in this section.

Land Resources

Forest Products (negligible adverse)
Forest products harvesting and sales could affect available forage for grazing. Harvesting crews, machinery, and transports associated with permitted commercial or private harvesting of forest products in active grazing allotments likely would have direct, adverse and short-term effects on livestock grazing by displacing or disturbing livestock, increasing the potential for vehicle collisions with animals, and reducing available forage through trampling. However, post-harvest conditions would have a short-term, indirect beneficial effect by opening the canopy, which could then support a greater abundance of available forage in the form of early seral grasses and forbs. The overall effect from forest product management on livestock grazing is anticipated to be negligible adverse.

Lands and Realty (minor beneficial)
Land disposal acreage has been identified throughout the planning area. Most of the lands identified for consideration for disposal are isolated and generally surrounded by private land. Most land disposed of likely will continue to be grazed under different (e.g., private) ownership. However, the BLM would no longer collect grazing fees. Frequently, land disposal is tied to land exchanges, resulting in no net change in AUMs or only a slight increase or decrease in AUMs. If lands are only disposed of, this would have a direct adverse effect over the long term because grazing fees from public land grazing would decrease. If lands are exchanged, that would have a

direct beneficial effect over the long term because available AUM and associated grazing fees would change only slightly. Overall management actions for land Lands and realty would have a minor beneficial effect on livestock grazing.

Renewable Energy (no effect)
The management actions common to all alternatives for renewable energy will have no effect on livestock grazing management.

Rights-of-Way and Corridors (minor adverse)
Construction that would result from ROW grants and land use authorizations could create noise that would disturb livestock, limit the area available for livestock distribution, and reduce available forage near project sites. However, the development of access and maintenance roads associated with ROW and other land use authorizations could indirectly affect rangeland management by providing better access to allotments and range projects (e.g., water sites, fences, and corrals) and could be used by lessees to guide or retrieve livestock. The preferred location for new ROW would be in or adjacent to existing disturbed areas associated with existing ROW, constructed roads, or highways, therefore minimizing the amount of surface-disturbing activities that would require reclamation. Minimizing the amount of disturbance would directly benefit livestock grazing over the long term. However, the construction of ROW would have a direct adverse effect on livestock grazing over the long term. The overall effect from ROW and corridor management on livestock grazing is anticipated to be minor adverse.

Travel and Transportation Management (minor beneficial)
Under all alternatives, the BLM would design, construct, and maintain roads or trails based on the specific objectives for each trail or road in consideration of other resources. Management actions that reduce erosion of soil that in turn affects vegetation would indirectly benefit forage. Minimizing surface disturbance, minimizing surface water runoff to reduce erosion, and restricting travel to posted/designated roads would directly benefit livestock grazing over the long term by minimizing forage loss and reclamation projects. Limiting access or closing roads could affect grazing lessees and management of livestock; this effect would be indirect and long-term. The beneficial effects would outweigh the adverse effect.

Recreation (minor adverse)
Closing developed recreation sites such as picnic areas, campgrounds, and environmental education areas to livestock grazing would have a direct adverse effect on livestock grazing over the long term. However, development of recreation sites is expected to remove only small acreages in various locations.

Lands with Wilderness Characteristics (no effect)
Evaluating newly acquired lands for wilderness characteristics will have no effect on livestock grazing management.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas (minor adverse)
Special designations would directly and adversely affect livestock grazing if they removed livestock grazing from designated areas for the long term. Limitations or restrictions associated with roads could inconvenience grazing lessees in the performance of general ranch maintenance,

including checking fences and water sources. Physical interaction between recreationists and livestock could stress animals; this would have a direct and adverse, but short-term, effect.

Socioeconomic Resources

Social and Economic Conditions (minor adverse)
Social and economic resources management actions could affect livestock in a way that could increase or decrease grazing activities. The levels of livestock grazing are integrally linked to supply and demand for livestock, which involves local, national, and international economics and politics, and is therefore difficult to predict on the scale of the planning area. The BLM will refer to socioeconomic monitoring plans for, and remain sensitive to, the economic and social health of affected areas, quantify socioeconomic effects associate with BLM actions to the extent possible, and manage in consideration of these resources.

4.6.8.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. The effects described under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative A.

Livestock Grazing Management (minor beneficial)
Under Alternative A, livestock grazing would not be authorized on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing would be allowed on all public lands in the planning area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values. Most of these areas produce little vegetation and have fragile soil surfaces and steep slopes. Any permanent increases in the amount of forage produced would be considered for wildlife and watershed protection before additional livestock use is authorized. Providing increases in forage toward habitat and watershed protection before making it available for livestock consumption helps maintain healthy ecological conditions for these resources, but would have a direct adverse effect on livestock grazing over the long term. To benefit livestock grazing, increases in forage produced would be allocated to livestock as the first priority. Alternative A addresses rest periods from livestock grazing following prescribed fire and other vegetative treatments, including rest the first year following treatment and deferment the second year.

Estimations of surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbance. Fences would disturb approximately 70 acres (80 miles), with successful reclamation on approximately 50 acres (57 miles) and approximately 30 acres disturbed over the long term. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Physical Resources

Soil (major adverse)
Alternative A soils management actions limit surface-disturbing activities on slopes, badlands,

rock outcrops, and slopes susceptible to mass movement; on soils with poor reclamation suitability; and in areas of severe erosional hazard with timing season restrictions. Actions also include reclaiming roads and trails if they are heavily eroded or washed out, or if other access roads in better condition are available. Surface disturbance on public lands can result in the direct removal of forage available to livestock. Projected surface disturbance under Alternative A is anticipated to result in short- and long-term removal of forage. Surface disturbances can have major direct and indirect adverse effects on rangeland health and forage production through the loss of forage, the spread of invasive plant species, and soil erosion.

Water Resources (no effect)
Alternative A does not include water management actions that would affect livestock grazing.

Cave and Karst Resources (no effect)
Alternative A does not include cave and karst management actions.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative A locatable minerals entry would be available on all but 33,299 acres of BLM surface. For the planning area overall it is estimated that BLM actions would disturb less than 1% of public land over the next 20 years. This is a negligible adverse effect on livestock grazing management.

Leasable Minerals – Coal and Fluids (moderate adverse)
Alternative A would open all federal coal lands (federal mineral estate for coal retained by the federal government) outside areas with high development potential to study and exploration, subject to license stipulations necessary to protect other resource values, would allow surface-disturbing activities. However, development would occur only on a small portion of this acreage, but where is does occur, livestock grazing would be excluded. For oil and gas development, only the WSAs (28,931 acres) would be administratively unavailable for leasing. Out of approximately 480 allotments, there are 198 allotments in areas considered as having a very high to moderate potential for conventional oil and gas development, and 43 allotments in high-potential areas for coal development, and 198 allotments in areas with very high to moderate potential for CBNG development. Therefore, all or portions of these allotments would likely be affected by coal and oil and gas development under Alternative A. It is estimated that surface disturbance associated with conventional oil development (vertical and horizontal wells) will have a major adverse impact (10.6%) in the short term. However in the long term due to reclamation it will be a minor adverse impact (3.5%). Minerals development that removes the vegetative layer to extract the minerals, and the possible removal of livestock to achieve successful reclamation, would directly and adversely affect livestock grazing over the long term. Short-term, indirect, adverse effects on the livestock animals include, but are not limited to, respiratory ailments from road dust, vehicle collisions with animals, separation of mothers from calves, noise, and movement of livestock from gates left open. These are short-term events, but they occur over the long term of the leases or permits.

Salable Minerals (negligible adverse)
Alternative A would exclude salable minerals entry on 28,873 acres. For the planning area overall it is estimated that BLM actions would disturb less than 1% of public land over the next 20 years. This is a negligible adverse effect on livestock grazing management.

Fire and Fuels Management (minor beneficial)

Alternative A fire and fuels management actions include suppressing wildfires in high-value areas, rehabilitating fire and suppression damage, and conducting prescribed fires to improve vegetative health and wildfire habitat. Wildfires affect livestock primarily by direct removal of forage until the next growing season, and displacement of livestock in the burn areas for the short term of the fires (days to weeks). Rehabilitation after wildfires also can displace cattle for up to two years. This would have a direct adverse effect on livestock grazing. Rehabilitation also would have a long-term, indirect beneficial effect because it would help replace dead or damaged forage with new seedlings. Prescribed fire would have an indirect beneficial effect by improving the ecological state of vegetation. However, prescribed fire would have an indirect adverse effect, because treated areas would be rested from livestock grazing for a minimum of two years. Long-term estimates for the application of prescribed fire to support grassland and shrubland communities and wildlife habitat objectives include approximately 14,000 acres from BLM actions. All acres would be successfully reclaimed (Appendix G (p. 1671)).

Biological Resources

Vegetation – Grassland and Shrubland Communities (minor adverse)
Alternative A does not include management decisions for grassland and shrublands. Not having management actions guiding these resources has a direct and adverse effect on the vegetation which directly and adversely effects livestock management.

Vegetation – Riparian/Wetland Resources (moderate adverse)
Under Alternative A, prohibiting surface disturbance within 500 feet of springs and perennial streams, if the authorized officer waives the prohibition it would still allow actions in those areas. This management would allow disturbance on approximately 23,831 acres of public land (approximately 3.0% of BLM-administered lands in the planning area). The loss of forage, the need for reclamation, the potential to remove livestock, and the opportunity for invasive species to establish and spread, that might occur from surface-disturbing activity all would have a direct moderate adverse effect on livestock grazing.

Invasive Species and Pest Management (minor beneficial)
Under Alternative A, controlling invasive plant species on public lands in cooperation with county weed and pest control districts would have an indirect beneficial effect on livestock grazing by removing invasive species and improving the ecological state of vegetation, thereby improving the quality and quantity of forage for livestock and wildlife over the long term. Current management has not addressed the invasion of cheatgrass. This annual grass has a direct, adverse, and long-term effect on vegetative communities and is found in all land-type associations. Exact acreages are not known due to a lack of vegetative inventory, but BLM specialists' professional judgment estimates the cheatgrass canopy cover to be 20 to 25% of the planning area, making it a major problem. Control treatments have not been pursued because the plant is not listed on the Wyoming Weed and Pest Control Act Designated List and a lack of funding. Livestock grazing is indirectly and adversely affected because cheatgrass is so competitive with native species, repeatedly outcompeting natives for soil nutrients and available water. It has spread and overtaken thousands of acres. Other than in early spring and late fall, cheatgrass is nutrient deficient and increases grazing pressure on adjacent plant communities from livestock and wildlife.

Fish and Wildlife Resources – Fish and Wildlife (minor beneficial)
Under Alternative A, designating areas where surface-disturbing and disruptive activities are not

allowed would have a direct beneficial effect on livestock grazing because these areas would be protected from removal of vegetative forage.

Special Status Species – Plants, Fish, and Wildlife (minor adverse)
Providing and managing habitat for Threatened and Endangered and special status plant, animal and fish species on all public lands in compliance with the Endangered Species Act, approved recovery plans, and BLM policy associated with management of habitat would have direct adverse effects on livestock grazing. Actions that would close areas to grazing, limit control efforts for invasive species, and restrict vegetative treatments would have direct adverse effects on livestock grazing over the long term. Protecting special status species habitat would have a direct effect on livestock grazing, beneficial or adverse depending on the species. If management actions and the species habitat requirements favor habitat protection over livestock grazing, protective measures would have a direct adverse effect on livestock grazing. If protecting special status species habitat improves ecological conditions, effects would be indirect and beneficial over the long term. The overall effect from special status species management on livestock grazing is anticipated to be minor adverse.

Heritage and Visual Resources (no effect)

Under Alternative A, there would be no effects from cultural and visual resources on livestock grazing management.

Land Resources

Forest Products (negligible adverse)
Alternative A management includes considering fencing regeneration areas to prevent livestock from damaging seedlings. Livestock could graze young saplings to the degree where fencing or some type of protective device might be needed. Fences would have a direct adverse effect on livestock over the short term, and would be constructed on a project-specific basis. The percentage of acres impacted would be less than one, therefore a negligible effect.

Lands and Realty (moderate beneficial)
Under Alternative A, approximately 117,427 acres of BLM-administered land are identified for disposal. Most are isolated and generally surrounded by private land, and have no access; many of these parcels would be associated with a category C allotment. Land disposals have a direct adverse effect on livestock grazing because such actions would reduce the number of public land acres available for grazing over the long term. Land exchanges would have a direct beneficial effect on livestock grazing. However, public land acreages would likely decline because more acres of public lands would be exchanged for fewer acres. Net loss of public lands would be less under land exchanges than land disposals. Land tenure adjustments on Category C allotments would have a direct beneficial effect on the overall grazing program over the long term because there would be less administration for these small isolated parcels.

Renewable Energy (no effect)
There is no previous decision so there will be no effect on livestock grazing management.

Rights-of-Way and Corridors (minor adverse)
ROW grants and land use authorizations are anticipated to disturb 38,562 acres (14,000 acres of pipelines, 18,550 acres of roads, 4,916 acres of powerlines, 56 acres of communication sites, and

1,040 acres of other disturbances) of BLM surface (4.9%). Prompt reclamation will encourage forage recovery. The effect of ROWs and corridors on livestock grazing would be minor adverse.

Travel and Transportation Management (major beneficial)
Alternative A limits motorized vehicle use to existing roads and vehicle routes. Prohibiting vehicular travel in certain areas (approximately 3,704 acres), limiting vehicular travel to designated roads and trails (150,070 acres) in other areas, and seasonally closing areas to vehicular travel (approximately 29,011 acres) would have a direct, minor, beneficial effect on livestock management over the long term. Over 10% of the acres open to grazing would benefit from limiting motorized vehicles, therefore a major beneficial effect.

Recreation (minor adverse)
Livestock could be disturbed by recreational activity and trampling or soil compaction could reduce available forage and promote noxious and invasive plants establishment. Most of the impacts from dispersed recreation would be direct, adverse, site-specific and short-term. Recreational site development is anticipated to disturb about 5 acres with 100% successful reclamation.

Lands with Wilderness Characteristics (no effect)
There are no public lands, outside of WSAs, presently be managed for wilderness characteristics, so there will be no effect on livestock grazing management.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways (no effect), **Wild and Scenic Rivers and Wilderness Study Areas** (negligible adverse)
Under Alternative A, special designations, including ACECs, BCBs, WSRs or WSAs, generally would not result in adverse impacts to livestock grazing. All areas historically open to grazing are open under this alternative. However, special designations adversely impact livestock grazing by limiting or closing roads and trails. These closures could have a direct adverse effect on the grazing lessee for access to perform maintenance activities. Special designation areas under Alternative A affect less than one percent of the planning area, and include one recommended WSR and three WSAs, but no ACEC or BCB.

Socioeconomic Resources (no effect)

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.4. Alternative B

This section describes management actions under Alternative B, which would emphasize resource conservation, and the likely effects on livestock grazing due to their implementation. The impacts described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative B.

Livestock Grazing Management (moderate adverse)
Alternative B livestock grazing management actions include: (1) prohibiting increases in livestock stocking rates as a result of vegetative treatments; (2) providing a minimum of 2 years rest following prescribed fire, wildfire (in lieu of an approved plan), and other vegetative treatments, with additional rest where necessary; (3) limiting or prohibiting livestock grazing

where it has been determined to be incompatible with other resource values; (4) locating livestock salt or mineral supplements a minimum of 0.5 mile from water sources, riparian areas, and aspen stands; (5) designating and managing future resource reserve allotments as needed and developing management criteria for the resource reserve allotments at the time of designation; (6) authorizing permanent increases in forage allocations to wildlife habitat and watershed protection as the first priority, and livestock grazing as a second priority; (7) reducing or eliminating the potential effects of grazing to meet timber harvest regeneration objectives; and (8) Category M allotments would be managed to achieve multiple resource objectives, Category I allotments would have AMP goals/objectives based on multiple resource and livestock grazing, and Category C allotments would continue with minimal input of resource planning and improvements. These allotments are given consideration for land realty sales or exchanges to reduce overall management of small acreage adjacent to private and State of Wyoming lands. Management actions for Category C allotments are common to all alternatives. Prohibiting increases in livestock stocking rates would ensure that benefits to vegetative treatments would not be lost to increased grazing pressure. This would also reduce the incentive of grazing lessees to support vegetative treatments, and treatments would likely be limited to just the public lands. Locating salt or mineral supplements away from water sources would alleviate grazing pressure and entice livestock to move away from accessible water sources. On specific allotments, the number of riparian systems and location of aspen stands could make the 0.5 mile salt and mineral buffer difficult to administer reserve allotments would allow other pastures and allotments to be rested from natural disasters or vegetative treatments if needed. Additional rest allows vegetation to complete two life-cycles, or more if needed, before resuming livestock grazing. This would complicate grazing management since treated locations and pastures would be rested and unavailable for grazing for a minimum of two years. Deferment instead of rest would allow these area to be grazed outside the growing system. Increases in forage would be allocated to watershed protection and wildlife habitat to meet rangeland health standards before making it available to livestock. This could serve as a disincentive for grazing lessees to apply good rangeland management since their livestock would not be the priority to benefit from increases in forage. Protecting new generations of timber species from livestock and wildlife would improve seedling establishment and growth. Other than designating resource reserve allotments, all these actions would put other resource needs as a higher priority than livestock grazing management and they would have an adverse effect over the long term.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Physical Resources

Soil (moderate beneficial)
Soils management actions under Alternative B would prohibit surface-disturbing activities on sensitive soils. This would have an indirect beneficial effect on livestock grazing over the long term, because there would be no loss of forage, no reclamation, and no increased opportunities for invasive species to establish and spread.

Water Resources (minor beneficial)
All Alternative B water management actions would directly benefit livestock management over the long term. Maintaining water supplies to meet needs includes having adequate water for livestock. Powering water sources with alternative energy could allow water sources to be established in remote locations or in areas without a nearby power source, which would open areas to livestock that are seldom grazed. Prohibiting surface-disturbing activities would prevent disturbance of vegetative forage. Not converting abandoned oil and gas wells to water supply wells for livestock use would have direct adverse effect over for the long term; conversion of wells could help with livestock management and use existing water.

Cave and Karst Resources (negligible adverse)
Alternative B cave and karst management actions include restricting livestock from entrances to significant caves. This would keep livestock from going into caves and rock shelters, where they could rub on cave and shelter and possibly affect historical pictographs and other significant rock art. Keeping livestock out of these areas would have a direct adverse effect over the long term. However, the restriction would cover a minimal amount of acreage because it would apply only the entrances. Because there has been no completed cave inventory, the number of caves requiring restrictive actions is not known.

Mineral Resources

Locatable Minerals (minor adverse), **Leasable Minerals – Coal and Fluids** (moderate adverse), **and Salable Minerals** (minor adverse)
Any surface-disturbing activity associated with minerals development, including well pads, coal exploration and leasing, areas of extraction, roads, pipelines, and utility corridors, would require removal of vegetation. These disturbances would have a direct adverse effect on livestock until successful reclamation is achieved. The reclamation process itself also would have a direct adverse effect if livestock were removed from reclamation projects to achieve objectives. Alternative B management would reduce the acreage available for exploration and development by 65% compared to Alternative A. For locatable, salable, and other leasable minerals, the disturbance level and subsequent effects on livestock grazing would be negligible to minor. For leasable fluid minerals and coal, the disturbance level and associated effects would be moderate.

Fire and Fuels Management (minor adverse)

Unplanned fire management actions have an indirect and adverse effect on livestock grazing. Vegetative communities infested with cheatgrass will respond with more cheatgrass due to the additional nitrogen put into the soil by the fire. Suppression efforts would directly benefit livestock grazing by limiting the sizes and locations of the unplanned fires. Allowing unplanned fires to burn in areas where fire can be used as a management tool would have a direct adverse effect over the short term due to the loss of the forage. Over the long term, unplanned and prescribed fire could help improve the vegetative ecological condition, which would translate to improved forage quality and increased quantity. This would have an indirect beneficial effect on livestock grazing. Management actions to rehabilitate all fire-related damage would have a direct, short-term adverse effect if livestock were removed to achieve reclamation objectives. Rehabilitation would have a direct, long-term beneficial effect if the ecological state of the rehabilitated sites was improved and there was an improvement in forage quality and quantity. Overall, the effects from fire and fuels management would have a minor adverse effect on managing livestock grazing.

Biological Resources

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Under Alternative B, authorizing only native plant species for all reclamation activities would promote native species and eliminate or reduce opportunities for non-native species to be introduced. Use of non-native species could have an indirect beneficial effect on livestock grazing by establishing vegetation on sites quickly and reducing opportunities for erosion and invasive plant establishment.

Vegetation – Riparian/Wetland Resources (minor beneficial)
Alternative B management actions to prohibit surface-disturbing and disruptive activities within 500 feet of riparian/wetland systems, aquatic habitats, and floodplains would affect approximately 23,831 acres BLM-administered lands in the planning area, and does not include the provision for the authorized officer to waive the prohibitions. This would have a direct beneficial effect on livestock grazing over the long term.

Invasive Species and Pest Management (major beneficial)
Alternative B management actions that do not limit aerial application of pesticides and would treat annual brome species throughout the planning area would indirectly benefit livestock grazing. Aerial application of herbicide allows treatment of large areas and in remote areas. Large-scale treatments of invasive plant species would allow native species to prosper in treated areas. Treating cheatgrass also would reduce or eliminate this nutrient-deficient and less palatable invasive species that has affected thousands of federal, state, and private lands. These effects would be minor for noxious weeds and major for cheatgrass, and the effects would be long term for both.

Fish and Wildlife Resources – Fish (negligible adverse)
Alternative B management actions would consider fish and fish habitat in reservoirs, riparian and wetland systems. Alternative B would apply constraints on surface disturbing and disruptive activities on one percent of acres open to grazing would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Fish and Wildlife Resources – Wildlife (minor adverse)
Alternative B management actions include not allowing surface disturbance and disruptive activity in crucial elk winter range (50,586 acres) between November 15 and April 30, and in elk calving areas (37,549 acres) from May 1 to June 30 (Map 23). Also no surface disturbance and occupancy within 0.25 miles of all sharp-tailed grouse leks at any time has a negligible effect on livestock grazing. Prohibiting surface disturbance and disruptive activities within 0.5 mile of a big game migration corridor affects 15,559 acres. Traditional migration and travel corridors would be maintained for big game species. Alternative B avoids constrictions of big game corridors and restricting facility development and occupancy within elk crucial winter range and calving areas. Migration and travel corridors would be maintained for big game; this would be have to be done in cooperation with adjacent private land owners due to the mixed land status in these areas. Management of these areas primarily for wildlife could impact the management of livestock by limiting or restricting activities in these areas during stated time periods. Excluding surface disturbing activities would have a direct benefit to livestock management since forage plants would be available for grazing and opportunities for invasive plants to establish would be limited. The actions that promote wildlife management would have direct adverse effects on livestock management over the long term.

Special Status Species – Plants (moderate adverse)
Alternative B would restrict livestock grazing to prevent trampling by livestock, and would not allow water developments or mineral, salt, or forage supplements in special status plant species habitat or in other sensitive areas. These restrictions would have a direct adverse effect on livestock grazing over the long term. The allotments where there are special status plant species are a mixture of federal, State of Wyoming, and private ownerships. Protecting special status plant habitat on public lands would likely require the construction of fences to keep livestock out. Protecting potential habitat could require special management or no presence of livestock on hundreds of acres based on the possibility that one plant could be present. Special status species plant management would likely have a moderate adverse effect on managing livestock grazing.

Special Status Species – Fish (negligible adverse)
Alternative B would apply constraints on surface disturbing and disruptive activities on one percent of acres open to grazing would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Special Status Species – Wildlife (major adverse)
Increasing the visibility of existing fences to avoid collision from upland game birds would slightly increase costs of range improvement fences. Requiring anti-perching devices in Greater Sage-Grouse habitat would protect young livestock, especially lambs, from raptor predation. Protecting special status wildlife species could conflict with livestock grazing if habitat requirements are contrary to typical habitat requirements, such as those of prairie dogs and mountain plover (approximately 6,156 acres). These habitats are associated with short-grass prairie dominated by blue grama, and these species require an early seral vegetation state to thrive. Prohibiting surface disturbance would have a direct beneficial effect on livestock grazing; however, maintaining current levels of prairie dog populations and not encouraging improvement of the ecological state would have a direct adverse effect on livestock grazing. Prohibiting surface disturbing activities and disruptive activities could alter locations and timing of installation of range improvements and general ranch management of livestock (e.g., livestock roundups, timing and ability of maintenance/repair of range improvements). Inventories to determine the presence or absence of species could increase costs and affect timeframes of project planning and completion.

Closing grazing within 4.0 miles of Greater Sage-Grouse leks or winter concentration areas would have a major adverse impact on livestock grazing (approximately 467,897 acres of the total 782,102 acres (60%) would be affected. There are no fences or natural barriers separating BLM and non-BLM-administered lands. If the public lands are not leased, the operator must keep livestock off public lands through herding or fencing, or else be in violation of federal grazing regulations. The mixed ownership pattern in the BFO resource area makes herding difficult, in addition to the fact that herding does not ensure that public lands are not grazed. Fences will likely be constructed on private land, fragmenting the area and making BLM unable to stipulate wire spacing to facilitate wildlife movement. In the absence of fences, the BLM must constantly supervise the public lands to assure they are not being grazed.

Restoration of disturbed sagebrush communities due to range improvement projects such as stock water pipelines within nesting, brood-rearing and winter habitat would have a minor adverse impact.

Prohibiting surface disturbance and disruptive activities, and the establishment of disturbance-free zones for Greater Sage-Grouse, raptors, amphibians and reptiles would adversely affect livestock management since these only apply (unless it is associated with mineral leasing) to public land parcels which are usually small in acreage and locations are scattered among private lands. Maintaining the integrity of traditional wildlife migration and travel corridors could also impact management of livestock; these also would comprise a mixture of land statuses. Overall these management actions would have a major adverse impact on livestock management for the long term.

Overall these management actions would have a major adverse impact on livestock management for the long term.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (minor adverse)
Alternative B cultural resources management actions that restrict or prohibit surface-disturbing activities related to energy development (approximately 330,592 acres, or 42% of the BLM surface in the planning area) would have a direct beneficial effect on livestock grazing. Management actions that require paleontological field surveys on all PFYC Class 3, 4, and 5 formations (approximately 754,668 acres, or 96% of BLM surface in the planning area) would have an indirect adverse effect on livestock grazing. Those surveys and the identification of cultural or paleontological resources could prohibit the placement of a range improvement project, or cause the project to be moved such that it would greatly increase the cost of or cancel the project.

Land Resources

Forest Products (negligible adverse)
Alternative B management actions would address conflicts between livestock grazing and forest species regeneration. Livestock can graze young saplings, so fencing or other types of barriers would be required. This would have a direct adverse effect on livestock grazing over the short term until regeneration objectives were met.

Lands and Realty (minor beneficial)
Alternative B management actions to pursue land tenure adjustments or sales on lands with custodial grazing allotments to improve management of the public lands would directly benefit livestock grazing over the long term. Land disposal would have a direct adverse effect on livestock grazing because it would reduce the amount of public land acres available for grazing. Land exchanges would directly benefit livestock grazing. However, public land acreages would likely decline because more acres of public lands would be exchanged for fewer acres. Net loss of public lands would be less under land exchanges than land disposals. Land tenure adjustment on Category C allotments could affect up to 202,012 acres of federal land. This would directly benefit the overall grazing program over the long term by reducing the administration effort necessary to manage 293 custodial allotments that encompass these small isolated parcels of federal lands.

Renewable Energy (minor adverse)
Under Alternative B, development of renewable energy would be excluded on approximately 710,376 acres of public land and avoided on an additional 67,319 acres of public land. Less than two percent of BLM-administered lands within grazing allotments could possibly be affected by renewable energy development. Under this alternative, there could be renewable-energy development in areas not presently disturbed by other energy development. With the reduction

in available forage either through surface-disturbance or fencing, this management action has a minor adverse effect on livestock grazing management.

Travel and Transportation Management (minor beneficial)
Alternative B management actions would limit motorized vehicle use to designated routes within stock driveways. This would reduce adverse effects on forage and potential interactions between livestock and human activities. Closing areas to motorized travel in special status species habitat would adversely affect grazing lessees. Prohibiting vehicular travel and implementing seasonal closures or limitations would reduce disturbance from livestock and adverse effects on forage from trampling or soil compaction. This management would directly benefit livestock grazing over the long term. Administratively closing areas to motorized travel would preclude permitted access for grazing purposes unless such access is determined to be necessary. This would have a direct and adverse impact to management of livestock for the long term. The benefits of protecting forage vegetation outweigh the inconvenience of reduced motor vehicle access, resulting in an overall minor beneficial effect.

Recreation (minor adverse)
Alternative B designates seven SRMAs (55,529 acres; 7%) of the BLM-administered land within the planning area and eight ERMAs (726,573 acres). Only small portions of a few of the SRMAs have areas that livestock grazing is currently excluded. Prohibiting surface disturbance in designated SRMAs, unless the disturbance is for administrative purposes, would generally help protect, maintain, and enhance vegetative resources. However, promoting visitor use and access in the SRMAs, would increase the areas' popularity and visitation. This would increase vegetation disturbance from trampling, increase the potential for invasive species introduction and spread, and could result in conflicts between recreationists and livestock. Designation of the ERMAs will not have any effects on livestock grazing.

Alternative B also proposed to close 372 acres along the Tongue Rive of the Welch Ranch Recreation Area to grazing. This closure would have an overall negligible (<1%) adverse effect on livestock grazing management. However, to the individual grazing allotment on the Welch Ranch it would be a major adverse effect. Management actions would have an overall minor adverse effect on livestock grazing management.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative B actions would include managing the full LWC area to emphasize vegetative health, natural values, and primitive recreational opportunities on 12,237 acres. With limited surface-disturbing activities, this area would conserve vegetation on the acres open to grazing in the planning area. Managing for wilderness characteristics generally does not preclude livestock grazing. Managing these lands to those standards would have an indirect, negligible, beneficial effect over the long term.

Special Designations (negligible adverse)

Special designations could affect livestock grazing by limiting or closing roads and trails. This would indirectly benefit livestock, but could have a direct adverse effect on the grazing lessee for access to perform ranch maintenance activities. Effects would be long-term, but negligible. Special designation areas under Alternative B include eight ACECs, six potential byways, one recommended WSR, and three WSAs.

Socioeconomic Resources (no effect)

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.5. Alternative C

This section describes management actions under Alternative C, which emphasizes resource utilization, and the likely resulting effects on livestock grazing due to its implementation. The effects described above under Impacts Common to All Alternatives would be in addition to the effects described below for management actions under Alternative C.

Livestock Grazing Management (moderate beneficial)
Alternative C management actions include taking no action to reduce or eliminate the effects of livestock grazing impacts on timber regeneration following timber harvests. Alternative C management actions would support increases in livestock stocking rates as a result of vegetative treatments. This Alternative would provide a maximum two years of rest following vegetative treatments or wildfire (if no rehab plan of its own). Under Alternative C, growing-season rest would allow vegetation to complete two life-cycles, but pastures or allotments would be available for late summer, fall, and winter grazing. Alternative C limits or prohibitions on livestock grazing in certain areas would be the same as Alternative A; closing areas to livestock grazing would reduce conflicts with other uses. These areas would generally be small, ranging from two to 20 acres, and likely would not affect permitted use on the grazing lease. Locating livestock mineral or salt supplements a minimum of 500 feet away from water sources, riparian areas, and aspen stands, would directly benefit livestock grazing by ensuring livestock would not be stressed in obtaining these dietary requirements, but could promote overgrazing and potential trampling of vegetation on these sensitive sites, including habitat for special status plant species. Under Alternative C, not establishing reserve allotments would prevent flexibility in planning vegetative treatments and addressing droughts and pest invasions. If reserve allotments were not available, adjustments in livestock numbers, season of use, and grazing periods would be necessary. Alternative C would authorize permanent increases in forage allocations to livestock grazing as the first priority and wildlife habitat and watershed protection as a second priority. Authorizing increases in forage to livestock would be an incentive for grazing lessees to enhance grazing practices. Category M allotments would be managed to achieve livestock management objectives only. Category I allotments would have AMP goals/objectives based livestock management only.

Estimations for surface disturbance over the planning area in the next 20 years for range improvement projects consist of spring developments, pipeline developments, fence construction, and well developments. Spring developments are estimated to disturb approximately 4 acres, with successful reclamation on 2 acres and 2 acres of long-term disturbance. Pipelines are estimated to disturb 40 acres, with successful reclamation on 35 acres and 5 acres of long-term disturbances. Fences would disturb approximately 100 acres (120 miles), with successful reclamation on approximately 70 acres (84 miles) and approximately 30 acres of long-term disturbance. Wells are estimated to disturb one acre, with successful reclamation (Appendix G (p. 1671)).

Physical Resources

Soil (major adverse)
Alternative C soil management actions would not constrain surface-disturbing activities. Allowing surface-disturbing activities on more than 50% of BLM-administered lands available for grazing would decrease available forage and increase opportunities for invasive species to

establish and spread throughout the planning area. This would have direct, major adverse effect on livestock grazing.

Water Resources (moderate adverse)
Alternative C management actions include allowing on-channel reservoirs in the most productive forage sites. Surface discharge would be authorized when permitted by the State of Wyoming, which would allow upland sites to convert to hydric and invasive species. Allowing surface disturbance within 500 feet of springs, perennial streams, and riparian habitat would have a direct adverse effect on livestock grazing by removing or decreasing the quality and quantity of forage.

Cave and Karst Resources (negligible beneficial)
Alternative C cave and karst management would not constrain livestock grazing in those areas.

Mineral Resources

Locatable Minerals (minor adverse), **Leasable Minerals – Coal and Fluids** (major adverse), **and Salable Minerals** (minor adverse)
Alternative C mineral resources management would not include new withdrawal from minerals entry. All coal lands would be open to coal exploration and leasing (approximately 195,700 acres of predicted disturbance). Although all acres would available for coal exploration, leasing history shows only a small portion would actually be developed. Alternative C would make approximately 3,356,009 acres of federal mineral estate available for fluid minerals leasing. It is estimated that surface disturbance associated with conventional oil development (vertical and horizontal wells) will have a major adverse impact (11.6%) in the short term. However in the long term due to reclamation it will be a minor adverse impact (3.8%). Exploration would disturb soils, which would result in lost forage. Removing vegetation would have a direct adverse effect on livestock grazing until disturbed areas were successfully reclaimed. The reclamation process itself also would have a direct and adverse effect if livestock were removed from reclamation projects to achieve reclamation objectives.

Fire and Fuels Management (minor adverse)

Full protection of resources would limit size of wildfires, not allowing historical fire patterns to return and would not limit heavy equipment impacts on forage. Management actions to rehabilitate all fire related damage is a direct and adverse impact for the short term if livestock are removed to achieve reclamation objectives. Rehabilitation is a direct benefit long-term if the ecological state of the rehab sites is enhanced and there is an improvement in forage quality and quantity. Use wildfire and other vegetative treatments (prescribed fire) to enhance forage for commodity production is a direct benefit for the long term. Overall the effect of the management action for fire and fuels would have a minor adverse effect on livestock grazing.

Biological Resources

Vegetation – Grassland and Shrubland Communities (moderate adverse)
Under Alternative C, allowing non-native plant species for initial reclamation could introduce species that out compete native plants; such plant species also could be less palatable and less nutritious for livestock. This would have a direct adverse effect on livestock grazing over the long term.

Vegetation – Riparian/Wetland Resources (moderate adverse)
Alternative C management actions would allow surface-disturbing and disruptive activities within 500 feet of riparian/wetland systems, which would remove any protective buffer from these vegetative systems. This would have a direct adverse effect on livestock grazing over the long term. Managing riparian/wetland systems to achieve DFC could affect livestock grazing because the priority management actions would focus on the health and functioning of the systems. Overall, this management would likely have a direct adverse effect on livestock grazing.

Invasive Species and Pest Management (moderate adverse)
Alternative C management would limit aerial application to insecticides only, which would eliminate the opportunity to treat invasive plant species in large areas, remote locations, and on topography difficult to traverse. The most effective method of herbicide application on cheatgrass and leafy spurge would be eliminated. This would have an indirect adverse effect on livestock grazing. Effects would be minor for most invasive plant species, moderate for leafy spurge in the PRB, and major for cheatgrass throughout the planning area; all effects would be long-term. Over the next 20 years, BLM actions are predicted to treat approximately 10,000 acres.

Fish and Wildlife Resources – Fish (negligible beneficial)
Alternative C would not apply constraints on surface disturbing and disruptive activities on 1% of acres open to grazing and would not provide protection of vegetation, soils and forage. Since livestock will not excluded from these areas, there would be a negligible beneficial effect on grazing. Overall, there would be a negligible beneficial effect on livestock grazing management.

Fish and Wildlife Resources – Wildlife (moderate beneficial)
Alternative C wildlife management actions, including upland game birds, amphibians and reptiles, migratory birds, special status fish, and special status amphibians and reptiles would not be implemented on a project-specific basis. There would be no prohibitions or limitations on surface-disturbing and disruptive activities except in areas with known populations of species, in designated areas, and during designated periods. Migration and travel corridors composed of mixed land status would be managed consistent with other resource values rather than primarily for big game. Management actions for special status fish would prohibit surface-disturbing and disruptive activities if adverse effects could not be mitigated. Prohibiting or limiting surface disturbing activities would have a beneficial effect on livestock grazing. Management actions that are consistent with other resource values have an indirect and direct, moderate, beneficial effect on livestock management for the long term.

Special Status Species – Plants (negligible adverse)
Under Alternative C, the BLM would manage livestock grazing to protect known populations of special status plant species. Possible tools to accomplish this include exclosures, barriers, and timing of grazing. This would have a direct, negligible adverse effect on grazing, but protected areas would incorporate small acreages overall. Over time, as populations of listed species are identified, protected areas would increase.

Special Status Species – Fish (negligible adverse)
Alternative C management actions would prohibit surface-disturbing activities in less than one percent of the acres open for livestock grazing, this would improve the amount of forage available in those areas. If livestock was eliminated in the areas where stream segments area restored for special status fish species, there would be a negligible adverse effect.

Special Status Species – Wildlife (minor adverse)
Alternative C management would maintain current levels of prairie dog populations and not

encourage improvement of the ecological condition. This would have a direct adverse effect on livestock grazing. Allowing surface-disturbing and disruptive activities in all prairie dog colonies would affect 6,156 acres. Such activities could displace the prairie dogs to another location, where they likely would affect the vegetation to a lower ecological state. This would increase the area of vegetative disturbance and would have a direct, negligible adverse effect on livestock grazing over the long term.

There would be no emphasis to increase visibility of fences to avoid collision from upland game birds. Anti-perching devices in Greater Sage-Grouse habitat would only be required for new powerlines and would protect young livestock, especially lambs, from raptor predators. Prohibiting surface disturbing activities and disruptive activities could alter locations and timing of installation of range improvements and general ranch management of livestock (e.g. livestock roundups, timing and ability of maintenance/repair of range improvements). Inventories to determine the presence or absence of species could increase costs and affect timeframes of project planning and completion. Prohibiting surface disturbance, disruptive activities, and the establishment of disturbance-free zones would exist for Greater Sage-Grouse and raptors, not amphibians and reptiles; these limitations are smaller in acreage and time span. This would adversely affect livestock management since these only apply to public land parcels (unless it is associated with mineral leasing) which are usually small in acreage and locations are scattered among private lands. Managing traditional wildlife migration and travel corridors consistent with other resources could also impact timing, numbers, and presence or absence of livestock; managing livestock in these localized areas would also be difficult because of the mixture of land status. These management actions would have a minor adverse impact on livestock management for the long term.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (minor adverse)
Alternative C management actions would not restrict or prohibit surface-disturbing activities related to energy development and would have a direct, minor adverse effect on livestock grazing. Management actions would require field surveys for paleontological resources. This could have a direct adverse effect on livestock grazing if identifying resources prohibited range improvement projects or caused projects to be moved or cancelled.

Land Resources

Forest Products (negligible beneficial)
Alternative C management would not address conflicts between livestock grazing and forest species regeneration. Livestock could graze young saplings, and fencing or other type of barriers would not be required. This would directly benefit livestock grazing over the long term.

Lands and Realty (major adverse)
Alternative C management would not pursue land tenure adjustments and sales for lands with custodial grazing allotments to improve management of the public lands. This would have a direct, major adverse effect on the administration of livestock grazing on public land over the long term. This would have a direct adverse effect on the overall grazing program over the long term by not reducing the administrative effort necessary to manage 293 custodial allotments that encompass these small isolated federal parcels.

Renewable Energy (major adverse)
Under Alternative C, renewable energy could affect all but 28,551 acres (less than 10%) of BLM surface. If large tracts of public land were disturbed and vegetation removed or fenced out long term, this management would have a direct, major adverse effect on livestock grazing over the long term. Renewable energy could be developed in areas not presently disturbed by other energy development.

Travel and Transportation Management (minor adverse)

Alternative C management actions would allow motorized vehicles within the stock driveways, on saturated soils and on slopes greater than 25%, and in special species habitat. Management actions would close or limit travel to designated routes to motorized vehicle use and would implement winter closures (November 15 to April 30) on designated big game ranges. These actions would have a direct, long-term, minor, adverse effect by not protecting the protecting the soil or vegetation resources.

Recreation (minor adverse)
Alternative C management actions include designation of six areas as SRMAs with no consideration to additional lands for SRMA designation, leasing minerals in accordance with management for areas surrounding SRMAs, and allowing surface disturbance and salable minerals development in the six designated SRMAs. This would have a direct, minor adverse effect.

Lands with Wilderness Characteristics (no effect)
There are no special restrictions related to lands with wilderness characteristics so there will be no effect on livestock grazing management.

Special Designations

Areas of Critical Environmental Concern and Scenic or Back Country Byways (no effect), **and Wild and Scenic Rivers and Wilderness Study Areas** (negligible adverse)
Special designations under Alternative C could affect livestock grazing by limiting or closing roads and trails. This would indirectly benefit livestock, but could have a direct adverse effect on the grazing lessee for access to perform ranch maintenance activities. Effects would be long-term, but negligible. Special designation areas under Alternative C include one recommended WSR and three WSAs. There would be no effect from ACECs or byways.

Socioeconomic Resources (no effect)

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative.

This section describes management actions under Alternative D and the likely resulting effects on livestock grazing due to their implementation. The effects described above under Impacts

Common to All Alternatives would be in addition to the effects described below for management actions under Alternative D.

Livestock Grazing Management (moderate beneficial)
Alternative D management actions include timber restoration treatments as described under Alternative B; reducing or eliminating potential grazing impacts on timber restoration treatments until regeneration objectives are met, rather than suspending or adjusting livestock grazing use in areas where timber harvest have occurred. Alternative D management of Category M allotments would be the same as under Alternative B. Any permanent increases in forage allocations are considered for watershed protection, livestock grazing, wildlife habitat, and other resource values; allocation would be dependent upon resource goals and objectives of management plans or resource needs. Alternative D would continue to not authorize livestock grazing on approximately 4,000 acres of public land in the canyons and slopes of the southern Big Horn Mountains because of the rough terrain and steep slopes. Livestock grazing would be allowed on all public lands in the planning area except on approximately 6,000 acres (1%) where it has been determined to be incompatible with other resource uses or values. Most of these areas produce little vegetation and have fragile soil surfaces and steep slopes. Preferred management actions would allow livestock grazing on all public lands except where an evaluation has determined it would be incompatible with other resource uses or values, e.g., established campgrounds, entrances of caves. These authorized livestock grazing restrictions are limited to small acreages, estimated to be between 1 and 20 acres. Mineral and salt placement would be managed as described under Alternative C. Reserve allotments will be managed as described under Alternative B. Rest and deferment following prescribed fires or other vegetative treatments would continue until resource objectives were met. Livestock stocking rates would be allowed to increase based on these vegetative treatments. Management actions have a direct moderate beneficial effect on livestock grazing for the long term.

Physical Resources

Soil (moderate adverse)
Alternative D soils management actions would allow surface-disturbing activities on sensitive soils when resource objectives can be met. This would have an adverse effect on livestock grazing because areas of disturbance would have to be reclaimed and surface-disturbing activities would promote the establishment and spread of invasive species. These adverse effects would be indirect and long-term.

Alternative D would restrict development on more than 50% of BLM surface. Alternative D would work toward ensuring that projects are capable of being reclaimed before the BLM would approve them. Alternative D soils management would have a moderate adverse effect on livestock grazing.

Water Resources (minor beneficial)
Alternative D water management actions would allow abandoned oil and gas wells to be converted to water supply wells if a beneficial use can be demonstrated. Existing water supply sources would be maintained where possible, and the development of new water supply sources would be allowed to meet demand, consistent with management of other resources. Alternative D would encourage the use of alternative sources of energy (e.g., solar and wind) rather than overhead power or petroleum-based power to power new water resource developments. Actions to make water available would directly benefit livestock grazing over the long term. Alternative D water management actions would have a minor beneficial effect on livestock grazing.

Cave and Karst Resources (negligible adverse)
Alternative D management actions would restrict livestock from entrances to significant caves. This would have a direct, long-term, but negligible adverse effect on livestock grazing because it would incorporate minimal total acreage.

Mineral Resources

Locatable Minerals (negligible adverse)
Alternative D would open 3,232,508 acres of mineral estate to locatable minerals entry greater than 80% of lands with a grazing lease). It is doubtful that mineral development would occur on all of those acres. For the planning area overall it is estimated that BLM actions would disturb approximately 1,252 acres of public land over the next 20 years. This is a negligible adverse effect (less than 1%) on livestock grazing management.

Leasable Minerals – Coal (minor adverse)
All coal lands would be open to coal exploration and leasing (approximately 195,700 acres of predicted disturbance). Although all acres would available for coal exploration, leasing history shows only a small portion would actually be developed.

Leasable Minerals – Fluids (minor adverse)
Under this alternative, there would be 138,558 acres of federal mineral estate open for exploration, and 101,214 acres federal mineral estate administratively unavailable for fluid minerals leasing. This management would have a direct adverse effect on livestock grazing. Specifically, it is estimated that surface disturbance associated with conventional oil development (vertical and horizontal wells) will have a moderate adverse impact (9.4%) in the short term. However in the long term due to reclamation it will be a minor adverse impact (3.1%). There is no anticipated disturbance from geothermal related activity.

Salable Minerals (negligible adverse)
Alternative D would open 2,957,960 of federal mineral estate to salable minerals exploration and development and close 390,162 acres. For salable minerals development over the next 20 years, the estimated areas of surface disturbance would total 1,193 acres; 224 acres would be reclaimed, leaving 969 acres long-term disturbance (0.1%). Therefore there would be a negligible adverse effect by reducing available forage for livestock grazing.

Fire and Fuels Management (minor beneficial)

Alternative D response to wildland fires would be the same as described under Alternative B. Alternative D would prohibit heavy equipment use in specified areas except when human safety would be at risk or if the expected effects of the fire would cause more resource damage than the use of heavy equipment. Prohibiting heavy equipment would directly benefit vegetation over the short and long terms. Full protection strategies and tactics would be used in designated areas on approximately 38,760 acres; all protective measures would directly benefit vegetation over the long term, unless allowing a fire to burn would improve vegetative health. Alternative D would use wildfire and other vegetative treatments to meet fire and fuels management objectives. These actions would have an indirect minor beneficial effect on livestock grazing over the long term.

Biological Resources

Vegetation – Grassland and Shrubland Communities (moderate beneficial)
Alternative D would allow the use of non-native species for initial reclamation, as incorporated in an approved reclamation plan. Achieving successful reclamation would remove possible restrictions on livestock grazing and help control invasive species. This would indirectly benefit livestock grazing over the long term.

Vegetation – Riparian/Wetland Resources (negligible adverse)
Alternative D would allow surface-disturbing activities in riparian/wetland areas when resource objectives can be met and vegetation in CBNG-supported wetland/riparian systems is restored to ecological site potential. In the short term, surface-disturbing activities on 23,831 acres (less than 3% of the acres open to grazing) will cause a minor adverse effect due to the loss of forage. In the long term, with the restoration of most of the riparian vegetation, this would have an indirect negligible adverse effect on livestock grazing.

Invasive Species and Pest Management (moderate beneficial)
Alternative D would authorize aerial applications of pesticides in areas where topography, extent of infestation, target species, and timing limit other application methods. Annual brome areas would be designated and prioritized for treatment. Both these actions would directly benefit vegetative communities in the planning area over the long term, and would have a direct moderate benefit effect on livestock grazing.

Fish and Wildlife Resources – Fish (negligible adverse)
Alternative D management actions would consider fish and fish habitat in reservoirs, riparian and wetland systems. Alternative D would apply constraints on surface disturbing and disruptive activities on 6% of acres open to grazing would provide protection of vegetation, soils and forage. If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Fish and Wildlife Resources – Wildlife (minor adverse)
Alternative D wildlife management would include prohibiting disruptive activity in crucial big game winter range (81,437 acres) during WGFD specified dates, and in elk calving areas (37,549 acres) during WGFD specified dates (Map 23). Historic uses, including livestock grazing, would be exempted. Management actions also include maintaining and reestablishing identified traditional priority travel corridors for big game species and include prohibiting construction of new travel barriers within 0.5 mile of identified big game priority travel corridors (15,559 acres), reducing barriers with cooperation of other agencies, and avoiding constrictions of big game corridors. Allowing above ground facility development within elk crucial winter range and calving areas in when resource objectives can be met. Management actions that exempt historic uses such as livestock grazing are beneficial, other management actions would have direct and indirect minor adverse effects on management of livestock over the long term.

Special Status Species – Plants (negligible adverse)
Alternative D management actions for special status plant species include allowing the placement of water developments and mineral or salt supplements in special status species habitat, but not in areas with known populations these species. This would have a direct, negligible adverse effect on livestock grazing over the long term by slightly limiting the areas where water developments and supplements can be placed.

Special Status Species – Fish (negligible adverse)
Alternative D would apply constraints on surface disturbing and disruptive activities on less than one percent of acres open to grazing and would provide protection of vegetation, soils and forage.

If livestock were excluded from these areas, there would be an adverse effect on grazing. Overall, there would be a negligible adverse effect on livestock grazing management.

Special Status Species – Wildlife (moderate adverse)
Alternative D would allow surface-disturbing and disruptive activities in active prairie dog colonies on BLM surface in accordance with identified criteria, if those activities would not adversely affect suitable habitat for special status species that depend on prairie dog colonies. Both the surface disturbance and the protection of the black tailed prairie dog towns would have a direct and adverse effect on livestock grazing for the long term. Existing fences will be prioritized for modification and new fences will meet visibility requirements. Anti-perching devices would be required on new powerline in occupied Greater Sage-Grouse habitat; these also would protect young livestock, especially lambs, from raptor predation.

Prohibiting surface disturbing activities and disruptive activities in Greater Sage-Grouse Core Population Area and Connectivity Corridor, and certain areas outside of them could alter locations and timing of installation of range improvements and general ranch management of livestock. The extent of the effects would vary slightly between the different areas, but all would be moderately adverse. Prohibiting surface disturbance and disruptive activities, and the establishment of disturbance-free zones would exist for Greater Sage-Grouse and raptors. These activities would be avoided for amphibians, reptiles, and bats and their habitats. Prohibitions and avoidances would adversely affect livestock management since these only apply to public land parcels (unless it is associated with mineral leasing) and could be difficult to administer due to land status. Traditional wildlife corridors will be maintained or enhanced, travel corridors will be managed in consistency with other resource values. These could affect location and timing of grazing by livestock, livestock numbers, and increase the complexity of grazing livestock in these localized areas of mixed land status. Overall, Alternative D management actions would have a moderate adverse impact on livestock management for the long term.

Heritage and Visual Resources (minor adverse)

Alternative D management action would prohibit surface disturbances on identified cultural resources sites and would allow disturbance and infrastructure on other identified sites if they would result in a weak visual contrast with the surrounding area. This would have a direct adverse effect on livestock grazing. Alternative D management actions would require paleontological field surveys, which could have an indirect adverse effect if those surveys and identified locations of paleontological resources would prohibit the placement of range improvement projects or cause projects to be cancelled. Overall, Alternative D management of cultural, paleontological, and visual resources would have a minor adverse effect on livestock grazing.

Land Resources

Forest Products (negligible adverse)
Alternative D management actions include protecting forest regeneration areas, but would not require fencing. Protective measures would include keeping livestock out of these areas. This would have a direct, negligible adverse effect on livestock grazing over the long term.

Lands and Realty (minor beneficial)
Alternative D management actions to address land tenure adjustments on lands with custodial grazing allotments would be the same minor beneficial effect as management under Alternative B.

Renewable Energy (minor adverse)
Alternative D management actions would exclude renewable-energy development in the southern Big Horn Mountains, areas closed to mineral leasing for fluids and solids, locatable minerals, salable minerals, ROW exclosures areas, and other areas where surface disturbance is prohibited for a total exclusion acreage of 413,001 public land acres. Renewable energy development would also be avoided on 271,455 public land acres, leaving less than 6% of public land available for development. Overall it is estimated that BLM actions would disturb approximately 75,240 acres over the next 20 years. Reclamation would occur on 50,240 acres of BLM, leaving 25,000 acres (approximately 3% of the public land) of long-term disturbance (Appendix G (p. 1671)). Development where it is allowed would have a direct and minor adverse effect on the vegetation and on livestock grazing over the long term.

Travel and Transportation Management (minor beneficial)
Alternative D would close special designation areas to motorized vehicle use. Motorized vehicle use in stock driveways would be allowed on designated routes. Motorized vehicle use would be allowed with travel management designations in special status species habitat and on saturated soils or on slopes 25% or greater. Alternative D would limit motorized vehicle travel to designated roads and trails, consistent with management of other resources and would seasonally prohibit travel in game ranges. Alternative D management actions would have a direct, minor beneficial effect over the long term.

Recreation (minor adverse)
Alternative D designates seven areas as SRMAs (54,160 acres) and eight ERMAs (349,663 acres). Prohibiting surface disturbance in designated SRMAs unless for administrative use would generally help protect, maintain, and enhance vegetative resources. Alternative D allows additional recreation facilities consistent with other resource values which would have a direct adverse effect on vegetation in and around the facilities and could possibly prohibit livestock grazing in these facilities, the effect would be long term. Only small portions of a few of the SRMAs have areas that livestock grazing is currently excluded. Visitor use and access is promoted in SRMAs which would increase popularity and visitation. Increased human activity could promote vegetation disturbance from trampling, increase livestock animal and human interactions, and increase the potential for introduction and spread of invasive plant species; these would have an adverse effect. However, designated SRMAs would also provide increased education opportunities to reduce conflicts. Designation of the ERMAs will not have any effects on livestock grazing. Overall, these management actions would have a minor adverse effect on livestock grazing over the long term.

Lands with Wilderness Characteristics (negligible beneficial)
Alternative D actions would include managing to emphasize vegetative health, natural values, and primitive recreational opportunities on about 6,864 acres in the LWC unit. With limited surface-disturbing activities, this area would conserve vegetation on less than one percent of the acres open to grazing in the planning area. Managing for wilderness characteristics generally does not preclude livestock grazing. Managing these lands to those standards would have an indirect, negligible, beneficial effect over the long term.

Special Designations

Areas of Critical Environmental Concern, Scenic or Back Country Byways, Wild and Scenic Rivers, and Wilderness Study Areas (negligible adverse)
Special designation areas under Alternative D include three ACECs, six potential byways, one

recommended WSR, and three WSAs. These special designations generally would not result in adverse impacts to livestock grazing. All areas historically open to grazing are open under this alternative. However, special designations adversely impact livestock grazing by limiting or closing roads and trails. These closures could have a direct adverse effect on the grazing lessee for access to perform ranch maintenance activities. This management would affect less than one percent of the planning area resulting in a negligible adverse effect on the livestock grazing program.

Socioeconomic Resources

There are no anticipated effects from socioeconomic resource management actions.

4.6.8.7. Cumulative Impacts

Chapter 4 describes effects to livestock grazing management from past and present actions, federal and non-federal as part of the affected environment. Non-federal actions will affect livestock grazing management similar to federal actions but mitigation for effects to vegetation resources would differ between federal and non-federal actions. Current management of livestock, vegetation, and wildlife is intended to facilitate achievement of the standards for public land health. Guidelines for livestock grazing management set the parameters for mitigation, restoration, or other measures needed to improve rangeland health. Changing levels of livestock use on public lands could cause changes in grazing practices on private land. A reduction of the time or numbers of livestock allowed on public lands could lead to increased or longer duration of use on private lands which could lead to a decline in the ecological state of these lands and reduce wildlife habitat quality provided by them. The need for land development associated with energy development is expected to increase in the future. As the amount of land required for these types of development or uses increase, impacts on vegetation and other resources from land development, including expanded transportation corridors, utility corridors, and others also are likely to increase. Based on the emphasis for Special Designations and recreational opportunities and the availability of maintained roads, there is a high probability that recreation use would continue to increase in the future. The increased public use in and around the area could lead to more human-caused wildfires, augmented dispersal of invasive plant and noxious weed species, and increased degradation of native plant communities, which could potentially reduce access to and the amount of available forage. As these types of resource uses increase and public perceptions or needs shift, conflicts between new uses and historic livestock grazing could occur. Limitation and prohibitions of surface disturbing activities will facilitate rangelands remaining intact for the benefit of all forage and habitat users.

4.6.8.8. Conclusion

In general, Alternative B management actions would be more conservative than Alternative A management actions for the following resources: soils, water, riparian/wetland communities, special status species, fish, wildlife, cultural and paleontological resources, ROW, livestock grazing, recreation, and special designations. This is primarily because Alternative B would not allow the authorized officer to waive prohibitions on surface-disturbing and disruptive activities for multiple conservation management actions as under Alternative A. In addition, Alternative B would include a number of restrictions (e.g., timing and location).

Treatment of invasive plant species including cheatgrass and other annual grasses, as stated under alternatives B and D, would benefit vegetation systems and improve the habitat and forage for wildlife and livestock species that inhabit these plant communities.

Livestock management would emphasize the allocation of additional forage to habitat and watershed protection before livestock grazing as compared to Alternative C which emphasized livestock grazing. Periods of deferment and rest following wildfires or planned vegetation treatments would allow sufficient rest to achieve the desired ecological condition. Placement of salt or mineral supplements would be a minimum of 500 feet from water sources, riparian areas, and aspen stands under alternatives C and D and a minimum of 0.5 mile under Alternative B.

Livestock management would emphasize the allocation of additional forage to habitat and watershed protection before livestock grazing as compared to Alternative C which emphasized livestock grazing. Periods of deferment and rest following wildfires or planned vegetation treatments would allow sufficient rest to achieve the desired ecological condition. Placement of salt or mineral supplements would be a minimum of 500 feet from water sources, riparian areas, and aspen stands under alternatives C and D and a minimum of 0.5 mile under Alternative B.

SRMAs and other special designation areas would in most cases protect and enhance vegetative resources. More restrictive management under Alternative B and Alternative D with qualifiers, would reduce surface disturbance, which would reduce the opportunity for invasive species to be introduced or spread. Under Alternative C, these areas would be available for minerals leasing and permitting thus subverting invasive species and pest management. The greater the number of recreational facilities and opportunities, the higher the probability of livestock and recreationist confrontation.

Although Alternative B management would result in the fewest acres of surface disturbance and would reduce AUMs the least of all alternatives, it would be the most restrictive on livestock grazing and would have the greatest adverse effects on livestock grazing management compared to the other alternatives. Alternative C management would result in the most long-term acres of surface disturbance and would be the least restrictive on livestock grazing. Alternative D management would result in the second highest acreage of surface disturbance and would be less restrictive on livestock grazing compared to Alternative B. Alternative D's relatively higher surface disturbance is associated with fisheries and wildlife enhancements and range management improvements; these enhancements and the greater management flexibility associated with Alternative D would have the most beneficial effects on livestock grazing compared to the other alternatives.

Table 4.73, "Summary of Impacts to Livestock Grazing Management" (p. 1390) summarizes impacts to livestock grazing management by alternative.

Table 4.73. Summary of Impacts to Livestock Grazing Management

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Major adverse	Moderate beneficial	Major adverse	Moderate adverse
Water Resources	No effect	Minor beneficial	Moderate adverse	Minor beneficial
Cave and Karst Resources	No effect	Negligible adverse	Negligible beneficial	Negligible adverse
Mineral Resources				
Locatable Minerals	Negligible adverse	Minor adverse	Minor adverse	Negligible adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Leasable Minerals – Coal	Moderate adverse	Moderate adverse	Major adverse	Minor adverse
Leasable Minerals – Fluids	Moderate adverse	Moderate adverse	Major adverse	Minor adverse
Salable Minerals	Negligible adverse	Minor adverse	Minor adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Minor beneficial	Minor adverse	Minor adverse	Minor beneficial
Planned Fire (Prescribed Fire)	Minor beneficial	Minor adverse	Minor adverse	Minor beneficial
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	Minor adverse	Moderate beneficial	Moderate adverse	Moderate beneficial
Vegetation – Riparian/Wetland Resources	Moderate adverse	Minor beneficial	Moderate adverse	Negligible adverse
Invasive Species and Pest Management	Minor beneficial	Major beneficial	Moderate adverse	Moderate beneficial
Fish and Wildlife Resource – Fish	Minor beneficial	Negligible adverse	Negligible beneficial	Negligible adverse
Fish and Wildlife Resources – Wildlife	Minor beneficial	Minor adverse	Moderate beneficial	Minor adverse
Special Status Species – Plants	Minor adverse	Moderate adverse	Negligible adverse	Negligible adverse
Special Status Species – Fish	Minor adverse	Negligible adverse	Negligible adverse	Negligible adverse
Special Status Species – Wildlife	Minor adverse	Major adverse	Minor adverse	Moderate adverse
Heritage and Visual Resources				
Cultural Resources	No effect	Minor adverse	Minor adverse	Minor adverse
Paleontological Resources	No effect	Minor adverse	Minor adverse	Minor adverse
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	Negligible adverse	Negligible adverse	Negligible beneficial	Negligible adverse
Lands and Realty	Moderate beneficial	Minor beneficial	Major adverse	Minor beneficial
Renewable Energy	No effect	Minor adverse	Major adverse	Minor adverse
Rights-of-Way and Corridors	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Travel and Transportation Management	Major beneficial	Minor beneficial	Minor adverse	Minor beneficial
Recreation	Minor adverse	Minor adverse	Minor adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	Negligible beneficial	No effect	Negligible beneficial
Livestock Grazing Management	Minor beneficial	Moderate adverse	Moderate beneficial	Moderate beneficial
Special Designations				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Areas of Critical Environmental Concern	No effect	Negligible adverse	No effect	Negligible adverse
Scenic or Back Country Byways	No effect	Negligible adverse	No effect	Negligible adverse
Wild and Scenic Rivers	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Wilderness Study Areas	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.7. Special Designations

4.7.1. Areas of Critical Environmental Concern

This section describes impacts to proposed ACECs in the planning area. ACECs are designated to provide special management for relevant and important values, resources, natural systems, and natural hazards (referred to herein as values of concern). The discussion of ACECs focuses on the values of concern and impacts to those values from other programs. Many of the values of concern in ACECs are also resources with management independent of ACEC designation; this non-ACEC management is addressed under the relevant sections of this chapter. For example, impacts to wildlife values in the proposed Fortification Creek Elk ACEC are discussed below, while the overall impacts to wildlife from management under the alternatives appear in the *Biological Resources* section. The ACECs that would be designated in each alternative are identified in Table 4.74, "Proposed ACEC BLM Surface Acres" (p. 1392).

Table 4.74. Proposed ACEC BLM Surface Acres

Name	Alternative A	Alternative B	Alternative C	Alternative D
Cantonment Reno	0	523	0	0
Burnt Hollow	0	17,282	0	0
Dry Creek Petrified Tree	0	2,567	0	0
Fortification Creek Elk Area	0	32,602	0	32,602
Hole in the Wall	0	11,952	0	0
Pumpkin Buttes	0	1,733	0	1,733
Sagebrush Ecosystem	0	467,897	0	0
Welch Ranch	0	1,748	0	1,116
Source: BLM 2012f				

4.7.1.1. Methods and Assumptions

Generally, an ACEC designation will result in additional prescriptions for other land use activities in the ACEC to protect the associated relevant and important features. Degradation of relevant and important values would primarily occur from surface-disturbing activities. Other activities, such as vegetation manipulation and OHV use, could affect relevant and important values by removing soil and vegetation. Protecting relevant and important values in proposed ACECs would result from the implementation of management actions designed to protect physical,

biological, and heritage resources. Management actions for soils, water, vegetation, and fish and wildlife usually limit the extent of surface-disturbing activities and associated vegetation removal. This is generally achieved through the designation of protective buffers, area closures, restrictions on surface use, and other measures.

Scale of impacts:

- Negligible – Less than 1% of proposed ACECs would be affected; only a small portion of a single evaluated ACEC would be affected.
- Minor – 1% to 5% of proposed ACECs would be affected; a moderate portion of a single evaluated ACEC or small portions of two to three evaluated ACECs would be affected.
- Moderate – 5% to 10% of proposed ACECs would be affected; the majority of a single evaluated ACEC or moderate portions of two to four evaluated ACECs would be affected.
- Major – 10% of proposed ACECs would be affected; the majority of several evaluated ACECs or moderate portions of most evaluated ACECs would be affected.

To protect the values for which each ACEC is designated, the BLM will formulate specific management decisions and mitigation measures for each ACEC (Appendix S (p. 2121)). While non-BLM-administered lands may appear within ACEC administrative boundaries, management prescriptions will only apply to BLM actions. ACEC designation would not affect valid existing rights.

To allow for a consistent analysis, the ACEC boundaries proposed under Alternative B are used as the area of analysis for all alternatives. Using Alternative B boundaries, the analysis compares the impacts of management actions to ACEC values in these areas. The BLM based the determination of impacts to ACEC values on the management actions listed in Chapter 2. For example, the BLM would not designate any ACECs under Alternative C. However, to ensure the analysis is comparable across alternatives, Alternative C analyzes effects to ACEC values for the same geographic area as the other alternatives. The adverse and beneficial impacts to ACEC values are discussed under Alternative C just as they are under the other alternatives.

Significance Criteria

An adverse effect on ACECs as a result of project actions would be considered potentially significant if the following were to occur:

- Management actions would result in long-term elimination or reduction of the "relevant and important values" for which the ACEC was proposed.
- The intensity of development would not be compatible with the stated objectives of an ACEC.

4.7.1.2. Impacts Common to All Alternatives

Areas of Critical Environmental Concern (major beneficial)
Common to all alternatives, BLM activities would be mitigated to protect the integrity and characteristics of designated ACECs. Educational materials would describe ACEC features to assist the public in accessing ACECs while protecting their resource values. There are presently no ACECs within the planning area (Alternative A), Alternative B would designate eight ACECs, no ACECs would be designated under Alternative C, and three ACECs would be designated with Alternative D.

Physical Resources

Air Quality (major beneficial)
Managing prescribed burns, and implementing mitigation measures to reduce emissions would beneficially affect ACECs by protecting the air quality and visibility within and surrounding ACECs. These management actions would be applied throughout the planning area and could affect all ACECs, therefore the level of effect is major beneficial.

Soil (major beneficial)
Soil management actions common to all alternatives include mitigating surface-disturbing activities and requiring reclamation plans. Soil typically is one of, or supports, ACEC resource values. These actions would be applied to BLM actions across the entire planning area, which could have a major beneficial effect on ACECs.

Water Resources (major beneficial)
Water management actions common to all alternatives include providing alternative or "off-source" water, installing flow-control devices, managing surface-disturbing activities to prevent degradation of water quality, minimizing impacts to groundwater, reducing channel and bank erosion, and managing water to meet Wyoming Standards for Healthy Rangelands. Water typically is one of, or supports, ACEC resource values. These actions would be applied to BLM actions across the entire planning area, which could have a major beneficial effect on ACECs.

Cave and Karst Resources (no effect)
The cave and karst program does not have any management actions common to all alternatives that would effect ACEC management. Common to all management actions relate to inventories and not cave protection.

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals.

Locatable Minerals (negligible adverse)
There is likely to be minimal overlap between locatable minerals activities and potential ACECs. There are no active or proposed mines within or adjacent to potential ACECs. The maximum foreseeable locatable minerals development is 1,455 acres of BLM surface (0.2%) in the planning area. Therefore, the potential for locatable minerals development to affect ACEC resource values would be negligible.

Leasable Minerals - Coal (negligible adverse)
Coal leasing would be limited to the high development potential areas of central Campbell County and northern Sheridan County, which would include the Welch Ranch and western edge of the Burnt Hollow proposed ACECs. There are currently no active coal mines within Sheridan County. Coal has been leased for mining within 3.5 miles of the proposed Burnt Hollow ACEC. There is not an existing lease or a lease application that includes or is adjacent to Burnt Hollow. Coal mining within or adjacent to proposed ACECs is not foreseeable during the planning period, therefore effects to ACEC resources would be negligible.

Leasable Minerals - Fluids (major adverse)
The federal oil and gas mineral estate within the planning area is available for leasing, including for geothermal activity, unless administratively closed. Lessees would be required to minimize adverse resource impacts. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek has

moderate potential for conventional development. Fluid mineral surface-disturbing activities and production operations within ACECs would have major adverse impacts on ACEC values.

Salable Minerals (moderate adverse)
BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch proposed ACECs. In addition to these two proposed ACECs, sand and gravel deposits occur within three additional proposed ACECs: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. Salable mineral activities within ACECs would have moderate adverse impacts on ACEC values.

Fire and Fuels Management

Unplanned Fire (Wildfire) (major beneficial)
Common to all alternatives, a resource advisor would be consulted or assigned to any wildland fires potentially affecting ACECs, fire retardant would be restricted or prohibited to protect rock art or surface water, and fire lines would be rehabilitated to prevent or control erosion. These actions would be applied to across the entire planning area, which could have a major beneficial effect on ACECs.

Planned Fire (Prescribed Fire) (negligible beneficial)
Management actions common to all alternatives include: reducing hazardous fuels within WUIs, and ensuring prescribed burning activities comply with air quality and smoke management rules. These management actions would benefit ACECs by reducing the potential for catastrophic wildfire and by protecting the air quality and visibility within the ACECs. Planned fire has occurred historically only within the proposed Fortification Creek ACEC. There are no foreseeable planned fire activities within any of the proposed ACECs, therefore the level of beneficial effect is negligible.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities which would likely benefit ACEC values.

Vegetation – Forests and Woodlands (no effect)
There are no management actions common to all alternatives for forest and woodland resources that would affect ACEC values.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Grass and shrub communities are the predominant vegetation types within the planning area. Relevant management actions include managing vegetation communities for healthy rangelands; using an integrated management approach to enhance the health and diversity of plant communities; managing the location of facilities, routes, and uses to reduce impacts to vegetation; and cooperatively managing plant communities to maintain healthy rangelands. These actions would be applied across the entire planning area, which would have a major beneficial effect on potential ACECs.

Vegetation – Riparian/Wetland Resources (major beneficial)
Management actions common to all alternatives that could affect ACECs include managing riparian and wetland habitats to improve water quality, to manage towards properly functioning

condition, to cooperatively enhance riparian/wetland systems, and to prevent the loss or degradation of riparian/wetland habitat. All potential ACECs except Pumpkin Buttes, contain riparian and/or wetland communities. Riparian/wetland management actions could have a major beneficial effect on ACEC values.

Invasive Species and Pest Management (major beneficial)
Management actions common to all alternatives that could affect ACECs include an integrated approach to pest management, limiting surface disturbance, use of certified weed seed-free products, and requiring invasive species treatment. These actions would benefit native vegetative communities, an ACEC value. These actions would be applied to across the entire planning area, which would have a major beneficial effect on potential ACECs.

Fish and Wildlife Resources – Fish (major beneficial) **and Special Status Species – Fish** (negligible beneficial)
There are several fisheries management actions that could affect ACECs including developing mitigation for surface-disturbing and disruptive activities, managing barriers to fish passage, providing public access to fish-bearing waters, managing non-native vegetation, and providing cooperative fisheries education. These management actions would benefit fish, an ACEC value. All potential ACECs except Pumpkin Buttes, contain streams capable of supporting fish. Fisheries management actions could have a major beneficial effect on ACEC values. Welch Ranch is the only potential ACEC capable of supporting current special status fish species (Yellowstone cutthroat trout), therefore the beneficial effect of special status fish management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Wildlife and special status species management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and a permanent disturbance-free buffer for bald eagle nests. Collectively, these actions could have a major beneficial effect on ACECs by promoting habitat protection while causing the relocation, modification, or redesign of surface disturbing activities. These actions would be applied across the entire planning area, where the appropriate wildlife resources are present, which would have a major beneficial effect on potential ACECs.

Special Status Species – Plants (minor beneficial)
Special status species plant management actions common to all alternatives include implementing conservation measures and best management practices, and allowing vegetation treatments that would benefit the species. These actions would benefit ACECs by protecting special status plant habitat and native vegetation communities. However, Hole in the Wall is the only potential ACEC containing special status plant habitat (11,952 acres), therefore the level of beneficial effect on potential ACECs would be minor.

Heritage and Visual Resources

Cultural Resources and Paleontological Resources (moderate beneficial)
Public lands containing areas important to Native Americans or significant paleontological resources would be retained. Pumpkin Buttes is a proposed ACEC important to Native Americans and Dry Creek Petrified Tree is a potential ACEC containing significant paleontological resources. These management actions would have a moderate beneficial effect on ACECs as they would be limited to two of the seven potential ACECs.

Visual Resources (negligible beneficial)
A management action common to all alternatives is the requirement for permanent facilities to blend with the surrounding landscape. This requirement is secondary to managing within the VRM class, meaning that although facilities might be visible within VRM Class II through IV areas, mitigation for adverse effects on visual resources should be included wherever possible. Blending permanent facilities would help mitigate visual impacts, however development activities would likely still be readily visible and therefore the beneficial effect of the management action on ACEC values is likely to be negligible.

Land Resources

Forest Products (negligible adverse)
Forests and woodlands of the planning area would be available for the collection and harvest of forest products, except within 200 feet of surface waters. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole in the Wall, Pumpkin Buttes, and Welch Ranch potential ACECs all contain forest or woodland vegetation that could be available for forest product use. However, the commercial timber areas where forest product use would be most foreseeable does not overlap any proposed ACEC, therefore the anticipated level of adverse effect on ACEC values would be negligible.

Lands and Realty (minor adverse)
Management actions common to all alternatives affecting ACEC values include the consideration of land withdrawal or disposal and signage to aid access and avoid trespass. Withdrawal of surface-disturbing activities such as mineral development and reducing trespass would benefit ACEC values. Disposal of public lands containing ACEC values would be an adverse effect. Increased access could also be an adverse effect if the ACEC values are not protected from the increased use. It is unlikely that public lands containing ACEC values would be disposed of. ACEC specific management plans would reduce the potential for adverse effects from facilitated access to the ACECs. Overall, the level of effect from lands and realty actions on ACEC values is expected to be minor adverse.

Renewable Energy (no effect)
The renewable-energy program does not have any management actions common to all alternatives that would affect ACEC management. Effects will vary by alternative.

Rights-of-Way and Corridors (minor adverse)
Management actions common to all alternatives affecting ACEC values include designating ROW corridors to minimize impacts to other resources, with the preferred ROW location being within or adjacent to existing disturbance; providing access to public lands; and maintaining a transportation system. ROW within ACECs would adversely affect ACEC values. However, the management actions common to all alternatives are designed to minimize impacts to other resources including ACECs, therefore the level of anticipated effect is minor adverse.

Travel and Transportation Management (minor adverse)
Management actions common to all alternatives relate to standards for the location, design, and maintenance of roads. Roads within ACECs would adversely affect ACEC values. However, the management actions common to all alternatives are designed to provide a safe transportation network while minimizing impacts to other resources including ACECs, therefore the level of anticipated effect is minor adverse.

Recreation (minor adverse)
Management actions common to all alternatives encourage and provide for the recreational use of public lands. Management actions are included for the protection of riparian areas and surface water. Most potential ACECs are also desirable for recreation opportunities; however access to Cantonment Reno, Fortification Creek, and Pumpkin Buttes is limited. ACEC-specific management plans would reduce the potential for adverse effects from recreation use. Overall, the level of effect of recreation management actions on ACEC values is expected to be minor adverse.

Lands With Wilderness Characteristics (no effect)
Management actions common to all alternatives would not affect ACEC values as they pertain to inventory rather than direct physical land management. Additionally, wilderness characteristic inventories identified one area with wilderness characteristics, which is not contiguous with or adjacent to any proposed ACECs. Therefore, lands with wilderness characteristics will not be discussed further in the ACEC section.

Livestock Grazing Management (negligible adverse)
Livestock grazing would be managed to achieve healthy rangelands and special habitats. Poorly managed grazing can impair ACEC values by over utilizing native vegetation, increasing erosion and stream sedimentation. Properly managed grazing can avoid these impacts and be beneficial to some resources. Overall, the level of anticipated effect is negligible adverse, as not all adverse effects can be avoided or mitigated such as inadvertent trampling of cultural artifacts or temporary over utilization.

Special Designations

Scenic or Back Country Byways (negligible adverse)
Presently there are no byways within the planning area. The potential Tipperary/Thompson Creek Roads byway access the potential Dry Creek Petrified Tree ACEC. If the Tipperary/Thompson Creek Roads byway were to be designated, it would be managed to encourage responsible use while protecting resource values. Increased byway use could lead to increased use of the potential Dry Creek Petrified Tree ACEC. An ACEC specific management plan would reduce the potential for adverse effects from recreation use. Overall the level of effect on ACEC values is expected to be negligible adverse, as only one potential ACEC would be affected and the site-specific management plan would reduce adverse effects.

Wild and Scenic Rivers (no effect)
There are no management actions for WSRs that would affect ACEC values as the proposed Middle Fork Powder River WSR is not contained within a potential ACEC. WSRs will not be discussed further in this section.

Wilderness Study Areas (minor beneficial)
The potential Fortification Creek ACEC contains a WSA. Common to all alternatives, WSAs would be managed to preserve natural conditions and processes. WSA management would benefit ACEC values. Since Fortification Creek is the only potential ACEC containing a WSA the level of beneficial effect would be minor.

Socioeconomic Resources

Social and Economic Conditions (no effect)
There are no social or economic management actions common to all alternatives or by alternative that would have a measurable effect on ACEC values. Therefore, these topics are not addressed further in this section.

Health and Safety (minor beneficial)
Management actions common to all alternatives control, manage, and mitigate health and safety hazards. Environmental hazards such as the coal fire at Welch Ranch can benefit ACEC values. While these management actions are primarily designed for the protection of human health and safety they often protect other resources such as soil, vegetation, and wildlife. The application of these actions is generally limited in time and space, therefore the level of beneficial effect is minor.

Health and safety does not have any management actions that vary by alternative, therefore there is no effect to ACECs and will not be discussed further in this section.

4.7.1.3. Alternative A

Areas of Critical Environmental Concern (minor adverse)
There are presently no ACECs within the planning area and no additional ACECs would be designated. The PRB FEIS (BLM 2003c) analyzed all of the ACECs that would be designated under Alternative B with the exception of the Welch Ranch. The PRB FEIS concluded that present management was sufficient to protect the relevant and important ACEC values. The PRB FEIS was an oil and gas project and therefore did not analyze all potential land use activities affecting ACEC values. Land uses such as renewable-energy development, ROWs, and other mineral development could adversely affect ACEC values. However, since oil and gas development is one of the primary land uses within the planning area and other land uses are often correlated with oil and gas (such as ROW) the level of adverse effect is anticipated to be minor.

Physical Resources

Air Quality (no effect)
Alternative A would analyze the effects of activities on air quality and may include modeling. Data analysis and modeling do not directly relate to ACEC management, therefore there would be no effect to ACEC values.

Soil and Water Resources (moderate adverse)
Management actions regulate surface disturbing activities on sensitive soils and near water resources while allowing for exceptions. The intent of the management actions are to allow for resource use while protecting sensitive soils and water. However management has been applied inconsistently, adversely affecting soil and water resources and therefore ACEC values in many situations. Sensitive soils and water resources are present within all the areas being evaluated resulting in an overall moderate adverse effect.

Cave and Karst Resources (negligible adverse)
Cave and karst resources are associated with the Big Horn Mountains. Only the Hole-in-the-Wall evaluation area contains karst-bearing formations. There are no cave and karst management actions in the 1985 RMP, therefore management in cave and karst areas are considered on a project-specific basis; which has led to inconsistent management of surface-disturbing activities. The potential for surface-disturbing activities in cave and karst areas is relatively low, related both to the difficult topography and limited potential for mineral resources. Because of the limited

foreseeable activity, the lack of previous management actions to consistently protect cave and karst resources, and only one evaluation area being affected, overall there would be a negligible adverse effect on ACEC values.

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals.

Locatable Minerals (negligible adverse)
Locatable minerals have been withdrawn from three WHMAs and locatable mineral activities are restricted within the three WSAs. The only ACEC evaluation area to benefit from these withdrawals and restrictions is Fortification Creek. There is potential for locatable mineral activity within the other evaluation areas and within Fortification Creek outside the WSA. However, there are no active or proposed mines within or adjacent to ACEC evaluation areas. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect ACEC resource values would be negligible.

Leasable Minerals - Coal (negligible adverse)
All federal coal lands would be available for study and exploration including the ACEC evaluation areas. Coal leasing would be limited to the high development potential areas of central Campbell County and northern Sheridan County, which would include the Welch Ranch and western edge of the Burnt Hollow evaluation areas. Coal exploration and subsequent development within or adjacent to the ACEC evaluation areas is not foreseeable during the planning period, therefore effects to ACEC resources would be negligible.

Leasable Minerals - Fluids (major adverse)
Nearly the entire federal oil and gas mineral estate within the planning area is available for leasing, including for geothermal activity. Lessees would be required to minimize adverse resource impacts. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek has moderate potential for conventional development. Fluid mineral surface-disturbing activities and production operations within ACECs would have major adverse impacts on ACEC values.

Salable Minerals (moderate adverse)
Mineral material activity is prohibited within WSAs, which would benefit a portion of the proposed Fortification Creek ACEC. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch evaluation areas. In addition to these two areas, sand and gravel deposits occur within three additional evaluation areas: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. Salable mineral activities within ACECs would have moderate adverse impacts on ACEC values.

Fire and Fuels Management

Unplanned Fire (Wildfire) (negligible adverse)
Present management of unplanned fires takes resource values into consideration during suppression activities. There are no existing ACECs, therefore ACECs would not be considered as an independent resource value but the relevant and important resource values (physical,

biological, cultural, etc.) would be. Designation could heighten the awareness and therefore the protection of ACEC values, the lack of designation could result in resource values being overlooked. However, since all resource values should be considered during suppression, the adverse effect would be negligible.

Planned Fire (Prescribed Fire) (negligible beneficial)
Prescribed fire would be used to support vegetation and wildlife habitat objectives. These management actions could benefit ACEC evaluation areas as vegetation and wildlife are often the relevant and important ACEC values. There are no foreseeable planned fire activities within any of the evaluation areas, therefore the level of beneficial effect is negligible.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities which would likely benefit ACEC values.

Vegetation – Forests and Woodlands (minor beneficial)
Forest and woodland treatments would be designed to improve forest health, biodiversity, and water quality. Five evaluation areas (Burnt Hollow, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch) contain forest and woodland communities. The evaluation areas should benefit from these management actions. Designation would heighten the awareness and therefore the protection of ACEC values, the lack of designation could result in resource values being overlooked. However, since all resource values should be considered, ACEC values should benefit, but to a minor degree.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
The only management action which varies by alternative relates to the use of non-native plant species for reclamation. The present RMP did not address the issue, therefore non-native plants are used in accordance with the BLM reclamation policy and are considered on a project-specific basis. There is development potential within all evaluation areas particularly without ACEC-specific management, which would regulate development activities. The presence of non-native species would detract from naturalness values for knowledgeable public land users. However, since reclamation areas would be limited in scale and duration, the adverse effect would be negligible.

Vegetation – Riparian/Wetland Resources (moderate adverse)
Current management prohibits surface-disturbing activities within 500 feet of surface water unless the prohibition is waived. All evaluation areas except Pumpkin Buttes contain riparian and/or wetland communities. Management has been applied inconsistently, adversely effecting riparian and wetland resources and therefore ACEC values in many situations. The inconsistent management results in a moderate adverse effect to ACEC values.

Invasive Species and Pest Management (minor beneficial)
Invasive species are currently managed in cooperation with the county weed and pest districts. ACEC evaluation areas and ACEC values benefit from invasive species management. Invasive species decrease biodiversity, ecosystem health, and visual naturalness. The evaluation areas would be more likely to receive treatment through ACEC designation as designation would be an additional factor considered in determining treatment areas. The benefit to ACEC values would likely be minor, as without designation few evaluation areas would likely be targeted for invasive species management.

Fish and Wildlife Resources – Fish and Special Status Species – Fish (negligible beneficial)
Hole-in-the-Wall and Welch Ranch are the evaluation areas most likely to benefit from current fisheries management. However, the other evaluation areas could also benefit if reservoirs were to be constructed as enhancing fisheries would be encouraged. There are no current management decisions for special status fish species. Welch Ranch is the only evaluation area capable of supporting Yellowstone cutthroat trout. Fisheries has not been a management priority or forecasted to become one. The beneficial effect of fish and special status species fish management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife (moderate adverse) **and Special Status Species – Wildlife** (major adverse)
Current management provides seasonal and in some cases year-round spatial buffers from surface-disturbing activities for raptor nests, big game calving areas and crucial winter range, and sharp-tailed grouse leks. Similar buffers are provided for special status species such as bald eagles and Greater Sage-Grouse. Exceptions to these protections are allowed. Exception criteria was not defined in the current RMP and therefore exceptions have not been consistently applied which has lead to localized adverse effects to wildlife and therefore ACEC values. In the case of Greater Sage-Grouse, the best available science clearly indicates that current management has not been sufficient to sustain the Greater Sage-Grouse populations within the planning area (Doherty et al. 2010). All ACEC evaluation areas contain Greater Sage-Grouse habitat. Alternative A special status species management would not sustain Greater Sage-Grouse populations within the evaluation areas or the planning area as a whole, and therefore have a major adverse effect on ACEC values.

Special Status Species – Plants (negligible adverse)
The current RMP does not address special status plants, therefore they are managed on a project-specific basis. The absence of direction can lead to inconsistent management and adverse effects to the plants and therefore ACEC values. Hole-in-the-Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas, the level of adverse effect on ACEC values would be negligible.

Heritage and Visual Resources

Cultural Resources (moderate adverse)
Current management includes a NSO stipulation on fluid mineral leases associated with the Bozeman Trail, which includes the Cantonment Reno evaluation area. Otherwise cultural resources would be considered on a project-specific basis. The absence of management direction can lead to inconsistent management and adverse effects to the cultural resources and therefore ACEC values. The anticipated level of effect is moderate adverse as all ACECs outside of Cantonment Reno would not be guaranteed protection.

Paleontological Resources (minor adverse)
There are no paleontological resources management decisions in the current RMP, paleontological resources are considered on a project-specific basis. The Dry Creek Petrified Tree evaluation area is an area containing paleontological resources of high quality or importance. The Hole-in-the-Wall evaluation area contains areas of PFYC 5 and likely contains paleontological resources. Paleontological resources are likely not present or rare within the other evaluation areas. The absence of management direction can lead to inconsistent management and adverse effects to the paleontological resources and therefore ACEC values. The resources at Dry Creek Petrified Tree are well known and therefore not likely to be affected as surface-disturbing

activities would be avoided. The opportunity for adverse effects within the other evaluation areas is greater as their paleontological resources are unknown. But since Hole-in-the-Wall is the only other evaluation area likely to contain high quality paleontological resources, the anticipated level of effect is minor adverse.

Visual Resources (major adverse)
The Welch Ranch and western half of the Hole-in-the-Wall evaluation areas are currently managed as VRM Class II where management activities may be seen but should not attract attention. All of Pumpkin Buttes and portions of the Burnt Hollow and Fortification Creek evaluation areas are managed as VRM Class III, where management activities may attract attention but should not dominate the view. The remainder of the evaluation areas are managed as VRM Class IV where management activities may dominate the view. Scenic quality is an ACEC value. With the potential for development activities to dominate throughout all or large portions of five evaluation areas, the anticipated effect to ACEC values would be major adverse.

Land Resources

Forest Products (negligible adverse)
Forests and woodlands of the planning area would be available for the collection and commercial harvest of minor forest products. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch evaluation areas all contain forest or woodland vegetation that could be available for forest product use. However, the commercial timber areas where forest product use would be most foreseeable does not overlap any proposed ACEC, therefore the anticipated level of adverse effect on ACEC values would be negligible.

Lands and Realty (moderate beneficial)
Current management actions for the lands and realty program mostly relate to the acquisition and disposal of public lands. Lands with resource values are generally not disposed of and are desirable for acquisition. The absence of designated ACECs would be one less resource value assessed during land and realty actions. It is unlikely any of the evaluation areas would be disposed of as their resource values are known. Acquisition within or adjacent to the evaluation areas would be beneficial. Acquisition must be from, and is typically initiated by, a willing land owner. There has been recent interest in exchanges by private land owners within the Welch Ranch, Burnt Hollow, and Hole-in-the-Wall evaluation areas. Burnt Hollow and Welch Ranch are both products of recent land exchanges. The effects of current management on ACEC values are moderate beneficial.

Renewable Energy (minor adverse)
The 1985 RMP does not contain any management decisions for renewable energy, projects are considered on an individual basis. Pumpkin Buttes is the only evaluation area with wind-power potential of good or better. It is not foreseeable for any of the six other evaluation areas to be affected by renewable energy. Wind-power development near Pumpkin Buttes would impair the scenic qualities of the evaluation area. As adverse impacts would likely be limited to one evaluation area, the level of effect is minor.

Rights-of-Way and Corridors (major adverse)
ROW are analyzed and authorized on a project-specific basis under the present RMP. Pumpkin Buttes contains communication sites on the South Middle Butte with provisions for expansion

to North Middle Butte, if absolutely necessary. Communication sites and surface-disturbance from ROW within evaluation areas adversely affects ACEC values. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, Pumpkin Buttes, and Welch Ranch are within the CBNG development area and given the mixed ownership pattern of both surface and mineral estate ROW applications are likely. The level of anticipated effect to ACEC values is major adverse.

Travel and Transportation Management (minor adverse)
Travel and transportation management actions define where, when, and how motorized vehicles can be used within the planning area. Current management prohibits motorized use within portions of the Burnt Hollow, Cantonment Reno and Dry Creek Petrified Tree evaluation areas. There are seasonal vehicle restrictions within portions of the Fortification Creek evaluation area. Where open to motorized vehicles, including seasonally, motorists are limited to existing or designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation, and other resources including ACEC values. The level of anticipated effect is minor adverse.

Recreation (minor adverse)
Current management recognizes all of the evaluation areas, with the exception of Pumpkin Buttes, as important recreation areas. Proposals for surface-disturbing or disruptive activities are mitigated to protect the recreation and related resources such as soil, water, vegetation, wildlife habitat, and therefore ACEC values. Recreation use itself can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation, wildlife displacement, and the development of recreation facilities. Overall, the level of effect recreation management actions on ACEC values is expected to be minor adverse.

Livestock Grazing Management (minor adverse)
Livestock grazing would be allowed within the evaluation areas and managed to achieve healthy rangelands and special habitats. Properly managed grazing can avoid adverse impacts and be beneficial to some resources. Overall, the level of anticipated effect is minor adverse as not all adverse effects can be avoided or mitigated, such as inadvertent trampling of cultural artifacts or temporary over utilization. ACEC designation could also have provided heightened awareness and further minimized the adverse effects.

Special Designations

Scenic or Back Country Byways (no effect)
Presently there are no byways within the planning area. The potential Tipperary/Thompson Creek Roads byway accesses the Dry Creek Petrified Tree evaluation area. If the Tipperary/Thompson Creek Roads byway were to be designated it would be managed to encourage responsible use while protecting resource values. Without designation this beneficial effect would not occur. Increased use of Tipperary/Thompson Creek Roads and the Dry Creek Petrified Tree area would also likely not occur. Alternative A would likely have no effect on ACEC values.

Wilderness Study Areas (minor beneficial)
The Fortification Creek evaluation area is the only evaluation area to contain a WSA. WSAs would be managed to preserve natural conditions and processes. WSA management would benefit ACEC values. Since Fortification Creek is the only ACEC evaluation area containing a WSA, the level of beneficial effect would be minor.

4.7.1.4. Alternative B

Areas of Critical Environmental Concern (major beneficial)
Alternative B emphasizes resource conservation and would designate eight ACECs totalling 536,304 acres (65%) of BLM surface. Appendix S (p. 2121) lists the objectives and management prescriptions for each ACEC. ACEC-specific prescriptions would protect the integrity of the characteristics for which each ACEC was designated. Management prescriptions could vary dependent on the relevant and important values present at each site.

Designation of ACECs would establish these areas as priority areas and management efforts would focus such that problems and issues could be addressed more effectively, thereby serving to better protect the relevant and important resources. Management actions common to all ACECs would include: closing or limiting motorized vehicle use; managing visual resources as VRM Class II; restricting mineral development; ROW; and other surface-disturbing activities. It is important to note that an ACEC designation would not affect present leases or valid existing rights. However, when current leases expire, they would become administratively unavailable for future leasing.

Physical Resources

Air Quality (major beneficial)
Alternative B would analyze the effects of activities on air quality and would include modeling to identify mitigation strategies. Air quality mitigation would beneficially effect ACEC values. Burnt Hollow is the most likely ACEC to benefit as it is the eastern most ACEC and the closest to the coal mines which is a primary emissions source within the planning area. ACECs within the center of the planning area are influenced by oil and gas emissions including Cantonment Reno, Fortification Creek, and Pumpkin Buttes. Air quality mitigation would have a major beneficial effect on ACEC values.

Soil and Water Resources (major beneficial)
Alternative B management actions prohibit surface-disturbing activities on sensitive soils and near water resources which protects ACEC values. Sensitive soils and water resources are present within all the areas being evaluated resulting in a major beneficial effect for ACEC values.

Cave and Karst Resources (negligible beneficial)
Surface-disturbing activities and forest product sales would be prohibited within karst areas benefitting ACEC values. The Hole-in-the-Wall evaluation area contains bands of karst-bearing formations. Because limited portions of one evaluation area would be affected, overall there would be a negligible beneficial effect on ACEC values.

Mineral Resources

Locatable Minerals (major beneficial)
In addition to the present mineral withdrawals, another 618,256 acres would be recommended for withdrawal from mineral entry including the ACECs. This management action would have a major beneficial effect on ACEC values by preventing locatable mineral development.

Leasable Minerals - Coal (major beneficial)
Federal coal lands would be available for study, exploration, and leasing only within the high development potential areas of central Campbell County and northern Sheridan County, which would include the Welch Ranch and western edge of the Burnt Hollow evaluation areas. The

remaining ACEC evaluation areas would not be available for any coal uses thereby benefitting the ACEC values. Coal gasification would be prohibited within ACEC evaluation areas. These management actions would have a major beneficial effect on ACEC values.

Leasable Minerals - Fluids (major adverse)
The ACECs would be unavailable for additional leasing. Seventy-five percent (2,544,512 acres leased, 3,386,530 acres federal estate) of the federal fluid mineral estate has already been leased, including within the ACECs. Existing leases would be honored. There has been fluid mineral development within all ACECs except Cantonment Reno. Dry Creek Petrified Tree, Hole-in-the-Wall, and Welch Ranch each contain one plugged and abandoned well, abandoned between 1962 (Welch) and 1978 (Hole-in-the-Wall). Fortification Creek and Pumpkin Buttes leases are currently producing. Applications (APDs) are pending within Fortification Creek, Pumpkin Buttes, and Welch Ranch. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek also has moderate potential for conventional development. Development of the existing leases during the planning period is likely. Fluid mineral surface-disturbing activities and production operations within ACECs would have major adverse impacts on ACEC values.

Salable Minerals (minor beneficial)
Mineral material activity would be prohibited within the ACECs. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch ACECs. Existing rights would be honored, expansion of permit areas into the ACECs would not be authorized. Sand and gravel deposits occur within three additional ACECs: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. The prohibition of salable mineral activities within ACECs is beneficial to ACEC values, however the existing activities adjacent to two ACECs would temper the beneficial effects to minor.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (major beneficial)
Unplanned fire management would be cognizant of resource goals, including ACECs, and respond accordingly including limiting heavy equipment use. Wildland and planned fire would be used to restore fire-adapted ecosystems. ACEC designation would heighten the awareness and therefore the protection and management of ACEC values. These management actions would be a major benefit to the ACECs.

Biological Resources

Vegetation – Forests and Woodlands (moderate beneficial)
Alternative B would emphasize natural processes and keep silviculture treatments to a minimum. The lack of intensive management would benefit ACEC values as the ACECs would visually be more natural. Aspen and limber pine communities would likely continue to decline. Insect and disease outbreaks would be allowed to run their course. Hole-in-the-Wall contains limber pine and potentially aspen, otherwise these species and disease are not widespread in the other four ACECs containing forest and woodland vegetation. Because four of the seven ACECs would benefit from these management actions and only one would likely be adversely affected, the overall level of effect to ACEC values would likely be moderate beneficial.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Native plant species would be required for all reclamation activities. ACEC management which would regulate development activities and keep surface-disturbing activities to a minimum. The presence of only native species would increase naturalness values for knowledgeable public land users. Since reclamation areas would be limited in scale and duration, the beneficial effect would be negligible.

Vegetation – Riparian/Wetland Resources (major beneficial)
Alternative B prohibits surface-disturbing activities within 500 feet of surface water. All evaluation areas except Pumpkin Buttes, contain riparian and/or wetland communities. The prohibition of surface-disturbing activities is a major benefit to ACEC values.

Invasive Species and Pest Management (minor beneficial)
ACEC designation would likely factor into determining treatment areas. The highest priority would be given to BLM-administered lands threatened by invasion from adjacent lands. Few ACECs are likely to be the highest priority for treatment. Therefore benefit to ACEC values would likely be minor.

Fish and Wildlife Resources – Fish (major beneficial) **and Special Status Species – Fish** (negligible beneficial)
Surface-disturbing activities would be prohibited within 0.25 mile of fish-bearing water bodies. This management action would be a major benefit as all ACECs except Pumpkin Buttes, contain fish-bearing waters. Welch Ranch is the only ACEC capable of supporting Yellowstone cutthroat trout, therefore the benefits of special status fish species management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Alternative B would provide seasonal and permanent spatial buffers where surface disturbing and disruptive activities are prohibited for the protection of raptor nests, big-game calving areas and crucial winter range, and sharp-tailed grouse leks. These management actions would be applied across the planning area where applicable and therefore be a major benefit to ACEC values. Similar buffers are provided for special status species such as bald eagles. Surface-disturbing and disruptive activities would be prohibited within prairie dog colonies. Greater Sage-Grouse management would apply prohibitions on surface-disturbing and disruptive activities within four miles of lek sites and winter concentration areas and therefore be a major benefit to ACEC values.

Special Status Species – Plants (minor beneficial)
Surface-disturbing and disruptive activities would be prohibited within special status plant habitat under Alternative B. Hole in the Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas the level of beneficial effect on ACEC values would be minor.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Mineral development and other surface-disturbing activities would be prohibited near historic properties that retain their historic setting and ares that contain sensitive cultural sites. These management actions would protect cultural resources, and therefore ACEC values, within the Cantonment Reno, Hole in the Wall, Pumpkin Buttes, and Welch Ranch ACECs. The anticipated level of effect is major beneficial.

Paleontological Resources (negligible adverse)
Mineral development and other surface-disturbing activities would be prohibited in areas containing paleontological resources of high quality or importance such as the Dry Creek Petrified Tree ACEC. Paleontological surveys would be required prior to surface-disturbing activities in all PFYC Class 3, 4, and 5 formations; this management action would include all seven ACECs. Monitoring of surface-disturbing activities would be required in PFYC Class 4 and 5 areas. The Hole in the Wall ACEC contains areas of PFYC 5. Surface-disturbing activities within PFYC Class 3 areas would be monitored on a project specific basis, this would include the six remaining ACECs and remainder of the Hole in the Wall ACEC. Surveying provides the opportunity to identify paleontological resources but would not be expected to discover all paleontological resources, and therefore monitoring could be required or recommended. Likewise, monitoring reduces adverse effects to paleontological resources, by identifying the resources as they are uncovered, but does not prevent all adverse effects. However, through the survey and monitoring requirements adverse effects should be negligible.

Visual Resources (major beneficial)
The seven ACECs would be managed as VRM Class II where management activities may be seen but should not attract attention. This management would be a major benefit to visual resources and ACEC values.

Land Resources

Forest Products (major beneficial)
Commercial timber activities would be limited to specified forest areas that do not overlap any ACEC. Vegetation, soil, water, and visual resources would be protected from surface-disturbing activities a major benefit to ACEC values.

Lands and Realty (major beneficial)
Alternative B would include an active land acquisition program. Acquisitions, from willing land owners, within or adjacent to the ACECs could be actively sought. There has been recent interest in exchanges by private land owners within the Welch Ranch, Burnt Hollow, and Hole in the Wall ACEC areas. Under Alternative B these exchanges would be pursued. An active acquisition program would be a major benefit to ACEC values.

Renewable Energy (minor beneficial)
ACECs would be designated as renewable energy exclusion areas under Alternative B. Pumpkin Buttes is the only evaluation area with wind power potential of good or better. It is not foreseeable for any of the six other ACECs to be affected by renewable energy. As renewable energy development would likely be proposed within one ACEC, and therefore only one ACEC truly benefits from the exclusion area, the beneficial effect is minor.

Rights-of-Way and Corridors (major beneficial)
New ROW, including new communication sites on the Pumpkin Buttes, would be prohibited within ACECs under Alternative B. The absence of new surface disturbance and visual intrusion would be a major benefit to ACEC values.

Travel and Transportation Management (minor adverse)
Alternative B would prohibit motorized use within the Burnt Hollow, Cantonment Reno, and Dry Creek Petrified Tree ACECs. There are seasonal vehicle restrictions within the elk crucial seasonal ranges within the Fortification Creek ACEC. Where open to motorized vehicles,

including seasonally, motorists would be limited to designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation and other resources including ACEC values. The level of anticipated effect is minor adverse.

Recreation (negligible adverse)
Alternative B would designate four of the ACECs as SRMAas including Burnt Hollow, Dry Creek Petrified Tree, Hole in the Wall, and Welch Ranch. Surface-disturbing activities, except for administrative use, would be prohibited within the SRMAs. Proposals for surface-disturbing activities would consider relevant and important values in the other ACECs and would be mitigated to protect such values. Recreation use can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation, wildlife displacement, and the development of recreation facilities. Overall the level of effect recreation management actions on ACEC values is expected to be negligible adverse as non-recreation related surface-disturbing activities would be minimized.

Livestock Grazing Management (negligible adverse)
Livestock grazing would be allowed within the ACECs where compatible with other resource values and managed to achieve healthy rangelands and special habitats. Properly managed grazing can avoid adverse impacts and be beneficial to some resources. ACEC designation would provide a heightened awareness and further minimize the adverse effects of grazing on other resources including ACEC values. Overall the level of anticipated effect is negligible adverse as not all adverse effects can be avoided or mitigated such as inadvertent trampling of cultural artifacts or temporary over utilization.

Special Designations

Scenic or Back Country Byways (negligible adverse)
Alternative B would evaluate six routes for national byway status. The potential Tipperary/Thompson Creek Roads byway accesses the Dry Creek Petrified Tree ACEC. If the Tipperary/Thompson Creek Roads byway were to be designated it would be managed to encourage responsible use while protecting resource values. Increased byway use could lead to increased use of the Dry Creek Petrified Tree ACEC. Educational efforts would reduce the level of adverse effects on ACEC values from increased use to negligible.

Wilderness Study Areas (minor beneficial)
The Fortification Creek evaluation area is the only ACEC to contain a WSA. Alternative B would continue to manage WSAs to preserve natural conditions and processes even if Congress were to release them. WSA management would benefit ACEC values. Since Fortification Creek is the only ACEC containing a WSA the level of beneficial effect would be minor.

4.7.1.5. Alternative C

Areas of Critical Environmental Concern (minor adverse)
Alternative C would emphasize resource use and would not designate any ACECs. Management decisions would be applied on a project-specific basis to protect relevant and important values when activities are proposed. This could result in additional restrictions or design requirements for certain uses or activities, thereby mitigating impacts to ACEC values, however adverse effects to ACEC values are likely to occur. Overall, Alternative C would likely have minor adverse effects on ACEC values.

Physical Resources

Air Quality (major adverse)
Alternative C would not model air quality effects or identify mitigation strategies. The absence of air quality mitigation would have a major adverse effect on ACEC values.

Soil and Water Resources (major adverse)
Management actions allow surface-disturbing activities on sensitive soils and near water resources where consistent with other resource values. The intent of the management actions are to allow for resource use without permanently impairing sensitive resources including soil, water, and other resources. Sensitive soils and water resources are present within all the areas being evaluated resulting in a major adverse effect.

Cave and Karst Resources (negligible beneficial)
Surface-disturbing activities and forest product sales would be restricted near significant caves benefitting ACEC values. The Hole-in-the-Wall evaluation area contains bands of karst-bearing formations. Because limited portions of one evaluation area would be affected, overall there would be a negligible beneficial effect on ACEC values.

Mineral Resources

Locatable Minerals (negligible adverse)
No additional mineral withdrawals would be recommended. There is potential for locatable mineral activity within all evaluation areas including Fortification Creek outside the WSA. However, there are no active or proposed mines within or adjacent to ACEC evaluation areas. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect ACEC resource values would be negligible.

Leasable Minerals - Coal (major adverse)
All federal coal lands would be available for study, exploration, and leasing including the ACEC evaluation areas. Coal exploration and subsequent development within or adjacent to the ACEC evaluation areas is not foreseeable during the planning period. Federal coal would be available for in-place gasification which would include all evaluation areas except Burnt Hollow and Hole-in-the-Wall. In-place gasification is an emerging technology that has the potential to occur during the planning period and therefore could have a major adverse effect on ACEC values.

Leasable Minerals - Fluids (major adverse)
The entire federal oil and gas mineral estate within the planning area would be available for leasing, including for geothermal activity. Lessees would be required to mitigate adverse resource impacts. There has been fluid mineral development within all ACECs except Cantonment Reno. Leases within Fortification Creek and Pumpkin Buttes are currently producing. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek has moderate potential for conventional development. Fluid mineral surface-disturbing activities and production operations within ACECs would have major adverse impacts on ACEC values.

Salable Minerals (moderate adverse)
Mineral material activity would be allowed where compatible with other resources. Alternative C does not designate any ACECs, therefore ACEC values would not be a resource taken into

consideration. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree and Welch Ranch evaluation areas. In addition to these two areas, sand and gravel deposits occur within three additional evaluation areas: Burnt Hollow, Cantonment Reno, and Fortification Creek. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. Salable mineral activities within ACECs would have moderate adverse impacts on ACEC values.

Fire and Fuels Management

Unplanned Fire (Wildfire) (major adverse)
Full protection strategies, with few constraints on heavy equipment use, would be used during suppression activities. There would not be any ACECs, therefore ACECs would not be considered as an independent resource value. Designation could heighten the awareness and therefore the protection of ACEC values. Given the aggressive nature of suppression activities and no ACEC designation, the effects to ACEC values would be major adverse.

Planned Fire (Prescribed Fire) (negligible adverse)
Prescribed fire would be used to restore fire-adapted ecosystems for commodity production. These management actions could benefit ACEC evaluation areas as vegetation is often a relevant and important ACEC value. However, the additional vegetation would likely be used for livestock forage or other commodities thereby negating the ecosystem restoration. The end result is a negligible adverse effect.

Biological Resources

Vegetation – Forests and Woodlands (major adverse)
Forest and woodland treatments would be designed to maximize forest health and resource use. Intensive management would detract from the naturalness of the evaluation areas and reduce their biodiversity. Alternative C management would have major adverse effects on ACEC values.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Non-native plants could be used for interim reclamation activities in accordance with the BLM reclamation policy. There is development potential within all evaluation areas particularly without ACEC-specific management which would regulate development activities. The presence of non-native species would detract from naturalness values for knowledgeable public land users. However, since reclamation areas would be limited in scale and duration, the adverse effect would be negligible.

Vegetation – Riparian/Wetland Resources (moderate adverse)
Surface-disturbing activities would be allowed within 500 feet of surface water where consistent with other resource values. All evaluation areas except Pumpkin Buttes contain riparian and/or wetland communities. There would not be any ACECs, therefore ACECs would not be considered as an independent resource value. Designation could heighten the awareness and therefore limit surface-disturbing activities. Development would be likely within the evaluation areas and result in a moderate adverse effect to ACEC values.

Invasive Species and Pest Management (negligible beneficial)
Fewer species would be treated under Alternative C and priority would be given to infestations on public lands which threaten adjacent private lands. Few if any evaluation areas are likely to be the highest priority for treatment. Therefore benefits to ACEC values would likely be negligible.

Fish and Wildlife Resources – Fish (major adverse) **and Special Status Species – Fish** (negligible adverse)
Surface-disturbing activities would be allowed within 0.25 mile of fish-bearing water bodies where consistent with other resource values. There would not be any ACECs therefore ACECs would not be considered as an independent resource value. Designation could heighten the awareness and therefore limit surface-disturbing activities. Development would be likely within the evaluation areas and result in a major adverse effect to ACEC values as all ACECs except Pumpkin Buttes contain fish-bearing waters. Welch Ranch is the only ACEC capable of supporting Yellowstone cutthroat trout therefore the impacts of special status fish species management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife (major adverse) **and Special Status Species – Wildlife** (major adverse)
Alternative C would apply a seasonal spatial buffer from surface disturbing activities for raptor nests but otherwise allow surface-disturbing and disruptive activities within, big-game calving areas and crucial winter range, and near sharp-tailed grouse leks. These management actions would result in major adverse effects to wildlife and therefore ACEC values.

Seasonal and permanent buffers prohibiting surface-disturbing activities are provided for special status species such as bald eagles and Greater Sage-Grouse. Raptors are a seasonal buffer only. Surface-disturbing and disruptive activities could be authorized within prairie dog colonies. These management actions would be unlikely to sustain black-tailed prairie dog, Greater Sage-Grouse, and raptor populations within the evaluation areas. Alternative C special status species management would have a major adverse effect on ACEC values.

Special Status Species – Plants (negligible beneficial)
Alternative C would allow surface-disturbing and disruptive activities within special status plant habitat but not within known populations. While this management would protect known populations there are likely undocumented populations that would not be protected as surveys that could identify additional populations would not be required. Hole in the Wall is the only evaluation area containing mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas the level of beneficial effect on ACEC values would be negligible.

Heritage and Visual Resources

Cultural Resources (moderate adverse)
Surface-disturbing activities would be allowed near historic properties and other sensitive sites when appropriate mitigation is accomplished. Four evaluation areas (Cantonment Reno, Hole in the Wall, Pumpkin Buttes, and Welch Ranch) are known to contain sensitive cultural resources and they are likely present in the other evaluation areas as well. The absence of management direction can lead to inconsistent management and adverse effects to the cultural resources and therefore ACEC values. The anticipated level of effect is moderate adverse.

Paleontological Resources (minor adverse)
Mineral development and other surface-disturbing activities would not be prohibited in areas containing paleontological resources of high quality or importance such as the Dry Creek Petrified Tree evaluation area. Paleontological surveys would be required prior to surface-disturbing activities in all PFYC Class 4, and 5 formations; this management action would include a portion of the Hole in the Wall evaluation area. Surface-disturbing activities would be monitored

on a project specific basis. Surveying provides the opportunity to identify paleontological resources but would not be expected to discover all paleontological resources, and therefore monitoring could be required or recommended. Likewise, monitoring reduces adverse effects to paleontological resources, by identifying the resources as they are uncovered, but does not prevent all adverse effects. Since only PFYC Class 4 and 5 area would be surveyed and therefore likely to be monitored it is likely some paleontological resources would be impacted therefore the level of adverse effects would be minor.

Visual Resources (major adverse)
All of Pumpkin Buttes and most of the Hole in the Wall evaluation areas as well as smaller portions of the Fortification Creek and Welch Ranch evaluation areas would be managed as VRM Class III. The remainder of the evaluation areas are managed as VRM Class IV. With the potential for development activities to dominate throughout all or large portions of five evaluation areas the anticipated effect to ACEC values would be major adverse.

Land Resources

Forest Products (major adverse)
Forests and woodlands of the planning area would be available for the collection and commercial harvest of forest products. Forest products would be managed to maximize economic return which includes no limitations on the size or shape of harvest areas. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole in the Wall, Pumpkin Buttes, and Welch Ranch evaluation areas all contain forest or woodland vegetation that could be available for available for forest product use. Commercial timber areas do not overlap any evaluation area. With the focus on economic return forest product activities are foreseeable within the evaluation areas and could be a major adverse effect to ACEC values.

Lands and Realty (major adverse)
Alternative C would focus on the disposal of public lands and would not acquire any additional lands. Lands with resource values including ACEC values would be candidates for disposal. The inability to acquire additional lands and the emphasis on public land disposal would have a major adverse effect on ACEC values.

Renewable Energy (minor adverse)
The ACEC evaluation areas would be available for renewable energy development under Alternative C. Pumpkin Buttes is the only evaluation area with wind power potential of good or better. It is not foreseeable for any of the six other evaluation areas to be affected by renewable energy. Wind power development near the Buttes would impair the scenic qualities of the evaluation area. As adverse impacts would likely be limited to one evaluation area the level of effect is minor.

Rights-of-Way and Corridors (major adverse)
ROW would be considered within the ACEC evaluation areas, including additional communication sites on the South Middle Butte. Communication sites and surface-disturbance from ROW within evaluation areas adversely effects ACEC values. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, Pumpkin Buttes, and Welch Ranch are within the CBNG development area and given the mixed ownership pattern of both surface and mineral estate ROW applications area likely. The level of anticipated effect to ACEC values is major adverse.

Travel and Transportation Management (moderate adverse)
Alternative C, without ACEC designation, could allow motorized use within Burnt Hollow, Cantonment Reno and Dry Creek Petrified Tree evaluation areas. There would continue to be seasonal vehicle restrictions within the elk crucial winter range of the Fortification Creek evaluation area. Where open to motorized vehicles, including seasonally, motorists are limited to existing or designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation and other resources including ACEC values. However, since motor vehicle use would be present within all seven evaluation areas the level of anticipated effect is moderate adverse.

Recreation (moderate adverse)
Alternative C would designate three of the ACEC evaluation areas as SRMAs including Burnt Hollow, Dry Creek Petrified Tree, and Welch Ranch. Surface-disturbing activities would be allowed within the SRMAs when consistent with resource values. Proposals for surface-disturbing or disruptive activities within the SRMAs and four remaining evaluation areas could be mitigated to protect the recreation and related resources such as soil, water, vegetation, wildlife habitat, and therefore ACEC values. Recreation use can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation, wildlife displacement, and the development of recreation facilities. Considering Alternative C's emphasis on resource use, the overall level of effect recreation management actions would have on ACEC values is moderate adverse as surface-disturbing activities within the evaluation areas would be likely.

Livestock Grazing Management (moderate adverse)
Livestock grazing would be allowed within all evaluation areas. Increases in livestock stocking rates could be allowed with any increases in forage production allocated to livestock as the first priority. With the overall emphasis of Alternative C on resource uses the level of anticipated effect is moderate as there could be increased stocking rates and therefore grazing pressure within the ACEC evaluation areas.

Special Designations

Scenic or Back Country Byways (no effect)
Alternative C would not designate any byways within the planning area. Increased use of Tipperary/Thompson Creek Roads and the Dry Creek Petrified Tree area would likely not occur. Alternative C would likely have no effect on ACEC values.

Wilderness Study Areas (minor beneficial)
The Fortification Creek evaluation area is the only ACEC to contain a WSA. Alternative C would manage WSAs to preserve natural conditions and processes unless Congress were to release them. If released, the WSAs would be managed similar to their surrounding public lands. Congressional action is not foreseeable within the planning period. Therefore WSA management would benefit ACEC values. Since Fortification Creek is the only evaluation area containing a WSA the level of beneficial effect would be minor.

4.7.1.6. Alternative D

Areas of Critical Environmental Concern (moderate beneficial)
Alternative D would designate three ACECs: Fortification Creek, Pumpkin Buttes, and Welch Ranch (35,451 acres). Appendix S (p. 2121) lists the objectives and management prescriptions for each ACEC. Designation of ACECs would establish these areas as priority areas and management

efforts would focus such that problems and issues could be addressed more effectively, thereby serving to better protect the relevant and important resources. ACEC-specific prescriptions would protect the integrity of the characteristics for which each ACEC was designated. Management prescriptions would vary dependent on the relevant and important values present at each site.

It is important to note that an ACEC designation would not affect present leases or valid existing rights. However, when current leases expire, they would become administratively unavailable for future leasing.

Physical Resources

Air Quality (moderate beneficial)
Alternative D would involve stakeholders to model air quality effects and identify mitigation strategies. Air quality mitigation would beneficially affect ACEC values. ACECs within the center of the planning area are influenced by oil and gas emissions including Fortification Creek and Pumpkin Buttes. Air quality mitigation would have a moderate beneficial effect on ACEC values as only two ACECs would benefit.

Soil and Water Resources (minor adverse)
Alternative D management actions regulate surface-disturbing activities on sensitive soils and near water resources where these resources can be adequately protected. The intent of the management actions are to allow for resource use while protecting soil, water, and other resources. However sensitive resources such as soil and water can not always be adequately protected resulting in a minor adverse effect.

Cave and Karst Resources (negligible beneficial)
Surface-disturbing activities and forest product sales would be restricted near significant caves benefitting ACEC values. The Hole-in-the-Wall evaluation area contains bands of karst-bearing formations. Because limited portions of one evaluation area would be affected, overall there would be a negligible beneficial effect on ACEC values.

Mineral Resources

Locatable Minerals (moderate beneficial)
In addition to the present mineral withdrawals, another 115,614 acres would be recommended for withdrawal from mineral entry including the ACECs. This management action would have a moderate beneficial effect on ACEC values by preventing locatable mineral development on approximately half the acreage being evaluated.

Leasable Minerals - Coal (major adverse)
Federal coal lands would be available for study and exploration subject to other resource values. Leasing would only occur within the high development potential areas of central Campbell County and northern Sheridan County, which would include the Welch Ranch and western edge of the Burnt Hollow evaluation areas. Burnt Hollow would not be designated as an ACEC under Alternative D and the acreage of Welch Ranch is reduced in Alternative D. Without ACEC designation these area may have more development potential as ACEC protection would not be a resource considered. Federal coal would be available for in-place gasification which would include all evaluation areas except Burnt Hollow and Hole-in-the-Wall. In-place gasification is an emerging technology that has the potential to occur during the planning period, and therefore could have a major adverse effect on ACEC values.

Leasable Minerals - Fluids (major adverse)
Additional leasing would be contingent on ACEC specific management plans. Fortification Creek would be unavailable for leasing, Pumpkin Buttes leases would be no surface occupancy, and Welch Ranch does not contain federal fluid mineral estate. All other ACEC evaluation areas would be available for leasing and development. Existing leases would be honored. Fortification Creek and Pumpkin Buttes leases are currently producing. Applications (APDs) are pending within Fortification Creek, Pumpkin Buttes, and Welch Ranch. Cantonment Reno, Dry Creek Petrified Tree, Fortification Creek, and Pumpkin Buttes have high potential for CBNG development; Fortification Creek also has moderate potential for conventional development. Development of the existing leases during the planning period is likely. Fluid mineral surface-disturbing activities and production operations within ACEC evaluation areas would have major adverse impacts on ACEC values.

Salable Minerals (negligible beneficial)
Mineral material activity would be prohibited within the three ACECs and available within the four other evaluation areas. BLM-authorized salable mineral development is taking place adjacent to the Dry Creek Petrified Tree evaluation area and the Welch Ranch ACEC. Existing rights would be honored, expansion of permit areas into Welch Ranch would not be authorized. Sand and gravel deposits occur within three additional evaluation areas: Burnt Hollow, Cantonment Reno, and the Fortification Creek ACEC. Salable mineral operations are generally localized and confined; occurring in discrete locations, not widespread such as oil and gas wells. The prohibition of salable mineral activities within ACECs is beneficial to ACEC values, however with only three ACECs designated, the existing activities adjacent to one of the ACECs, and potential development in three evaluation areas, the beneficial effects of prohibiting salable mineral activity would be negligible.

Fire and Fuels Management

Unplanned Fire (Wildfire) and Planned Fire (Prescribed Fire) (moderate beneficial)
Unplanned fire management would be cognizant of resource goals, including ACECs, and respond accordingly including limiting heavy equipment use. Wildland and planned fire would be used to restore fire-adapted ecosystems. ACEC designation would heighten the awareness and therefore the protection and management of ACEC values in the three designated ACECs. The lack of designation within the other four evaluation areas could result in ACEC resource values being overlooked. These management actions would be a moderate benefit to the ACECs.

Biological Resources

Vegetation – Forests and Woodlands (negligible beneficial)
Alternative D would use silvicultural treatments to maximize forest health. Management of old growth, aspen, and limber pine communities would be emphasized. These species are not widespread in Fortification Creek or Welch Ranch. Pumpkin Buttes does not contain forest or woodland vegetation. ACEC evaluation areas, most notably Hole-in-the-Wall may benefit from these management actions, but without designation the relevant and important ACEC values may be overlooked. The overall level of effect to ACEC values would likely be negligible beneficial.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Non-native plants could be used for short-term reclamation activities in accordance with the BLM reclamation policy. There is development potential within the three ACECs and four evaluation

areas. ACEC-specific management which would regulate development activities within the three ACECs, but not the four evaluation areas. The presence of non-native species would detract from naturalness values for knowledgeable public land users. However, since reclamation areas would be limited in scale and duration the adverse effect would be negligible.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Alternative D allows surface-disturbing activities within 500 feet of surface water where resources can be adequately protected. ACEC designation and management would further regulate development activities within the two ACECs containing riparian or wetland communities, but not within the four non-designated evaluation areas. Since surface-disturbing activities would be minimal in the ACECs and regulated within the evaluation areas, the result would be a moderate benefit to ACEC values.

Invasive Species and Pest Management (minor beneficial)
ACEC designation would likely factor into determining treatment areas. The highest priority would be given to BLM-administered lands threatened by invasion from adjacent lands. Few ACECs or evaluation areas are likely to be the highest priority for treatment. Therefore, the benefit to ACEC values would likely be minor.

Fish and Wildlife Resources – Fish (moderate beneficial) **and Special Status Species – Fish** (negligible beneficial)
Surface-disturbing activities would be allowed within 0.25 mile of fish-bearing water bodies where impacts are determined to be acceptable. Other management actions include incorporating fisheries enhancement into reservoir design, maintaining or enhancing fish habitat, and designing water crossings to support fish passage. These management actions would be a moderate benefit as although they allow for development, the adverse impacts would be mitigated to maintain a sustainable fisheries. Welch Ranch is the only ACEC capable of supporting Yellowstone cutthroat trout, therefore the benefits of special status fish species management actions on ACEC values is negligible.

Fish and Wildlife Resources – Wildlife (moderate beneficial) and **Special Status Species – Wildlife** (major adverse)
Alternative D would provide seasonal and permanent-spatial buffers where surface-disturbing and disruptive activities would be allowed with adequate protection of raptor nests, big game calving areas and crucial winter range, and sharp-tailed grouse leks. The allowance for development and disruptive activities would result in localized impacts but overall should be moderately beneficial to wildlife, and therefore ACEC values. Similar buffers are provided for special status species such as bald eagles and Greater Sage-Grouse. Greater Sage-Grouse management would be based on the Wyoming BLM Policy (WY-2012-019) and Wyoming EO (2011–05). The three designated ACECs are outside of Priority Habitat Area and therefore Greater Sage-Grouse and ACEC values would be adversely affected. Five evaluation areas are wholly (Cantonment Reno, Dry Creek Petrified Tree, and Hole-in-the-Wall) or partially (Burnt Hollow, western Welch Ranch) within Priority Habitat Area. The BLM and Wyoming Greater Sage-Grouse strategies are statewide strategies and may not be sufficient to sustain the Greater Sage-Grouse population within the planning area, and therefore have a major adverse effect on ACEC values.

Special Status Species – Plants (minor beneficial)
Alternative D would allow surface-disturbing and disruptive activities within special status plant habitat but not within known populations. Surveys would be required that could identify and therefore protect additional populations. Hole-in-the-Wall is the only evaluation area containing

mapped special status plant habitat. Since special status plants are unlikely in the remaining evaluation areas, the level of beneficial effect on ACEC values would be minor.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Mineral development and other surface-disturbing activities would be prohibited or restricted near specific historic properties and sensitive cultural sites. These management actions would protect cultural resources, and therefore ACEC values, within the Pumpkin Buttes, and Welch Ranch ACECs and the Cantonment Reno and Hole-in-the-Wall evaluation areas. The anticipated level of effect is major beneficial.

Paleontological Resources (negligible adverse)
Mineral development and other surface-disturbing activities would avoid areas containing paleontological resources of high quality or importance such as the Dry Creek Petrified Tree evaluation area. Paleontological surveys would be required prior to surface-disturbing activities in all PFYC Class 4, and 5 formations and Class 3 formations as needed. This management action would include all three ACECs and the four evaluation areas. Monitoring of surface-disturbing activities would be required based on survey results. The Hole-in-the-Wall ACEC contains areas of PFYC 5. Surveying provides the opportunity to identify paleontological resources, but would not be expected to discover all paleontological resources, and therefore monitoring could be required or recommended. Likewise, monitoring reduces adverse effects to paleontological resources, by identifying the resources as they are uncovered, but does not prevent all adverse effects. However, through the survey and monitoring requirements adverse effects should be negligible.

Visual Resources (minor adverse)
The Fortification Creek ACEC outside of the WSA would be managed as VRM Class III under Alternative D, while the other two ACECs and the four evaluation areas would be managed as VRM Class II. Management activities should not attract attention within six of the seven areas evaluated, therefore visual resources and ACEC should only be impaired to a minor degree.

Land Resources

Forest Products (moderate adverse)
Forests and woodlands of the planning area would be available for the collection and commercial harvest of forest products. Forest products would be managed to remain within ecologically sustainable limits and could include limitations on the size or shape of harvest areas. The harvest of forest products could adversely affect ACEC resource values such as fragile soils and watersheds, and visual resources. Burnt Hollow, Fortification Creek, Hole-in-the-Wall, Pumpkin Buttes, and Welch Ranch evaluation areas all contain forest or woodland vegetation that could for available for forest product use. Commercial timber areas do not overlap any evaluation area. Forest product activities are foreseeable within the evaluation areas and could be a moderate adverse effect to ACEC values.

Lands and Realty (major beneficial)
Alternative D would allow land acquisition from willing land owners and actively seek to dispose of public lands which are difficult to manage and do not contain resource values. Acquisitions, from willing land owners, within or adjacent to the three ACECs and four evaluation areas would be desirable. There has been recent interest in exchanges by private land owners within the

Burnt Hollow, and Hole-in-the-Wall evaluation areas and near the Welch Ranch ACEC. Under Alternative D, these exchanges would be pursued. The allowance for acquisitions would be a major benefit to ACEC values.

Renewable Energy (minor beneficial)
ACECs would be designated as renewable-energy exclusion areas under Alternative D. Pumpkin Buttes is the only ACEC with wind-power potential of good or better. It is not foreseeable for any of the six other evaluation areas to be affected by renewable energy. As renewable-energy development would likely be proposed within one ACEC, and therefore only one ACEC truly benefits from the exclusion area, the beneficial effect is minor.

Rights-of-Way and Corridors (moderate adverse)
New ROW, including new communication sites on the Pumpkin Buttes, would be prohibited within the three ACECs under Alternative D. The four evaluation areas would be available for ROW consideration. The three ACECs are within the CBNG development area and wold have their ACEC values protected. The Cantonment Reno and Dry Creek Petrified Tree evaluation areas are also within the CBNG development area where ROW requests are likely; therefore the likelihood of new surface disturbance and visual intrusion within the evaluation areas would have a moderate adverse effect on ACEC values.

Travel and Transportation Management (minor adverse)
Alternative D would prohibit motorized use within the Burnt Hollow and Cantonment Reno evaluation areas. There would be seasonal vehicle restrictions within the elk crucial seasonal ranges within the Fortification Creek ACEC. Where open to motorized vehicles, including seasonally, motorists would be limited to designated routes. Limiting vehicle use to defined routes limits impacts to soil, water, vegetation, and other resources including ACEC values. The level of anticipated effect is minor adverse.

Recreation (minor adverse)
Alternative D would designate the Welch Ranch ACEC as aSRMA. In addition, three of the ACEC evaluation areas would be designated as SRMAs including Burnt Hollow, Dry Creek Petrified Tree and Hole-in-the-Wall. Surface-disturbing activities, except for administrative use, would be prohibited within the SRMAs. Some protection of relevant and important values would be afforded in SRMAs that were not designated as ACECs in Alternative D due to the surface use restrictions. Recreation use itself can have adverse effects, although typically localized, from compacting soil and vegetation which increases vegetation and wildlife displacement, and the development of recreation facilities. Recreational use within ACECs may be mitigated to protect the ACEC values. Overall, the level of effect of recreation management actions on ACEC values is expected to be minor adverse as non-recreation-related surface-disturbing activities would be minimized within the four ACEC evaluation areas (including one designated ACEC) designated as SRMAs and reduced in the remaining two evaluation areas.

Livestock Grazing Management (negligible adverse)
Livestock grazing would be allowed within the three ACECs and four evaluation areas where compatible with other resource values. Properly managed grazing can avoid adverse impacts and be beneficial to some resources. ACEC designation would provide a heightened awareness and further minimize the adverse effects of grazing on other resources including ACEC values. Overall, the level of anticipated effect is negligible adverse, as not all adverse effects can be

avoided or mitigated such as inadvertent trampling of cultural artifacts or temporary over utilization, and not all evaluation areas would be designated.

Special Designations

Scenic or Back Country Byways (negligible adverse)
Alternative D would evaluate six routes for byway status. The potential Tipperary/Thompson Creek Roads byway accesses the Dry Creek Petrified Tree ACEC. If the Tipperary/Thompson Creek Roads byway were to be designated, it would be managed to encourage responsible use while protecting resource values. Increased byway use could lead to increased use of the Dry Creek Petrified Tree ACEC. Educational efforts would reduce the level of adverse effects on ACEC values from increased use to negligible.

Wilderness Study Areas (minor beneficial)
The Fortification Creek evaluation area is the only ACEC to contain a WSA. Alternative D would continue to manage WSAs to preserve natural conditions and processes even if Congress were to release them. WSA management would benefit ACEC values. Since Fortification Creek is the only ACEC containing a WSA, the level of beneficial effect would be minor.

4.7.1.7. Cumulative Impacts

The preferred alternative designates a total of 35,451 acres as ACECs (4.4% of the planning area). In these three areas, the ACEC will overlap with other designations, such as a WSA, TCP and SRMA. ACEC designation and management applies only to BLM actions. Actions on adjacent parcels such as the widespread CBNG development may affect the ability to manage for wildlife, visual resources, and other ACEC values.

4.7.1.8. Conclusion

Alternative B has the most beneficial effect on ACECs as seven ACECs would be designated and they would be managed to protect their relevant and important resource values. Alternative D is the second most beneficial alternative as three ACECs would be designated. Neither alternatives A or C would designate any ACECs. Alternative C emphasizes resource use and would therefore be the most adverse to ACEC values. Table 4.74, "Proposed ACEC BLM Surface Acres" (p. 1392) lists acreages of proposed ACECs by alternative. Table 4.75, "Summary of Impacts to Areas of Critical Environmental Concern" (p. 1420) summarizes effects on ACECs from management proposed under each alternative.

Table 4.75. Summary of Impacts to Areas of Critical Environmental Concern

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	Major beneficial	Major adverse	Moderate beneficial
Soil	Moderate adverse	Major beneficial	Major adverse	Minor adverse
Water Resources	Moderate adverse	Major beneficial	Major adverse	Minor adverse
Cave and Karst Resources	Negligible adverse	Negligible beneficial	Negligible beneficial	Negligible beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Major beneficial	Negligible adverse	Moderate beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Leasable Minerals – Coal	Negligible adverse	Major beneficial	Major adverse	Major adverse
Leasable Minerals – Fluids	Major adverse	Major adverse	Major adverse	Major adverse
Salable Minerals	Moderate adverse	Minor beneficial	Moderate adverse	Negligible beneficial
Fire and Fuels Management				
Unplanned Fire (Wildfire)	Negligible adverse	Major beneficial	Major adverse	Moderate beneficial
Planned Fire (Prescribed Fire)	Negligible beneficial	Major beneficial	Negligible adverse	Moderate beneficial
Biological Resources				
Vegetation – Forests and Woodlands	Minor beneficial	Moderate beneficial	Major adverse	Negligible beneficial
Vegetation – Grassland and Shrubland Communities	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible adverse
Vegetation – Riparian/Wetland Resources	Moderate adverse	Major beneficial	Moderate adverse	Moderate beneficial
Invasive Species and Pest Management	Minor beneficial	Minor beneficial	Negligible beneficial	Minor beneficial
Fish and Wildlife Resources – Fish	Negligible beneficial	Major beneficial	Major adverse	Moderate beneficial
Fish and Wildlife Resources – Wildlife	Moderate adverse	Major beneficial	Major adverse	Moderate beneficial
Special Status Species – Plants	Negligible adverse	Minor beneficial	Negligible beneficial	Minor beneficial
Special Status Species – Fish	Negligible beneficial	Negligible beneficial	Negligible adverse	Negligible beneficial
Special Status Species – Wildlife	Major adverse	Major beneficial	Major adverse	Major adverse
Heritage and Visual Resources				
Cultural Resources	Moderate adverse	Major beneficial	Moderate adverse	Major beneficial
Paleontological Resources	Minor adverse	Negligible adverse	Minor adverse	Negligible adverse
Visual Resources	Major adverse	Major beneficial	Major adverse	Minor adverse
Land Resources				
Forest Products	Negligible adverse	Major beneficial	Major adverse	Moderate adverse
Lands and Realty	Moderate beneficial	Major beneficial	Major adverse	Major beneficial
Renewable Energy	Minor adverse	Minor beneficial	Minor adverse	Minor beneficial
Rights-of-Way and Corridors	Major adverse	Major beneficial	Major adverse	Moderate adverse
Travel and Transportation Management	Minor adverse	Minor adverse	Moderate adverse	Minor adverse
Recreation	Minor adverse	Negligible adverse	Moderate adverse	Minor adverse
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	Minor adverse	Negligible adverse	Moderate adverse	Negligible adverse
Special Designations				

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Areas of Critical Environmental Concern	Minor adverse	Major beneficial	Minor adverse	Moderate beneficial
Scenic or Back Country Byways	No effect	Negligible adverse	No effect	Negligible adverse
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.7.2. Scenic or Back Country Byways

This section describes the impacts of each alternative to National Byways, which are an important recreational resource on BLM-administered lands. Byways enhance motorized recreation, wildlife viewing, and heritage tourism.

4.7.2.1. Methods and Assumptions

Six potential byways, totalling 205 miles, are evaluated in alternatives B and D. There are no designated National Byways within the planning area (Alternative A) and none are proposed in Alternative C. The resource evaluated is the 9,765 acres of BLM surface within 0.25 mile of the evaluated byways. Adverse impacts to National Byways result from management actions that substantially limit or prevent public use of byways. Beneficial impacts result from actions that enhance the use of the byways. Assumptions used in this analysis, include, but are not limited to, the following:

- Designating a byway will increase use of the road and increase human presence in the area.
- Byways will be designated in cooperation with the affected counties, adjacent landowners, and other stakeholders.
- No formal land use constraints, land-use closures, are associated with the designation of byways. Any regulations or restrictions related to byway designation will affect BLM-administered lands only.
- Management prescribed for designated byways would provide opportunities for motor touring while enhancing understanding of the multiple uses of public lands.

Scale of impacts:

- Negligible: Less than 1% of proposed BCBs would be affected; only a small portion of a single evaluated BCB would be affected.
- Minor: 1-5% of proposed BCB would be affected; a moderate portion of a single evaluated BCB or small portions of 2-3 evaluated BCB would be affected
- Moderate: 5-10% of proposed BCB would be affected; the majority of a single evaluated BCB or moderate portions of 2-4 evaluated BCB would be affected.
- Major: 10% of proposed BCB would be affected; the majority of several evaluated BCB or moderate portions of most evaluated BCB would be affected.

Significance Criteria

An adverse effect on Scenic or BCBs as a result of project actions would be considered potentially significant if the action would violate objectives associated with byway resource management and could not be mitigated.

4.7.2.2. Impacts Common to All Alternatives

Scenic or Back Country Byways (major beneficial)
Managing byways to encourage responsible motorized recreational use while protecting other resource values would preserve the natural features for which the byway was designated. Allowing for multiple use along byways would increase local support for byway designation. Coordination with local residents is critical for successful designation and maintenance of any designated byway.

Physical Resources

The **Air Quality, Soil, and Cave and Karst Resources** programs do not have any management actions common to all alternatives that would affect byway use or management. There are also no air management actions by alternative that would affect byway use or management; air quality will not be addressed further in this section.

Water Resources (major beneficial)
Water management actions common to all alternatives include managing surface-disturbing activities to prevent degradation of water quality, and managing water to meet Wyoming Standards for Healthy Rangelands. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways.

Mineral Resources

Under management actions common to all alternatives, almost the entire planning area would be available for exploration and development of locatable, leasable fluid, and salable minerals.

Locatable Minerals (negligible adverse)
There is likely to be minimal overlap between locatable minerals activities and potential byways. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to effect byway use would be negligible.

Leasable Minerals – Coal (no effect)
Coal leasing would be limited to the high development potential areas of central Campbell County and northern Sheridan County, which are not traversed by any of the evaluated byways. Coal activity in the planning area would have no effect on byway management and is not further addressed in this section.

Leasable Minerals – Fluids (major adverse)
The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. There are 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways along the Lower Powder River Road. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals (negligible adverse)
The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Fire and Fuels Management (no effect)

Fire and fuels management does not have any management actions common to all alternatives or by alternative that would affect byway management or use. There are also no fire and fuels management actions by alternative that would effect byway use or management; fire and fuels management will not be addressed further in the scenic or BCBs section.

Biological Resources

Management actions for biological resources are designed to protect those resources typically by limiting surface-disturbing activities which would likely increase byway use.

Vegetation – Forests and Woodlands (no effect)
The forests and woodland resource does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the forests and woodlands program on scenic or BCBs will vary by alternative.

Vegetation – Grassland and Shrubland Communities (major beneficial)
Grass and shrub communities are the predominant vegetation types within the planning area. Relevant management actions include protecting plant communities, and cooperatively managing plant communities to maintain healthy rangelands. Surface-disturbing activities would be sited to reduce adverse effects to vegetation. These management actions would have a major beneficial effect on potential byway use.

Vegetation – Riparian/Wetland Resources (major beneficial)
The primary byway that would be affected by riparian and wetland management is the Lower Powder River Road which parallels the Powder River; the Hazelton Road crosses multiple riparian areas. Management actions common to all alternatives that could affect byway management and use include managing riparian and wetland habitats to improve water quality, to manage towards properly functioning condition, to cooperatively enhance riparian/wetland systems, and to prevent the loss or degradation of riparian/wetland habitat. The Lower Powder River Road byway includes 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways. Riparian/wetland management actions could have a major beneficial effect on byway use.

Invasive Species and Pest Management (no effect)
Invasive species and pest management does not have any management actions common to all alternatives or by alternative that would affect byway management or use. Invasive species and pest management will not be addressed further in the scenic or BCBs section.

Fish and Wildlife Resources – Fish (major beneficial)
There are several fisheries management actions that could potentially increase use along the Lower Powder River and Hazelton Roads including developing mitigation for surface-disturbing and disruptive activities, managing barriers to fish passage, providing public access to fish-bearing waters, and providing cooperative fisheries education. These management actions would likely have a major beneficial effect on byway use by increasing opportunities for water-based recreation.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Wildlife and special status species management actions common to all alternatives include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing, maintaining, and restoring Greater Sage-Grouse habitat; and a permanent disturbance-free buffer for bald eagle nests. Collectively, these actions could have a major beneficial effect on byway use by promoting habitat protection while causing the relocation, modification, or redesign of surface-disturbing activities.

Special Status Species – Plant (no effect)
Special status species plant management does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the special status species plant management program on scenic or BCBs will vary by alternative.

Special Status Species – Fish (no effect)
Evaluated byways do not intersect with potential or occupied special status species fish habitat, therefore special status fish management would have no effect on byways and are not further addressed in this section.

Heritage and Visual Resources

There are no management actions common to all alternatives for cultural or paleontological resources that would affect byway management or use.

Visual Resources (negligible beneficial)
A management action common to all alternatives is the requirement for permanent facilities to blend with the surrounding landscape. This requirement is secondary to managing within the VRM class, meaning that although facilities might be visible within VRM Class II through IV areas, mitigation for adverse effects on visual resources should be included wherever possible. Blending permanent facilities would help mitigate visual impacts however development activities would likely still be readily visible, therefore the beneficial effect of the management action on byway use is likely to be negligible.

Land Resources

Forest Products (no effect)
Forest product management does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the forest product program on scenic or BCBs will vary by alternative.

Lands and Realty (no effect)
The lands and realty management actions common to all alternatives and which vary by alternative do not effect byway management or use and will not be addressed further in the scenic or BCBs section.

Renewable Energy (no effect)
Renewable-energy development does not include any management actions common to all alternatives that would affect use of the evaluated byways. The effects from the renewable-energy program on scenic or BCBs will vary by alternative.

Rights-of-Way and Corridors (major adverse)
The designation of ROW corridors adjacent to roads and other disturbance corridors could have a major adverse effect on byway use.

Travel and Transportation Management (major beneficial)
Management actions common to all alternatives relate to standards for the location, design, and maintenance of roads and would have a major beneficial effect on byway use by providing a safe transportation network.

Recreation (major beneficial)
Management actions common to all alternatives that would benefit byway use include providing diverse recreational opportunities, cooperatively developing recreational facilities and trails, and pursing access to public lands for recreational purposes. These management actions would likely have a major beneficial effect.

Lands With Wilderness Characteristics (no effect)
None of the evaluated byways traverse areas containing wilderness characteristics; this resource will not be addressed further in this section.

Livestock Grazing Management (minor beneficial)
Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats, a benefit to byway users. Overall, these management effects are likely to have a minor beneficial effect.

Special Designations (no effect)

Area of Critical Environmental Concern (no effect)
There are no management actions common to all alternatives for ACECs that affect scenic or BCBs, the effects of ACEC management on the scenic or BCB resource will vary by alternative.

Wild and Scenic Rivers and Wilderness Study Areas (no effect)
Management of WSRs or WSAs would not affect byway use. None of the evaluated routes directly access WSAs or the proposed Middle Fork WSR; they will not be addressed further in the scenic or BCBs section.

Socioeconomic Resources (no effect)

There are no social, economic, or health and safety management actions common to all alternatives or by alternative that would have a measurable effect on byway management or use. Therefore, these topics are not addressed further in this section.

4.7.2.3. Alternative A

Scenic or Back Country Byways (major adverse)
Alternative A would continue management in accordance with the 1985 RMP as amended and maintained. Under Alternative A, there are no designated Scenic or BCBs. Mineral and other land use activities could occur along the potential byways reducing user satisfaction and safety. Development is likely along the Powder River Road, Trabing/Sussex Roads, an Tipperary/Thompson Roads; a major adverse effect.

Physical Resources

Soil (moderate beneficial)
Soil management actions for Alternative A prohibit surface-disturbing activities on steep slopes and fragile soils with exception provisions. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by limiting development activities thereby enhancing recreational opportunities along the byways. However, inconsistent application of exceptions reduces the benefit to moderate.

Water Resources (moderate beneficial)
Water management actions prohibit surface-disturbing activities within 500 feet of perennial streams and reservoirs with exception provisions. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways. However, inconsistent application of exceptions reduces the benefit to moderate.

Cave and Karst Resources (minor beneficial)
While the 1985 does not contain any cave management decisions, surface-disturbing activities would likely be prohibited near significant caves. Much of the southern Big Horn Mountains is comprised of cave-bearing karst formation. Surface-disturbing activities could be prohibited near any significant caves along the Hazelton, Rome Hill, and Slip Roads proposed byways. This would likely include only a few caves and therefore a limited area of the byway evaluation area, a minor beneficial effect.

Mineral Resources

Locatable Minerals (negligible adverse)
There is likely to be minimal overlap between locatable minerals activities and potential byways. The potential for locatable minerals development to effect use within the byway evaluation areas would be negligible.

Leasable Minerals – Fluids (major adverse)
The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways are along the Lower Powder river Road. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals (negligible adverse)
The foreseeable development scenario predicts that salable minerals development would disturb less than one percent of BLM surface in the planning area. There is likely to be minimal overlap between salable minerals activities and potential byways. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources

Vegetation – Forests and Woodlands (moderate beneficial)
The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative A management actions are designed to promote biodiversity and healthy forests. These management actions would provide for management activities in the Hazelton and Slip Road evaluation areas which could cause short term reduction in users but overall diverse

healthy forests and woodlands should promote byway use. Therefore, forest and woodland management actions would have a moderate beneficial effect.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
The present RMP does not have any grass and shrub community management actions. Non-native species could be used in reclamation activities, which may have an adverse effect on knowledgeable byway users. However, most users would not notice therefore the impact would be negligible.

Vegetation – Riparian/Wetland Resources (minor beneficial)
The primary byway that would be affected by riparian and wetland management is the Lower Powder River Road which parallels the Powder River; the Hazelton Road crosses multiple riparian areas. The Lower Powder River Road byway includes 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways. Surface-disturbing activities would be prohibited within 500 feet of riparian and wetland areas with exception provisions. Inconsistent application of exceptions and only one evaluation area being affected reduces the benefit to minor.

Fish and Wildlife Resources – Fish (moderate beneficial)
The BLM cooperatively works with the WGFD to manage fish habitat. Fish habitat is present along the Lower Powder River and Hazelton Roads. Cooperative management would likely have a moderate beneficial effect on byway use by increasing opportunities for water-based recreation along these two routes.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate beneficial)
Wildlife and special status species management actions include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing Greater Sage-Grouse habitat; and a seasonal disturbance-free buffer for bald eagle nests. These management actions all include provisions for exceptions that have been inconsistently applied in the past. Collectively, these actions could have a moderate beneficial effect on byway use by promoting habitat protection while providing exceptions for surface disturbing activities.

Special Status Species – Plants (no effect)
There are presently no management actions for special status plant species. The potential byways are all existing roads and therefore would likely not be affected by any special status plant management actions.

Heritage and Visual Resources

Cultural Resources (moderate beneficial)
Alternative A would prohibit surface-disturbing activities near certain historic sites including the Bozeman Trail and Crazy Woman Battle Site. This management action would affect nearly all of the Trabing/Sussex byway which follows the Bozeman Trail. Small portions of the Hazelton, Powder River, and Slip Road byways would also be affected. This management action could have a moderate beneficial effect on byway use by limiting development activities thereby enhancing recreational opportunities along the byways.

Paleontological Resources (negligible beneficial)
The 1985 RMP prohibited mineral activities within the Dry Creek Petrified Tree Environmental Education Area. The Tipperary/Thompson Creek Roads byway provides access to Dry Creek.

This management action would have a negligible beneficial effect on byway as it effects a limited portion of one potential byway.

Visual Resources (moderate beneficial)
Alternative A manages the Big Horn Mountains as VRM Class II which includes the Hazelton, Slip, and Rome Hill byway evaluation areas. VRM Class II management would restrict development so that activities should not attract the attention of the casual observer. The remainder of the evaluation areas are primarily within VRM Class IV, with small sections within VRM Class II or III. VRM Class IV allows management activities to dominate the view. The effect is moderate beneficial as approximately one-third of the evaluation area is within VRM Class II, which restricts but does not prohibit development which detracts from byway user satisfaction.

Land Resources

Forest Products (moderate adverse)
The Hazelton and Slip Roads evaluation areas provide access to the commercial forest areas. Current management forecasts 6,000 acres of development during the planning period, clear cuts are limited to 20 acres in size. Commercial forestry activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Renewable Energy (moderate adverse)
Renewable energy development would be possible along the Hazelton and Slip Roads evaluation areas. Renewable energy activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Rights-of-Way and Corridors (major adverse)
The designation of ROW corridors adjacent to roads and other disturbance corridors could have a major adverse effect on byway use.

Travel and Transportation Management (no effect)
The byway evaluation areas are all public roads which would not be affected by the Alternative A management actions.

Recreation (no effect)
The Dry Creek Petrified Tree Environmental Education Area, along the Tipperary/Thompson Creek byway evaluation area is an established recreation site which is likely to not have any additional effect on byway use.

Livestock Grazing Management (minor beneficial)
Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats a benefit to byway users. Overall these management effects are likely to have a minor beneficial effect.

Special Designations

Areas of Critical Environmental Concern (no effect)
Presently, there are no ACECs within the planning area, therefore they have no effect on potential byway use.

4.7.2.4. Alternative B

Scenic or Back Country Byways (major beneficial)
Alternative B would emphasize resource conservation. Under this alternative, the BLM would evaluate six routes in the planning area for Scenic or BCB designation. This would help provide opportunities for the public to learn about the multiple uses of public lands, which would have a major benefit on any designated byway.

Physical Resources

Soil (major beneficial)
Soil management actions for Alternative B prohibit surface-disturbing activities on steep slopes and fragile soils. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the byways.

Water Resources (major beneficial)
Water management actions would prohibit surface-disturbing activities within 500 feet of perennial streams and reservoirs, and manage riparian areas to restore perennial flows. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways.

Cave and Karst Resources (moderate beneficial)
Surface-disturbing activities would be prohibited within the karst formation. Much of the southern Big Horn Mountains is comprised of karst formation. Surface-disturbing activities would be prohibited along the Hazelton, Rome Hill, and Slip Roads proposed byways. This could have a moderate beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the three byways.

Mineral Resources

Locatable Minerals (negligible adverse)
There is likely to be minimal overlap between locatable minerals activities and potential byways. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect byway use would be negligible.

Leasable Minerals - Fluids (major adverse)
The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. There are 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways along the Lower Powder River Road. There is also moderate to high CBNG potential along the Tipperary/Thompson Creek proposed byway. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals (negligible adverse)
The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources

Vegetation – Forests and Woodlands (major beneficial)
The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative B management actions are designed to promote natural processes and minimize silvicultural treatments. These management actions would be have a major beneficial effect on potential byway use by maintaining the natural ecosystems which the byways traverse.

Vegetation – Grassland and Shrubland Communities (negligible beneficial)
Native plant species would be required for all reclamation activities. This may have a beneficial effect on byway users sensitive to non-native species.

Vegetation – Riparian/Wetland Resources (major beneficial)
Riparian management actions would prohibit surface-disturbing activities within 500 feet of perennial streams and manage riparian areas to achieve DFC. These actions would be applied to federal actions across the entire planning area, which could have a major beneficial effect on byway use by protecting the water quality and water based recreational opportunities along the byways.

Fish and Wildlife Resources – Fish (major beneficial)
There are several fisheries management actions that could potentially increase use along the Lower Powder River and Hazelton Roads including enhancing fisheries potential by prohibiting surface-disturbing and disruptive activities near fish-bearing water bodies, cooperating with the WGFD in stocking operations, designing and managing reservoirs for fisheries, and designing crossings to support fish passage. These management actions would likely have a major beneficial effect on byway use by increasing opportunities for water-based recreation.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (major beneficial)
Wildlife and special status species management actions under Alternative B prohibit surface-disturbing and disruptive activities within important habitat for many species including big game, raptors, upland game birds, herptiles, and bats. Collectively, these actions could have a major beneficial effect on byway use by promoting habitat protection while causing the relocation, modification, or redesign of surface-disturbing activities.

Special Status Species – Plants (major beneficial)
Surface-disturbing activities that could adversely impact special status plant habitat would be prohibited under Alternative B. Much of the Hazelton, Slip, and Rome Hill potential byways traverse special status plant habitat. These management actions would be have a major beneficial effect on potential byway use by providing undisturbed special status species plant habitat that would be attractive to byway users.

Heritage and Visual Resources

Cultural Resources (major beneficial)
Alternative B would prohibit surface-disturbing activities within 5 miles of historic properties.

This management action would affect nearly all of the Trabing/Sussex byway which follows the Bozeman Trail. Small portions of the Hazelton, Powder River, and Slip Roads byways would also be affected. This management action could have a major beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the byways.

Paleontological Resources (negligible beneficial)
Alternative B would prohibit mineral development in areas containing paleontological resources of high quality or importance. The Tipperary/Thompson Creek Roads byway provides access to the Dry Creek Petrified Tree Environmental Education Area. Mineral activities are already precluded within the education area. This management action would have a negligible beneficial effect on byway as it effects a limited portion of one potential byway.

Visual Resources (major beneficial)
Approximately one-third of the Powder River Road and 2 miles of the Hazelton Road traverse areas that would be managed as VRM Class II under Alternative B. There are 1,784 acres of BLM surface within 0.25 mile of the evaluated byways; 18% of the 9,765 acres of BLM surface in total within 0.25 mile of the evaluated byways. In VRM Class II areas, management activities would be regulated to not attract the attention of byway users. Visual resource management could have a major beneficial effect on byway use by limiting development activities thereby enhancing recreational opportunities along the byways.

Land Resources

Forest Products (negligible adverse)
The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative B management actions limit the area from which and the amount of commercial saw timber sold, to remain within ecologically sustainable limits. Commercial timber sales discourage byway use due to the truck traffic and vegetation disturbance along the byways. Limiting the size of treatment areas, designing treatment areas to have meandering boundaries, and limiting the available sales quantity would keep the impacts to byway use at a negligible level.

Renewable Energy (moderate adverse)
Renewable-energy development would be discouraged within the southern Big Horn Mountains reducing potential development along the Hazelton and Slip Roads. Renewable-energy activities could reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse, as development is possible along the byways.

Rights-of-Way and Corridors (major beneficial)
Under Alternative B, ROW would be excluded from nearly all of BLM surface along the byways evaluated. The exclusion areas are for the protection of physical, biological, and heritage resources. Excluding ROW would have a major beneficial effect on byways by protecting resources important to byway users and enhancing recreational opportunities along the byways.

Travel and Transportation Management (minor adverse)
Alternative B would prohibit motorized travel within big game crucial winter range and calving areas during the appropriate periods. These management actions would only affect the Slip Road which is not maintained for winter travel anyway; therefore these management actions would have a negligible impact on byway use as the amount of time during the seasonal closures when the Slip Road would be clear of snow and available for use is short. Travel off designated routes

would be prohibited without a special use permit, this would likely affect some byway users but since few byway users are likely to be off-road recreationists, the effect is likely minor.

Recreation (no effect)
The Dry Creek Petrified Tree Environmental Education Area, along the Tipperary/Thompson Creek byway would be designated a SRMA under Alternative B. This is the only SRMA that would be accessed by an evaluated byway. As the Dry Creek Petrified Tree Environmental Education Area is already an established site the additional SRMA designation is likely to have no effect on byway use.

Livestock Grazing Management (minor beneficial)
Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats, a benefit to byway users. Overall, these management effects are likely to have a minor beneficial effect.

Special Designations

Areas of Critical Environmental Concern (negligible beneficial)
Cantonment Reno, along the Trabing/Sussex byway would be designated an ACEC under Alternative B. This is the only ACEC that would be accessed by an evaluated byway. Although Cantonment Reno is an established site with interpretive signs, the additional ACEC designation could bring additional attention to the historic fort and increase use of the byway. As only one byway would be affected, the effect would likely be negligible.

4.7.2.5. Alternative C

Scenic or Back Country Byways (major adverse)
Alternative C would not designate any Scenic or BCBs. Mineral and other land use activities could occur along the potential byways reducing user satisfaction and safety. Development is likely along the Powder River Road, Trabing/Sussex Roads, an Tipperary/Thompson Roads; a major adverse effect.

Physical Resources

Soil and Water Resources (major adverse)
Soil management actions for Alternative C allow surface-disturbing activities on steep slopes, fragile soils, and within 500 feet of perennial streams and reservoirs. These actions would have a major adverse effect on byway use by enabling development activities thereby reducing recreational opportunities along the byways.

Cave and Karst Resources (minor beneficial)
Surface-disturbing activities would be prohibited near any significant caves along the Hazelton, Rome Hill, and Slip Roads. This would likely include only a few caves and therefore a limited area of the byway evaluation area, a minor beneficial effect.

Mineral Resources

Locatable Minerals (negligible adverse)
There is likely to be minimal overlap between locatable minerals activities and potential byways. The potential for locatable minerals development to effect use within the byway evaluation areas would be negligible.

Leasable Minerals - Fluids (major adverse)
The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways are along the Lower Powder river Road. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals (negligible adverse)
The foreseeable development scenario predicts that salable minerals development would disturb less than one percent of BLM surface in the planning area. There is likely to be minimal overlap between salable minerals activities and potential byways. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources

Vegetation – Forests and Woodlands (moderate adverse)
The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative C management actions are designed to maximize forest health through intensive management. Commercial activity would decrease user safety and satisfaction within these two byway evaluation areas, a moderate adverse effect.

Vegetation – Grassland and Shrubland Communities (negligible adverse)
Non-native species could be used in reclamation activities, which may have an adverse effect on knowledgeable byway users. However, most users would not notice therefore the impact would be negligible.

Vegetation – Riparian/Wetland Resources (minor adverse)
The primary byway that would be affected by riparian and wetland management is the Lower Powder River Road which parallels the Powder River; the Hazelton Road crosses multiple riparian areas. The Lower Powder River Road byway includes 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways. Surface-disturbing activities would be allowed within 500 feet of riparian and wetland areas. Development activity would reduce byway user safety and satisfaction, a minor adverse effect as a portion of two evaluation areas would be affected.

Fish and Wildlife Resources – Fish (minor beneficial)
Development activities would be allowed within fish habitat where resource objectives could be met. Fish habitat is present along the Lower Powder River and Hazelton Roads. Alternative C management would likely have a minor beneficial effect on byway use as although development could detract from user satisfaction opportunities for water-based recreation along these two routes would be maintained.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate beneficial)
Wildlife and special status species management actions include mitigation for surface-disturbing activities; maintaining or improving wildlife habitats; protecting crucial wildlife habitats; managing Greater Sage-Grouse habitat; and a seasonal disturbance-free buffer

for bald eagle nests. Collectively, these actions could have a moderate beneficial effect on byway use by promoting habitat protection.

Special Status Species – Plants (minor beneficial)
Surface-disturbing activities that could adversely impact special status plant populations would be prohibited under Alternative C. While much of the Hazelton, Slip, and Rome Hill Roads traverse special status plant habitat there are few documented populations and populations are typically of limited size. These management actions would be have a minor beneficial effect on potential byway use as there are few documented sensitive species plant populations along the routes that might attract byway users.

Heritage and Visual Resources

Cultural Resources (minor beneficial)
Alternative C would allow surface-disturbing activities near historic and sites with mitigation. This management action could affect nearly all of the Trabing/Sussex byway which follows the Bozeman Trail. Small portions of the Hazelton, Powder River, and Slip Road byways could also be affected. This management action would have a minor beneficial effect on byway use by mitigating development activities within the evaluation areas thereby enhancing recreational opportunities.

Paleontological Resources (negligible adverse)
High-quality paleontological resource sites would not be designated. This could potentially allow development activities within the Dry Creek Petrified Tree Environmental Education Area. The Tipperary/Thompson Creek Roads byway provides access to Dry Creek. This management action would have a negligible adverse effect on byway use as it effects a limited portion of one potential byway.

Visual Resources (major adverse)
The byway evaluation areas are mostly within VRM Class IV, with some VRM. Class III. VRM Class IV allows management activities to dominate the view. The effect is major adverse as the amount of development that could be authorized would detract from byway user satisfaction.

Land Resources

Forest Products (moderate adverse)
The Hazelton and Slip Roads evaluation areas provide access to the commercial forest areas; management would maximize economic return. Commercial forestry activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Renewable Energy (moderate adverse)
Renewable energy development would be possible along the Hazelton and Slip Roads evaluation areas. Renewable energy activities would reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate adverse as only two evaluation areas would be affected.

Rights-of-Way and Corridors (major adverse)
The designation of ROW corridors adjacent to roads and other disturbance corridors could have a major adverse effect on byway use.

Travel and Transportation Management (no effect)
The byway evaluation areas are all public roads which would not be affected by the Alternative C management actions.

Recreation (no effect)
No SRMAs would be designated. The Dry Creek Petrified Tree Environmental Education Area, along the Tipperary/Thompson Creek byway evaluation area is an established recreation site which is likely to not have any additional effect on byway use.

Livestock Grazing Management (minor beneficial)
Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats a benefit to byway users. Overall these management effects are likely to have a minor beneficial effect.

Special Designations

Areas of Critical Environmental Concern (no effect)
Presently, there are no ACECs within the planning area, therefore they have no effect on potential byway use.

4.7.2.6. Alternative D

Scenic or Back Country Byways (major beneficial)
Alternative D promotes resource use while conserving physical, biological, and heritage resources. Under this alternative, the BLM would evaluate six routes in the planning area for scenic or BCB designation. This would help provide opportunities for the public to learn about the multiple uses of public lands, which would have a major benefit on any designated byway.

Physical Resources

Soil (moderate beneficial)
Soil management actions for Alternative D would allow surface-disturbing activities on steep slopes and fragile soils where the BLM determines the soil resource could be adequately protected. These actions while providing for development along the byways also conserve areas with fragile soils that would be attractive to byway users. Overall, there would likely be a moderate beneficial effect on byway use.

Water Resources (moderate beneficial)
Water management actions would allow surface-disturbing activities within 500 feet of perennial streams and reservoirs where the water resource could be adequately protected. These actions while providing for development along the byways also conserve water quality and water-based recreational opportunities that would be attractive to byway users. Overall, there would likely be a moderate beneficial effect on byway use.

Cave and Karst Resources (minor beneficial)
Much of the southern Big Horn Mountains, accessed by the Hazelton, Rome Hill, and Slip Roads proposed byways, is comprised of cave-bearing karst formations. Surface-disturbing activities would be prohibited in the vicinity of significant caves. While Hazelton and Rome Hill Roads help provide access to cave areas, only the Slip Road has identified significant caves in close

proximity to the potential byway, therefore the effect of cave and karst management on byway use is likely to be minor.

Mineral Resources

Locatable Minerals (negligible adverse)
There is likely to be minimal overlap between locatable minerals activities and potential byways. The maximum foreseeable locatable minerals development is 1,455 acres (0.2%) of BLM surface in the planning area. Therefore, the potential for locatable minerals development to affect byway use would be negligible.

Leasable Minerals - Fluids (major adverse)
The foreseeable development predicts moderate to high CBNG development and moderate conventional development along the Lower Powder River Road. The 2,659 acres (27%) of BLM surface (9,765 acres) within 0.25 mile of the evaluated byways are along the Lower Powder River Road. There is also moderate to high CBNG potential along the Tipperary/Thompson Creek proposed byway. Fluid mineral activities could have a major adverse effect on byway use.

Salable Minerals (negligible adverse)
The foreseeable development scenarios for all alternatives predict that salable minerals development would disturb less than one percent of BLM surface in the planning area. Overall, salable minerals development would likely have a negligible adverse effect on byway use.

Biological Resources

Vegetation – Forests and Woodlands (moderate beneficial)
The Hazelton and Slip Roads potential byways provide access to commercial forest management areas. Alternative D management actions are designed to promote forest and woodland health; particularly aspen communities and old growth forest stands. While these management actions provide for intensive management they also support healthy ecosystems attractive to byway users. These management actions would be have a moderate beneficial effect on potential byway use.

Vegetation – Grassland and Shrubland Communities (no effect)
Non-native plant species would be allowed only for short-term reclamation activities. This should not effect byway users sensitive to non-native species as their presence would be short duration.

Vegetation – Riparian/Wetland Resources (moderate beneficial)
Riparian management actions would allow surface-disturbing activities within 500 feet of riparian and wetland areas where they could be adequately protected. These actions while providing for development along the byways also conserve riparian/wetland resources and water based recreational opportunities that would be attractive to byway users. Overall, there would likely be a moderate beneficial effect on byway use.

Fish and Wildlife Resources – Fish (moderate beneficial)
There are several fisheries management actions that could potentially increase use along the Lower Powder River and Hazelton Roads including enhancing fisheries potential by limiting surface-disturbing and disruptive activities near fish-bearing water bodies, considering fish when designing and managing reservoirs, and designing crossings to support fish passage. These management actions would likely have a moderate beneficial effect on byway use by increasing opportunities for water-based recreation.

Fish and Wildlife Resources – Wildlife and Special Status Species – Wildlife (moderate beneficial)
Wildlife and special status species management actions under Alternative D regulate surface-disturbing and disruptive activities within important habitat for many species including big game, raptors, upland game birds, reptiles, and bats. Collectively, these actions could have a moderate beneficial effect on byway use by promoting habitat conservation attractive to byway users while allowing development protective of the wildlife resource.

Special Status Species – Plants (minor beneficial)
Surface-disturbing activities that could adversely impact special status plant populations would be prohibited under Alternative D. While much of the Hazelton, Slip, and Rome Hill potential byways traverse special status plant habitat where there are few documented populations and populations are typically of limited size. These management actions would have a minor beneficial effect on potential byway use as there are few documented sensitive species plant populations along the routes that might attract byway users.

Heritage and Visual Resources

Cultural Resources (moderate beneficial)
Alternative D would prohibit surface-disturbing activities near identified historic properties. This management action would affect portions of the Trabing/Sussex byway which follows the Bozeman Trail and individual sites along the Hazelton, Powder River, and Slip Road byways. This management action could have a moderate beneficial effect on byway use by limiting development activities, thereby enhancing recreational opportunities along the byways.

Paleontological Resources (negligible beneficial)
Mineral development under Alternative D would avoid areas containing paleontological resources of high quality or importance. The Tipperary/Thompson Creek Roads byway provides access to the Dry Creek Petrified Tree Environmental Education Area. Mineral activities are already precluded within the education area. This management action would have a negligible beneficial effect on byway as it affects a limited portion of one potential byway.

Visual Resources (minor beneficial)
Short stretches of Tipperary/Thompson Creek and Hazelton byways traverse areas that would be managed as VRM Class II under Alternative D. In VRM Class II areas management activities would be regulated to not attract the attention of byway users. Most of the remaining BLM surface traversed by the byways evaluated would be managed as VRM Class III where management activities may attract attention but should not dominate the view of byway users. Visual resource management would likely have a minor beneficial effect on byway use as development activities could be readily visible along much of the byways, while in limited areas development activities would not attract the attention of byway users.

Land Resources

Forest Products (negligible adverse)
Alternative D management actions limit the amount of commercial saw timber sold to remain within ecologically sustainable limits. Commercial timber sales discourage byway use due to the truck traffic and vegetation disturbance along the byways. Designing treatment areas to have meandering boundaries, and limiting the available sales quantity would keep the impacts to byway use at a negligible level.

Renewable Energy (moderate beneficial)
Renewable-energy development would be prohibited within the southern Big Horn Mountains preventing potential development along the Hazelton and Slip Roads. Renewable-energy activities could reduce user safety and detract from user enjoyment of the potential byways. The effect is moderate beneficial as only two evaluation areas are protected from development.

Rights-of-Way and Corridors (major beneficial)
Alternative D excludes or regulates ROW on much of BLM surface along the byways evaluated. The avoidance and exclusion areas are for the protection of physical, biological, and heritage resources. Avoiding and excluding ROW would have a major beneficial effect on byways by protecting resources important to byway users and enhancing recreational opportunities along the byways.

Travel and Transportation Management (minor beneficial)
Alternative D would prohibit motorized travel within big game crucial winter range and calving areas during the appropriate periods. These management actions would only affect the Slip Road which is not maintained for winter travel anyway; therefore these management actions would have a negligible impact on byway use as the amount of time during the seasonal closures when the Slip Road would be clear of snow and available for use is short. Limited travel off designated routes would be allowed without a special use permit, this would likely have a minor beneficial effect on byway users. As the allowance for limited off-road use effects all of the byways whereas the big game timing limitations only affect the Slip Road, the overall effect of these management actions on byway use is likely to be minor beneficial.

Recreation (no effect)
The Dry Creek Petrified Tree Environmental Education Area, along the Tipperary/Thompson Creek byway would be designated a SRMA under Alternative D. This is the only SRMA that would be accessed by an evaluated byway. As the Dry Creek Petrified Tree Environmental Education Area is already an established site the additional SRMA designation is likely to have no effect on byway use.

Livestock Grazing Management (minor beneficial)
Livestock are seen by some recreational motorists as an integral component of the rural pastoral setting while to others they are a detriment. Livestock grazing would be managed to achieve healthy rangelands and special habitats a benefit to byway users. Overall these management effects are likely to have a minor beneficial effect.

Special Designations

Areas of Critical Environmental Concern (no effect)
There are no ACECs under Alternative D that would be accessed from an evaluated byway; therefore there would be no effect from ACEC management on byway use.

4.7.2.7. Cumulative Impacts

Public use of any designated Scenic or BCBs could affect landowners and residents adjacent to the routes. In particular, increased traffic in fairly remote areas could result in requests for assistance, especially in times of bad weather. All evaluated Scenic or BCBs are county roads. The roads may require additional maintenance above the current level of county maintenance.

4.7.2.8. Conclusion

Alternatives B and D evaluate six potential byways. Alternative B would be the most protective of the scenic values for which byways are proposed. Alternative D provides for more land use activities and development than Alternative B which could be visible from designated byways. No byways are proposed in alternatives A or C.Table 4.76, "Summary of Impacts to Scenic or Back Country Byways" (p. 1440) summarizes effects on scenic or BCBs.

Table 4.76. Summary of Impacts to Scenic or Back Country Byways

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	Moderate beneficial	Major beneficial	Major adverse	Moderate beneficial
Water Resources	Moderate beneficial	Major beneficial	Major adverse	Moderate beneficial
Cave and Karst Resources	Minor beneficial	Moderate beneficial	Minor beneficial	Minor beneficial
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	Major adverse	Major adverse	Major adverse	Major adverse
Salable Minerals	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	Moderate beneficial	Major beneficial	Moderate adverse	Moderate beneficial
Vegetation – Grassland and Shrubland Communities	Negligible adverse	Negligible beneficial	Negligible adverse	No effect
Vegetation – Riparian/Wetland Resources	Minor beneficial	Major beneficial	Minor adverse	Moderate beneficial
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	Moderate beneficial	Major beneficial	Minor beneficial	Moderate beneficial
Fish and Wildlife Resources – Wildlife	Moderate beneficial	Major beneficial	Moderate beneficial	Moderate beneficial
Special Status Species – Plants	No effect	Major beneficial	Minor beneficial	Minor beneficial
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	Moderate beneficial	Major beneficial	Moderate beneficial	Moderate beneficial
Heritage and Visual Resources				
Cultural Resources	Moderate beneficial	Major beneficial	Minor beneficial	Moderate beneficial
Paleontological Resources	Negligible adverse	Negligible beneficial	Negligible adverse	Negligible beneficial

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Visual Resources	Moderate beneficial	Major beneficial	Major adverse	Minor beneficial
Land Resources				
Forest Products	Moderate adverse	Negligible adverse	Moderate adverse	Negligible adverse
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Moderate adverse	Moderate adverse	Moderate adverse	Moderate beneficial
Rights-of-Way and Corridors	Major adverse	Major beneficial	Major adverse	Major beneficial
Travel and Transportation Management	No effect	Minor adverse	No effect	Minor beneficial
Recreation	No effect	No effect	No effect	No effect
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	Minor beneficial	Minor beneficial	Minor beneficial	Minor beneficial
Special Designations				
Areas of Critical Environmental Concern	No effect	Negligible beneficial	No effect	No effect
Scenic or Back Country Byways	Major adverse	Major beneficial	Major adverse	Major beneficial
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Area	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.7.3. Wild and Scenic Rivers

Protecting and enhancing scenic qualities, fisheries, recreation, wildlife values, and the relatively unmodified character of the area in a near-natural setting are the primary objectives for managing waterway segments eligible and suitable for inclusion in the WSR system. Because Manual 6400 - Wild and Scenic Rivers provides clear guidance on prohibited versus allowable uses in WSR corridors, the range of alternatives or discretionary actions regarding WSRs is limited. There would be no or undetectable effects on WSRs from the proposed management of the following: **Physical Resources, Mineral Resources, Biological Resources, Lands and Realty, Renewable Energy, Rights-of-Way and Corridors, Travel and Transportation Management, Livestock Grazing Management, Scenic or Back Country Byways, or Wilderness Study Areas.** Management of several other resources or resource uses, including recreation, could have effects on recreational uses of public lands and waters. Water, fire and fuels, and vegetation management activities could influence the distribution of fish and wildlife and cause variations in the function and appearance of the landscape and river corridor. Other activities (including development of historic mining claims) that could affect outstandingly remarkable values (ORVs) in WSRs would be due to grandfathered or valid existing rights. Manual 6400 - Wild and Scenic Rivers provides guidance on the level of activity allowed, and adverse effects on ORVs are minimized as much as possible. In addition, there are no identified proposed actions contrary to managing the river to protect the ORVs and free-flowing condition.

4.7.3.1. Methods and Assumptions

The methods and assumptions used in the WSR analysis include, but are not limited to, the following:

- The management of suitable and eligible WSRs is guided by policy that supersedes the administrative flexibility and management alternatives in this document.
- Recreational use of river corridors eligible and suitable for WSR designation will increase. If the proposed corridors are designated, prescribed management will protect the ORVs for which the rivers were designated, requiring a mix of education and regulatory measures.
- Actions approved by the BLM will not affect the eligibility or suitability status of the subject waterways.
- Because the Middle Fork Powder River is currently the only waterway in the planning area that meets the requirements for eligibility and suitability, the extent of environmental consequences is limited to the area adjacent to that waterway.
- The analysis will discuss the ability to protect the outstanding remarkable values, eligibility or suitability of the waterway, and to manage the river in a free-flowing condition.
- If Congress designates the Middle Fork Powder River as a WSR, the BLM will manage it in accordance with the National Wild and Scenic Rivers Act of 1968 and BLM Handbook 8351 – Wild and Scenic Rivers.
- Management prescribed for rivers found suitable for designation in the National Wild and Scenic Rivers System would protect the outstandingly remarkable values, tentative classification, and free-flowing nature of those segments.

Significance Criteria

An adverse effect on an WSR as a result of federal actions would be considered potentially significant if the following were to occur:

- Any action that would limit the eligibility or suitability of the waterway.
- An action that would violate objectives associated with recreation resource management and with a magnitude that warrants special mitigation or it persists indefinitely.

4.7.3.2. Impacts Common to All Alternatives

The Middle Fork Powder River will be managed in cooperation with stakeholders to preserve outstanding remarkable values and WSR characteristics. Because the VRM classification of a designated WSR would automatically become VRM Class I, it would not be necessary to amend the RMP. Interim management requires that the river corridor be managed to protect the potential WSR classification. The adverse effects of proposed actions would be mitigated to protect the existing qualities upon which eligibility is based.

4.7.3.3. Alternative A

No previous decision has been made regarding continued management of the Middle Fork Powder River should Congress choose to release the river from further consideration. Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. The Middle Fork Powder River canyon is currently managed as a VRM Class II, offering adequate protection of scenic values in the canyon to maintain eligibility for WSR inclusion. Middle Fork Canyon is currently closed to motorized use and livestock grazing. Given

the topographical restraints in Middle Fork Canyon and the relatively low mineral potential, land uses, including minerals extraction and ROW, would be unlikely. Under Alternative A, project proposals for resource development (e.g., mineral resources, ROW, road construction) or extraction would be managed on a case-by-case basis. The protection of the free-flowing condition and outstanding remarkable values could not be guaranteed.

4.7.3.4. Alternative B

Alternative B would emphasize resource conservation. If Congress denies the Middle Fork Powder River WSR nomination, management under Alternative B would retain the free-flowing characteristics and ORV of the river. Alternative B provides for continued protections of the river corridor even if Congress denies the WSR nomination. The area would continue to be managed as VRM Class II. Middle Fork Canyon would be included in the SRMA designation, which would increase protections from the effects of overuse or damage from recreationists. In addition, the SRMA would be unavailable for leasing and withdrawn from minerals entry, further protecting the WSR resource. Other land use activities would be managed on a case-by-case basis.

4.7.3.5. Alternative C

Alternative C would emphasize resource use. Under this alternative, if Congress denies the WSR nomination, special provisions or restrictions would not be imposed on the river corridor. Project proposals for resource development or extraction would be managed on a case-by-case basis. The canyon of the Middle Fork Powder River would be managed as a VRM Class III area, which would reduce protections for scenic values. The Middle Fork Powder River would be included in the SRMA designation, which would increase protections from the effects of overuse or damage from recreationists. However, the area would not be closed to minerals leasing. Due to the low mineral potential in the area, the adverse effect of this action may not affect the river corridor's remarkable values. Alternative C could conceivably allow for future dams along the river should the river be released from consideration, damaging the river's free-flowing condition.

4.7.3.6. Alternative D

Alternative D would allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative. If Congress denies the Middle Fork Powder River WSR nomination, Alternative D management would retain the free-flowing characteristics and outstanding resource values of the river. This alternative would provide for continued protection of the river corridor. The area would be managed as VRM Class II. Middle Fork Powder River would be included in the SRMA designation, which would increase protections from the effects of overuse or damage from recreationists. In addition, the SRMA would be unavailable for leasing and withdrawn from minerals entry, which would further protect the WSR resource. Other land use activities would be managed on a case-by-case basis.

4.7.3.7. Cumulative Impacts

The section of Middle Fork Powder River that is eligible and suitable for WSR designation is surrounded by BLM-administered public lands with no private inholdings. Private land intersects the river both upstream and downstream of the 9.5-mile-long segment proposed for

WSR designation. The river corridor does briefly cross through a corner of land managed by the WGFD in the Ed O. Taylor Winter Game Range. The placement of a dam on private lands in the vicinity of Middle Fork Powder River has been proposed in the past; a dam would affect the river's free flowing characteristics. Such an action would require a permit through the State of Wyoming. There are currently no reasonably foreseeable actions in the WSR corridor that would impair the river's eligibility or suitability for WSR designation.

4.7.3.8. Conclusion

The impacts from each alternative will be contingent on whether or not Congress acts to release the Middle Fork Powder River from consideration or to designate as a Wild and Scenic River. Table 4.77, "Summary of Ability to Protect Characteristics of Wild and Scenic Rivers" (p. 1444) summarizes the ability of each alternative to protect the free-flowing condition and outstanding remarkable values of WSRs. Table 4.78, "Summary of Impacts to Wild and Scenic Rivers" (p. 1444) summarizes effects on WSRs from management proposed under each alternative.

Table 4.77. Summary of Ability to Protect Characteristics of Wild and Scenic Rivers

	Alternative A	Alternative B	Alternative C	Alternative D
Free-flowing Characteristic	Insufficient protection	Sufficient protection	Insufficient protection	Sufficient protection
Outstanding Remarkable Values	Insufficient protection	Sufficient protection	Insufficient protection	Sufficient protection

Table 4.78. Summary of Impacts to Wild and Scenic Rivers

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	No effect	No effect	No effect	No effect
Water Resources	No effect	No effect	No effect	No effect
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	No effect	No effect	No effect	No effect
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Riparian/Wetland Resources	No effect	No effect	No effect	No effect
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Wildlife	No effect	No effect	No effect	No effect
Special Status Species – Plants	No effect	No effect	No effect	No effect
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	No effect	No effect	No effect	No effect
Heritage and Visual Resources				
Cultural Resources	No effect	No effect	No effect	No effect
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	Moderate beneficial	Moderate beneficial	Moderate adverse	Moderate beneficial
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	No effect	No effect	No effect	No effect
Recreation	No effect	No effect	No effect	No effect
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	Major beneficial	Major beneficial	Moderate adverse	Major beneficial
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.7.4. Wilderness Study Areas

Because BLM Manual 6330 - Management of Wilderness Study Areas provides clear guidance on prohibited versus allowable uses in WSAs, the range of alternatives or discretionary actions

regarding WSAs is limited. There would be no effects on WSAs from the proposed management of the following: physical resources, mineral resources, fish and wildlife resources, lands and realty, renewable energy, ROW and corridors, Scenic or BCBs, or WSRs. Management of several other resources or resource uses, including recreation and livestock grazing, could have indirect, often minor, effects. Water, fire and fuels, and vegetation management activities could influence the distribution of fish and wildlife and cause variations in the function and appearance of the landscape. This could influence recreational use patterns and preferences in the planning area, but would not substantially alter the demand for or distribution of activities in the planning area as a whole, and are not further discussed in this section. Other activities (including range improvements and development of historic mining claims) that could affect wilderness values in WSAs would be due to grandfathered or valid existing rights. The WSA Manual provides guidance on the level of activity allowed, and adverse effects on wilderness values are minimized as much as possible.

4.7.4.1. Methods and Assumptions

The methods and assumptions used in the impact analysis for WSAs include but are not limited to the following:

- The extent of environmental consequences is limited to the BLM-administered lands in the North Fork, Gardner Mountain, and Fortification Creek WSAs.
- All WSAs in the planning area will continue to be managed under the BLM Manual 6330 - Management of Wilderness Study Areas until such time as Congress either designates all or portions of the WSAs as wilderness or releases the WSAs or portions of the WSAs from further consideration for wilderness.
- Should Congress release a WSA from further consideration for designation as wilderness, the lands within the WSA will be subject to consideration as lands with wilderness characteristics.
- Any resource-dependent activity approved in a WSA will be rigorously managed to ensure that it would not impair the area's wilderness characteristics or its suitability for designation as wilderness.
- Wilderness interim management is subject to Valid Existing Rights and the Grandfather Clause (see Manual 6330) under all of the alternatives.
- WSA designation helps protect air quality and watersheds, soil and water quality, ecological stability, plant and animal gene pools, archeological and historical sites, habitats for wildlife, and quality of forage.
- Although areas considered or proposed for withdrawal from mineral entry would require approval by Congress, this analysis assumes the area would be approved and withdrawn.
- The analysis will focus on the ability of the BLM to protect the wilderness characteristics (naturalness; opportunities for outstanding primitive and unconfined recreation and solitude; and identified supplemental values).

4.7.4.2. Impacts Common to All Alternatives

Restrictions on solid and fluid minerals development and motorized vehicle use in WSAs would be consistent with BLM Manual 6330 - Management of Wilderness Study Areas and protect the pristine character of these areas. Managing WSAs under VRM Class I objectives is mandated through WO-IM-2000-096 (BLM 2000b) and helps to meeting BLM Manual 6330 - Management of Wilderness Study Areas goals and objectives.

Under BLM Manual 6330 - Management of Wilderness Study Areas, the wilderness characteristics of WSAs and the areas' opportunities for solitude and primitive, unconfined recreation, as well as any special features that further qualify them for consideration as wilderness, would be preserved. At the same time, activities that would adversely affect the wilderness character of the areas would be prohibited.

4.7.4.3. Alternative A

Alternative A would continue management in accordance with the 1985 RMP (BLM 1985c) as amended and maintained. Under Alternative A, if Congress does not designate the WSAs as wilderness, automatically leasing these areas for oil and gas development would not protect the wilderness characteristics in each of the WSAs. An estimated 150 CBNG wells could be developed in the Fortification Creek WSA. Mineral potential in Gardner Mountain and North Fork WSAs is low; therefore, it is not likely that these WSAs would be developed. Under Alternative A, the WSAs are designated as "limited to designated routes" and most of the WSAs are seasonally closed to motorized use. While no routes have been designated within any WSA, the possibility for route designation exists and clarification is necessary to meet the objectives set forth in BLM Manual 6330 - Management of Wilderness Study Areas. Mechanized vehicle use is often considered inconsistent with wilderness values, however, no specific decisions related to mechanized use have been made within the planning area. The protection of the wilderness characteristics from motorized or mechanized uses could not be guaranteed.

4.7.4.4. Alternative B

Alternative B would emphasize resource conservation. Should Congress release a WSA from further consideration, a plan amendment would be necessary. Designating an ACEC for the Fortification Creek elk herd would provide additional protections for the fauna that inhabit the Fortification Creek WSA, but may not specifically protect wilderness characteristics. The protection of the wilderness characteristics from other resource uses would be subject to policy regarding lands with wilderness characteristics and dependent on a future RMP amendment. Current policy (Secretarial Order 3310) directs the BLM to protect the naturalness of lands with wilderness characteristics. Should policy change during the life of the plan, protection of wilderness characteristics in released WSAs could not be guaranteed. Prohibiting motorized and mechanized vehicle use would be consistent with management of designated wilderness areas and would be appropriate in WSAs.

4.7.4.5. Alternative C

Alternative C would emphasize resource use. Should Congress release a WSA from further consideration, a plan amendment would be necessary. The protection of the wilderness characteristics from other resource uses would be subject to policy regarding lands with wilderness characteristics and dependent on a future RMP amendment. Current policy (Secretarial Order 3310) directs the BLM to protect the naturalness of lands with wilderness characteristics. Should policy change during the life of the plan, protection of wilderness characteristics in released WSAs could not be guaranteed. Prohibiting motorized use would be consistent with BLM Manual 6330 - Management of Wilderness Study Areas. This alternative would not prohibit mechanized use in WSAs, which could result in reduced opportunities for primitive and unconfined recreation or solitude from the perspective of "traditional" back country visitors.

4.7.4.6. Alternative D

Alternative D would generally allow resource use if the activity can be conducted in a manner that conserves physical, biological, and heritage and visual resources, and would emphasize moderate constraints on resource uses to reduce adverse effects on resource values. Alternative D is the BLM preferred alternative. The impacts to WSAs of implementing Alternative D would be the same as Alternative B.

4.7.4.7. Cumulative Impacts

There is a 640-acre section owned by the State of Wyoming in the Fortification Creek WSA, while not presently leased for mineral development, it has been leased (but not developed) in the past and could be leased and potentially developed. However, adverse effects on the WSA resource are not anticipated from reasonably foreseeable actions. There are no other inholdings within the boundaries of any of the WSAs; therefore, there would be no non-BLM actions in the Gardner Mountain or North Fork WSA. There are private and state parcels adjacent to each of the WSAs, but activities outside of WSA boundaries would not affect the eligibility of a WSA for Wilderness designation.

4.7.4.8. Conclusion

The impacts from each alternative will be contingent on whether or not Congress acts to release the WSAs from consideration or to designate as Wilderness. Table 4.79, "Summary of Impacts to Wilderness Study Areas" (p. 1448) summarizes effects on WSAs from management proposed under each alternative.

Table 4.79. Summary of Impacts to Wilderness Study Areas

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	No effect	No effect	No effect	No effect
Water Resources	No effect	No effect	No effect	No effect
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	No effect	No effect	No effect	No effect
Leasable Minerals – Coal	No effect	No effect	No effect	No effect
Leasable Minerals – Fluids	No effect	No effect	No effect	No effect
Salable Minerals	No effect	No effect	No effect	No effect
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	No effect	No effect	No effect	No effect
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Wildlife	No effect	No effect	No effect	No effect
Special Status Species – Plants	No effect	No effect	No effect	No effect
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	No effect	No effect	No effect	No effect
Heritage and Visual Resources				
Cultural Resources	No effect	No effect	No effect	No effect
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	No effect	No effect	No effect	No effect
Rights-of-Way and Corridors	No effect	No effect	No effect	No effect
Travel and Transportation Management	No effect	No effect	No effect	No effect
Recreation	No effect	No effect	No effect	No effect
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	No effect	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.8. Socioeconomic Resources

4.8.1. Social Conditions

This section addresses the potential for the alternatives to affect social conditions in the planning area, including direct, indirect, short-term, and long-term effects. Appendix A (p. 1569) identifies the laws, regulations, policies, and guidance considered in this analysis of effects on social conditions.

Potential effects on 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 affect the ability of state, regional, and local governments to supply community services such as education; and changes in community character, culture, and social trends. The BLM does not directly manage social conditions in the planning area. However, BLM management actions have the potential to indirectly affect social conditions. For example, a decision to prohibit future oil and gas exploration or leasing on BLM-administered mineral estate could adversely affect the availability of 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 jobs elsewhere (or as fewer people move to the planning area for jobs).

4.8.1.1. Methods and Assumptions

Effects on social conditions associated with each of the alternatives were compared to existing conditions and trends in the planning area to establish a context for comparison. Effects on social conditions were broadly classified into three categories: effects on population; effects on housing and community services; and effects on customs, culture, and social trends. This section also describes each alternative's consistency with local land use plans.

Assumptions used in this analysis include:

- Economic conditions, especially jobs, labor earnings, and economic output, will 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 will continue to be collected on minerals produced in the planning area.
- While BLM management actions will have some influence on the pace and timing of economic development in the planning area, the pace and timing of development also depends and will continue to depend on many factors, most notably the price of coal, oil, gas, and mineral products on regional, national, and international markets, and national and world economic conditions (e.g., business cycles).

4.8.1.2. Impacts Common to All Alternatives

Any population change that could reasonably be associated with the alternatives would likely be due to changes in employment opportunities. Employment opportunities related to activities on BLM surface and federal mineral estate include jobs in exploration, development, and production of minerals, including oil and gas, coal, and locatable and salable minerals; jobs in livestock

production; jobs related to various recreation activities and OHV use; and other types of jobs that rely on BLM-administered lands, 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, grazing, and recreation activities on BLM surface and federal mineral estate. These quantitative estimates are used to aid in the analysis of effects on population.

The analysis that follows focuses on the effects of BLM actions. It is important to note that many other events outside BLM control could alter economic and social trends. For example, oil and gas prices could change as a result of an expansion or contraction of world or national economic activity, and that could affect the pace of development or the quantity of development. Similarly, state and local laws regulating the subdivision of land could alter land ownership and development patterns, which could affect open space and physical landscapes. Where the analysis finds that BLM actions would result in minimal or no change in social conditions, it does not necessarily mean there would be no change. Other forces frequently result in changes to complex economic and social trends.

The economic and social analysis incorporates variations in pace of development over time, where that information can be predicted with reasonable certainty. However, under all alternatives, the pace of development could differ from the rate assumed in the analysis. The BLM has limited control over the pace of development because it only authorizes economic activities such as oil and gas drilling, and does not perform these activities. An abrupt shift in the pace of development could result in short-term effects (beneficial or adverse) 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 inmigration or outmigration trends. Any such effects would likely be more severe for smaller communities, which are less likely to be able to absorb a sudden influx of new residents, or to continue to support existing infrastructure if outmigration suddenly increased.

Under all alternatives, the BLM would continue to consider effects on socioeconomics from site-specific actions, and incorporate socioeconomic issues into the analyses of environmental, social, and economic effects, such as the NEPA analyses required for certain future site-specific actions.

4.8.1.3. Alternative A

Effects on Population

Under Alternative A, activities on BLM surface and federal mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 3,478 full-time and part-time jobs per year, which represents approximately 6.0% of total employment in the planning area as of 2011. It is important to note that this does not constitute an increase of 3,478 jobs per year over current employment; it more closely represents an estimate of the contribution of certain activities on BLM surface and federal mineral estate to overall employment in the planning area. In addition, as noted in the *Economic Conditions* section, this does not include activities not modeled in IMPLAN (Impact Analysis for Planning computer model), including coal, renewable-energy, and locatable and salable minerals exploration and production.

The economic analysis is performed at a regional level and integrates across all producing sectors; thus, these job opportunities would occur throughout the planning area. This is also true because

oil and gas developers, livestock producers, and recreation providers operate throughout the planning area. However, job opportunities would concentrate in population centers. This would not represent a shift in the current distribution of employment opportunities. Indeed, because Alternative A would continue current management actions, it would not alter the overall trend of development in the planning area, nor would it alter current trends in population growth and decline.

Effects on Housing and Community Services

Changes in population have the potential to change the demand for housing and community services, such as roads, schools, and police and fire protection. County-wide vacancy rates in 2010 were 9.4% in Campbell County, 16.9% in Johnson County, and 11.3% in Sheridan County. These percentages, which include rental units as well as units for purchase, represent approximately 1,800 vacant units in Campbell County, 770 vacant units in Johnson County, and 1,600 in Sheridan County (U.S. Census Bureau 2011a). Vacancy rates for rental properties have been on the order of 7 to 8% in recent years according to the data from the Wyoming Housing Database Partnership presented in Chapter 3. However, because Alternative A would not result in a change in BLM management actions, management under this alternative should not result in a change in either the total demand for housing and community services or its geographic distribution.

If development is slower or faster than the relatively steady pace assumed in this analysis, there could be short-term effects on the demand for housing and community services and 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 rapid pace of development, there could be sudden short-term increases in demand for community services as a result of new jobs and increased population. However, local and state tax revenues collected from energy production could help mitigate short-term increases in demand for services, because tax revenues help pay for community services.

Consistency with Adopted County Land Use Plans

As noted in Chapter 3, BLM resource management plans must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative A would maintain existing policies for BLM-administered land management and therefore would not result in any inconsistencies or conflicts with existing county land use plans.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under Alternative A, the BLM would continue current policies of coordinating with county and municipal land use planners. Alternative A also would continue current policies related to livestock grazing, which would be consistent with the adopted Johnson County land use plan. That plan identifies three key concerns related to BLM-administered lands and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005).

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to visitors. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative A would maintain existing BLM policies. Historically, these policies have contributed – along with other government policies and the actions of private firms and residents – to economic viability and resilience. But it should be noted that under Alternative A there could be other forces at play that would drive changes in the economic, physical, and social conditions in the planning area.

Although there are specific groups with particular interests regarding specific land uses (e.g., wilderness advocates, oil and gas interests, ranchers), on the whole the residents of the planning area tend to support both conservation of natural resources and the economic viability of resource-based industries. For this reason, residents generally support multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative A would continue the current BLM practice of allowing multiple uses. The BLM also would continue to incorporate socioeconomic considerations into the planning process and perform socioeconomic analyses as required for site-specific actions.

4.8.1.4. Alternative B

Effects on Population

Under Alternative B, activities on BLM-administered lands and mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 137 full-time and part-time jobs per year, which represents approximately 0.2% of total employment in the planning area as of 2011. Compared to Alternative A, which represents the continuation of current trends, this represents a decrease of 3,341 jobs, or approximately 5.7% of employment in 2011. Most of these job losses would be related to restrictions on development of oil and gas from federal surface. The BLM predicts that oil and gas development on nearby state or fee surface land would partially compensate for the projected employment decrease (see the analysis of cumulative impacts for more information).

A decrease in employment opportunities could result in a decrease in population in the planning area because people might leave the area to seek employment elsewhere. The expected magnitude of any such decrease would be similar to the magnitude of employment loss, but would be lower because some people (e.g., those who are retired) live on unearned income and therefore do not depend directly on employment for their economic wellbeing. In other words, if 5.7% of employed people and their families leave the planning area, the population would decrease by less than 5.7% because some residents in the planning area are in retired or otherwise nonworking families.

There would be job opportunities related to BLM actions throughout the planning area. Oil and gas developers, livestock producers, and recreation providers operate throughout the planning area. However, job opportunities would concentrate in population centers. This would likely produce a shift in the current geographic distribution of employment opportunities within the planning area depending on the communities' dependence on oil and gas development. Moreover, Alternative B would result in employment moving away from jobs related to oil and gas development and into other sectors. One result would be lower average wages because jobs

related to oil and gas tend to have relatively higher average earnings per job than jobs related to services and agriculture. As a result, the implementation of Alternative B would likely produce a decline in population that would be noticeable in regional statistics.

Under Alternative B, job opportunities, and therefore job losses, would concentrate in population centers. Because the job losses under Alternative B would be primarily related to oil and gas development, any population changes would concentrate in areas that service oil and gas companies, such as Gillette.

Effects on Housing and Community Services

Alternative B management could result in decreased population and therefore would result in decreased demand for housing and community services. Alternative B management also would result in a reduced tax base for providing these services. Areas that service oil and gas production companies, such as Gillette, would experience the greatest reductions in reduced tax base.

If the decline in the oil and gas sector occurs slower or faster than the relatively steady pace assumed in this analysis, there could be short-term effects on demand for housing and community services, and 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.

Consistency with Adopted County Land Use Plans

BLM resource management plans must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative B would result in a measurable reduction in employment opportunities, amounting to about 5.7% of current employment, with the reduction attributable to direct, indirect, and induced effects related to oil and gas exploration and production (see "Effects on Population" above, and "Effects on Employment" in the *Economic Conditions* section). Accordingly, it could be argued that Alternative B would result in a conflict with the adopted land use plan of Campbell County, which indicates that the social stability of the county is based on "high-paying direct and indirect jobs related to mineral extraction in the county and depends on these industries being stable and viable." BLM management actions in Alternative B would not affect the long-term viability of mineral extraction activities on state and private land, but it would decrease the number of job opportunities available related to oil and gas over the life of the RMP.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under this alternative, the BLM would continue current policies of coordinating with county and municipal land use planners. The adopted Johnson County land use plan identifies three key concerns related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005). In this context, it is notable that Alternative B would result in slightly less surface disturbance that could adversely affect livestock grazing operators (approximately 22% less than in Alternative A). The increase in available AUMs for grazing operators could improve their financial viability, but the change may not be measurable for most operators

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative B would reduce economic opportunities overall, but also would result in lower air pollution and other adverse environmental effects associated with oil and gas development.

Although there are specific groups with particular interests regarding specific land uses (e.g., wilderness advocates, oil and gas interests, ranchers), on the whole, the residents of the planning area tend to support both conservation of natural resources and the economic viability of resource-based industries. For this reason, residents generally support multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative B would continue the current BLM practice of allowing multiple uses, but would prioritize other uses over oil and gas development. This would be inconsistent with the culture advocated by some interest groups (e.g., oil and gas developers) and would promote the culture advocated by others (e.g., wilderness advocates).

4.8.1.5. Alternative C

Effects on Population

Under Alternative C, activities on BLM-administered land and mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 4,201 full-time and part-time jobs per year, which represents approximately 7.2% of total employment in the planning area as of 2011. This total figure is somewhat higher than that for Alternative A. The IMPLAN model predicts a very small decrease in jobs related to livestock grazing, and more jobs related to oil and gas exploration, development, and production.

Because the economic analysis is performed at a regional level and integrates across all producing sectors, the job opportunities under Alternative C would occur throughout the planning area. Although this alternative would result in a slight shift away from jobs related to livestock grazing and toward jobs related to oil and gas development, this shift would not likely be noticeable in regional statistics for agriculture given the magnitude of the figures involved (i.e., three fewer jobs related to livestock grazing, but approximately 700 more related to oil and gas development). However, it is important to note that these figures reflect not just the sectors directly affected, but also indirectly related sectors such as product wholesalers and distributors. The geographic distribution of job opportunities would not change substantially from current conditions, and jobs would continue to concentrate in population centers.

An increase in employment opportunities could result in an increase in population in the planning area as people are drawn to the new jobs. The expected magnitude of any such increase would be similar to the magnitude of employment gained, as new employees move to the area with their families. Because this alternative would not result in a measurable increase in employment overall, it would not result in a change in population.

Effects on Housing and Community Services

Alternative C may result in a small increase in population and therefore could result in higher demand for housing and/or community services. The current vacancy rates for housing units in the three counties (reported in the analysis for Alternative A) indicate that housing would

likely be available for people migrating into the community, if that were to happen as a result of BLM actions in Alternative C. Alternative C would also result in a slightly greater tax base for providing these services than is presently available (see the *Economic Conditions* section). This would likely be perceived as a beneficial effect on community governments.

As noted under Impacts Common to All Alternatives, if development occurs slower or faster than the relatively steady pace assumed in this analysis, there could be short-term effects on demand for housing and community services, and 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.

Consistency with Adopted County Land Use Plans

BLM resource management plans must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative C would not result in any inconsistencies or conflicts with existing county land use plans.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under Alternative C, the BLM would continue current policies of coordinating with county and municipal land use planners. The adopted Johnson County land use plan identifies three key concerns related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005). In this context, it is notable that Alternative C would result in slightly more surface disturbance that could adversely affect livestock grazing operators (approximately 1.3 times as much as under Alternative A). Although the reduction in available AUMs for grazing operators could adversely affect their financial viability, there is a potential that some operators would benefit from offsetting financial benefits from surface agreements and leasing their mineral development rights to oil and gas producers. However, it is unclear on balance whether or not the financial gain would fully compensate for all the oil and gas related impacts.

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative C would increase economic opportunities, but also would result in more air pollution and other adverse environmental effects associated with oil and gas development.

Although there are specific groups with particular interests regarding specific land uses (e.g., wilderness advocates, oil and gas interests, and ranchers), on the whole, the residents of the planning area tend to support both conservation of natural resources and the economic viability of resource-based industries. For this reason, residents generally support multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative C would continue the current BLM practice of allowing multiple uses, but would prioritize oil and gas development over other

uses. This would be consistent with the culture advocated by some interest groups (e.g., oil and gas interests) and would be inconsistent with the culture advocated by others (e.g., wilderness advocates).

4.8.1.6. Alternative D

Effects on Population

Under Alternative D, activities on BLM surface and federal mineral estate related to oil and gas development, livestock grazing, and recreation would support an average of 3,557 full-time and part-time jobs per year, which represents approximately 6.1% of total employment in the planning area as of 2011. This total is a slight increase over Alternative A, with about 82 more jobs. The distribution of jobs under Alternative D would be essentially the same as Alternative A.

Because the economic analysis is performed at a regional level and integrates across all producing sectors, the job opportunities under Alternative D would occur throughout the planning area. The geographic distribution of job opportunities would not change substantially from current conditions, and jobs would continue to concentrate in population centers.

An increase in employment opportunities could result in an increase in population in the planning area as people are drawn to the new jobs. The expected magnitude of any such increase would be similar to the magnitude of employment gained as new employees move to the area with their families. Because this alternative would result in a barely measurable increase in employment overall, it would not result in a change in population.

Effects on Housing and Community Services

Alternative D would not likely result in a measurable increase in population and therefore would not result in higher demand for housing or community services. To the extent that there would be in-migration, recent housing vacancy rates suggest that the current housing stock could accommodate newcomers. Alternative D would also result in a slightly greater tax base for providing community services than is presently available (see the *Economic Conditions* section). This would likely be perceived as a beneficial effect on community governments.

As noted under Impacts Common to All Alternatives, if development occurs slower or faster than the relatively steady pace assumed in the analysis, there could be short-term effects on demand for housing and community services, and 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.

Consistency with Adopted County Land Use Plans

BLM resource management plans must be consistent with adopted local land use plans, and the BLM must take practical steps to resolve any identified conflicts between federal and local plans. The *Social Conditions* section in Chapter 3 summarizes adopted land use plans for each of the counties in the planning area. Alternative D would not result in any inconsistencies or conflicts with existing county land use plans.

Land use plans for the three counties in the planning area emphasize the importance of coordinating with the BLM and other federal land management agencies. Under this alternative, the BLM would continue current policies of coordinating with county and municipal land use

planners. The adopted Johnson County land use plan identifies three key concerns related to BLM-administered land and resources, all related to the continued availability of public lands for livestock grazing, the policies that affect the management of federal grazing allotments, and the continued financial viability of livestock grazing operators (Johnson County 2005). In this context, it is notable that Alternative D would result in slightly more surface disturbance that could adversely affect livestock grazing operators (approximately 1.3 times as much as under Alternative A). Although the reduction in available AUMs for grazing operators could adversely affect their financial viability, there is a potential that some operators would benefit from offsetting financial benefits from surface agreements and leasing their mineral development rights to oil and gas producers. However, it is unclear on balance whether or not the financial gain would fully compensate for all the oil and gas related impacts.

Effects on Quality of Life and Local Culture

Historically, the communities in the planning area developed around a combination of resource-based industries, including resource extraction, ranching, trade and commerce, and providing supplies and services to tourists. Quality of life for the people who live in the planning area depends on continued economic opportunities and features of the natural landscape. Alternative D would increase economic opportunities, but also would result in more air pollution and other adverse environmental effects associated with oil and gas development.

Although there are specific groups with particular interests regarding specific land uses (e.g., wilderness advocates, oil and gas interests, and ranchers), on the whole, the residents of the planning area tend to support both conservation of natural resources and the economic viability of resource-based industries. For this reason, residents generally support multiple uses of BLM-administered lands, including the development of mineral and energy resources, livestock grazing authorizations, continued access to BLM-administered lands for recreation, and conservation of wildlife and native vegetation. Alternative D would continue the current BLM practice of allowing multiple uses, but would prioritize oil and gas development over other uses. This would be consistent with the culture advocated by some interest groups (e.g., oil and gas interests) and would be inconsistent with the culture advocated by others (e.g., wilderness advocates).

4.8.1.7. Cumulative Impacts

See the *Cumulative Impacts* section in the *Economic Conditions* section for a discussion of cumulative impacts to social conditions.

4.8.1.8. Conclusion

Social conditions relate primarily to economic conditions that can influence the growth or development of employment and income. The economic sectors in the planning area most likely to be directly affected by BLM management actions are related to the service sector and resource development activities (e.g., oil and gas). That is not to imply that grazing, ranching, and other agricultural activities are unaffected or unimportant. However, based on their economic contribution to the overall economy, changes in this sector would be expected to produce relatively minor economic effects on the overall economy. Nevertheless, the agricultural sector in this area is quite influential in terms of community character and identity. Therefore, land management decisions affecting the agricultural sector have the potential to have far-reaching

effects on the social structure in the planning area, even though the economic effect is not expected to be substantial.

Table 4.80, "Overall Impacts on Social Conditions by Alternative" (p. 1459) summarizes effects on social conditions as described in this section for alternatives B, C, and D compared to Alternative A. Although the table attempts to summarize effects and characterize them as low, medium, or high, it does not classify these impacts as beneficial or adverse. Effects on social conditions seen as beneficial by some interest groups could be seen as adverse by other interest groups. For example, increased emphasis on resource conservation under Alternative B would result in a change from the current balance of uses, which wilderness advocates would likely see as a beneficial effects, but oil and gas development interests would see as an adverse effect. In the table, high impacts are those that would result in substantial changes to an existing condition in a way that would affect a large number of people and/or endure for a long period; low impacts are those that would be felt by a limited number of people and for a limited period; and medium impacts are intermediate.

Table 4.80. Overall Impacts on Social Conditions by Alternative

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Impact on Population	Low Impact	Medium Impact (likely reductions focused in oil/gas service areas, which generally correspond to population centers)	Low Impact	Low Impact
Impact on Housing and Community Services	Low Impact	Medium Impact (due to likely population reductions)	Low Impact	Low Impact
Consistency with Adopted County Land Use Plans	No effect	Medium impact (due to loss of employment opportunities from oil and gas)	No effect	No effect
Impacts on Quality of Life and Local Culture	Low Impact (continued policy of balanced use; no change from current conditions)	Low to Medium Impact (change from recent trends would constitute greater emphasis on resource conservation)	Low Impact (change from recent trends would constitute greater emphasis on resource development)	Low Impact (continued policy of balanced use, with some change from current conditions)
Source: Based on the analysis of impacts to social conditions, as described in the text.				

4.8.2. Economic Conditions

This section addresses the potential for the alternatives to affect economic conditions in the planning area, including direct, indirect, induced, short-term, and long-term effects. Appendix A (p. 1569) identifies the laws, EOs, regulations, policies, and guidance considered in the analysis of economic conditions.

Potential effects include changes in regional economic output, employment and earnings, and tax revenues for local, state, and federal governments. In terms of economic modeling analysis, direct and indirect effects are assumed to occur simultaneously, even though in reality these effects could take time to work their way through the economic sectors in the analysis area. For example, an action to permit gas exploration and production could result in the direct infusion of money into several economic sectors and indirect infusions into related sectors. In economic modeling,

these effects would be 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 would be analyzed over the life of the project, which in this case is likely to represent a multi-year period of production. Therefore, the analysis is designed to account for the economic activity produced by planning decisions over time. The effects are estimated on an annual basis from 2009 through 2028, based on the estimated annual direct effect of the alternatives.

4.8.2.1. Methods and Assumptions

The BLM used the IMPLAN model to estimate the economic effects of 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 might not be directly affected by management actions, but are linked to industries that are directly affected. In IMPLAN, these ripple effects are called indirect impacts (for changes in industries that sell inputs to the industries that are directly affected) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

For example, an increase in oil and gas production implies more money would be spent on the maintenance of existing oil and gas equipment or new oil and gas equipment; this implies more money would be 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 effects based on changes in production that might result from implementing an alternative. Appendix U (p. 2179) provides technical assumptions and additional information about the IMPLAN model.

Assumptions used in this analysis include:

- 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.
- The IMPLAN model can reasonably estimate indirect and induced benefits due to minerals, livestock grazing, and recreation. (The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the planning area.)
- Recreation-related expenditures by residents occur in the region, but do not represent new money coming into the study area; therefore, analysis of the economic effects of recreation considers only recreation expenditures of nonresidents in the three-county planning area. In other words, there is a multiplier affect associated with nonresident recreation-related spending because it results in an input of new money into the study region.
- The analysis of direct and indirect effects associated with oil and gas activities considers only activities on BLM surface and federal mineral estate, whereas the cumulative impacts analysis considers activities on state and fee land and mineral estate.
- For livestock grazing, the analysis reflects a "worst-case" assumption that all acres affected by surface-disturbing activities (from all the sources listed in Appendix G (p. 1671)) are lands currently authorized for grazing. Therefore, the number of acres available for grazing in 2028 is the number of acres currently available, minus acres that are affected long term by

surface-disturbing activities. In addition, the analysis of grazing reflects the assumption that surface-disturbing activities occur at a constant rate over time.

While BLM management actions influence the pace and timing of economic development in the planning area, the pace and timing of development also depends and will continue to depend on many factors. These include national and international energy demand, supply, and prices; operator business strategies; production conditions in the planning area; and demand and supply for agricultural products. Because the pace of development in the planning area is not known, this analysis assumes a relatively constant rate of development. Therefore, actual effects could differ (e.g., there could be boom and bust type short-term effects that would differ from long-term effects) 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 effects that reflect the interaction between and among the sectors in the planning area compared to a model using unadjusted national coefficients. Specifically, worker productivity in oil and gas production is higher in Wyoming than nationally, and more of the hay used for livestock feed is produced in the 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.

Changes in economic activity have an effect on federal, state, and local tax revenues. While all sectors of the economy contribute to tax revenues, the analysis of tax revenue effects focuses on oil and gas production because almost all of the measurable variation in economic activity among alternatives is in oil and gas.

The focus of the analysis is on regional earnings and output, employment, and tax revenue, with the region defined as the three-county planning area. Because the regional economic model relies on interlinkages among sectors that are aggregated over the entire planning area, it is not possible to predict total (direct, indirect, and induced) economic effects for individual communities in the three-county area.

4.8.2.2. Impacts Common to All Alternatives

The focus of this analysis is on the resource activities most likely to be affected by land management decisions, including oil and gas development, livestock grazing, and recreation. Actions from resource programs or constraints (as described for each alternative) that affect oil and gas development, livestock grazing, and recreation (e.g., surface-disturbing activities that affect the amount of land available for grazing) are included by implication. Also included by implication are restrictions on ROW and corridors, because the BLM Reasonable Foreseeable Development 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 would 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 a more important factor in a decision to develop a new field.

Economic effects related to other resources, such as coal, locatable and salable minerals, and renewable energy, are addressed outside the framework of the IMPLAN model. Running the IMPLAN model requires extensive quantitative data on each sector, such as unit costs of production broken into categories that can be assigned to individual economic sectors, and these data are not available for all types of economic activities. In addition, the BLM focused its use

of IMPLAN on those resources for which economic impacts would be substantively different across the alternatives in the RMP. In the case of coal, which is a critical economic base in the planning area, the production forecast does not differ across the alternatives, and therefore the economic impacts also would not differ across the alternatives. Therefore, the discussions for each alternative do not include quantitative estimates of earnings, jobs, or output related to coal, locatable and salable minerals, and renewable energy. However, the discussions do identify differences in expected levels of economic activity associated with these resources.

4.8.2.3. Alternative A

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative A for the modeled sectors (oil and gas, grazing, and recreation) would average approximately $202.6 million per year between 2009 and 2028, and regional output would average approximately $909 million per year, due to activities on BLM surface and federal mineral estate. The net present value of the stream of regional output, discounted at a 7% real discount rate (Office of Management and Budget 2002), would be approximately $8.6 billion over 20 years. Table 4.81, "Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area" (p. 1463) lists sector-level breakouts for earnings and output.

As noted above, data are insufficient to develop quantitative estimates of direct, indirect, and induced effects associated with the production of locatable and salable minerals in the planning area. Uranium and bentonite are the only locatable minerals currently being developed in the planning area, although gypsum also is present in commercial quantities. The primary salable minerals mined in the planning area are scoria and sand and gravel, both primarily used to support road building for oil, gas, and coal development, county road maintenance, and general construction. Under Alternative A, lands not formally withdrawn or segregated from locatable minerals entry would be open for the exploration and development of locatable minerals. Among the alternatives, Alternative A would withdraw from locatable minerals development and restrict minerals development activities on the fewest number of acres.

Locatable and salable minerals would continue to contribute to economic activity in the planning area. The U.S. Census Bureau estimated employment for mining and support activities, for minerals other than oil, gas, and coal, at between 20 and approximately 180 people in the three-county study area (Bureau of Labor Statistics 2012b). Earnings information was not provided, and the range of employment reflects restrictions on release of confidential business information. The BLM expects to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. Therefore, production of these minerals would not vary across the alternatives (with the possible exception of Alternative B as indicated in that section), and with this possible exception the BLM does not expect differences in the economic activity associated with each alternative. Variations in employment and earnings would likely be driven more by market fluctuations than by BLM management decisions.

Among renewable-energy sources, wind and solar energy are the most promising resources in the planning area. There have not been any formal inquiries associated with renewable-energy development in the planning area, nor has the area experienced any development of renewable energy other than some solar panels that provide supplemental electricity to some individual oil and gas development sites. The planning area is considered to have a moderate potential

for wind-energy development and a low potential for solar-energy development. Alternative A would not restrict renewable-energy development in any areas based on existing resource conditions or management designations, but would consider renewable-energy development on a project-specific basis. Given that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable energy development under this alternative.

Regarding coal, Alternative A would allow exploration on all federal coal lands, subject to license restrictions necessary to protect other resource values, and the BLM predicts 65 new exploration licenses would be issued during the planning period. Sixty of these licenses would be issued for areas with high potential for coal development, and five would be for other areas. Under Alternative A, the BLM could allow new development technologies, such as in situ gasification and methane farming, on federal coal lands. Economic activity from coal exploration and development under Alternative A would likely be similar to the current level of activity, based on the BLM forecast for leasing rate and production. According to this forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see the *Leasable Minerals – Coal* section for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative A for the modeled sectors would average approximately 3,478 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Note that the number of jobs is expressed as "annual job equivalents," where one annual job equivalent represents 12 months of employment. For example, one annual job equivalent could represent 2 jobs for 6 months each, or one job for 12 months. Annual job equivalents can represent full-time or part-time jobs. Table 4.82, "Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area" (p. 1464) provides information on how these jobs break out by sector.

Table 4.81. Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area

Sector	Alternative A	Alternative B	Alternative C	Alternative D
Impacts on Annual Average Earnings (millions of 2011 $)				
Oil and Gas	$199.2	$1.3	$239.5	$202.9
Livestock Grazing Management	$3.2	$3.3	$3.1	$3.1
Recreation	$0.2	$0.2	$0.2	$0.2
Total	$202.6	$4.8	$242.8	$206.2
Impacts on Annual Average Output (millions of 2011 $)				
Oil and Gas	$899.6	$11.0	$1,306.0	$1,012.6
Livestock Grazing Management	$9.2	$9.4	$9.0	$9.0
Recreation	$0.6	$0.6	$0.6	$0.6
Total	$909.4	$21.1	$1,315.6	$1,022.3
Impacts on Net Present Value of Output Over 20 Years (millions of 2011 $)[1]				

Sector	Alternative A	Alternative B	Alternative C	Alternative D
Oil and Gas	$8,477.5	$98.2	$12,059.8	$9,436.6
Livestock Grazing Management	$99.8	$101.3	$97.7	$97.8
Recreation	$6.7	$6.7	$6.7	$6.7
Total	$8,854.0	$206.2	$12,164.1	$9,541.0

Source: Calculated using the IMPLAN model, as described in the text.

[1]Net present value from 2009 to 2028, discounted at 7% (rate from Office of Management and Budget 2002).

IMPLAN Impact Analysis for Planning model

Table 4.82. Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area

Sector	Number of Jobs[1]			
	Alternative A	Alternative B	Alternative C	Alternative D
Oil and Gas	3,366	23	4,092	3,448
Livestock Grazing Management	105	107	102	102
Recreation	7	7	7	7
Total	3,478	137	4,201	3,557

Source: Calculated using the IMPLAN model, as described in the text.

[1]Number of jobs is in annual job equivalents, where one annual job equivalent represents 12 months of employment. For example, one annual job equivalent could represent 1 job for 12 months, or 2 jobs for 6 months.

IMPLAN Impact Analysis for Planning model

Average annual earnings per job would differ for each of these sectors. Based on the IMPLAN model, earnings per job (expressed in year 2011 dollars) would average:

- Between $52,000 and $65,000 for jobs in oil and gas well drilling and completion
- Approximately $67,000 for jobs in oil and gas production
- Approximately $31,000 for jobs associated with cattle and sheep grazing
- Between $23,000 and $26,000 for recreation-related jobs

Effects on Tax Revenue

Projected tax revenues under Alternative A due to oil and gas production on federal mineral estate would average $47.6 million per year for federal royalties, $22.9 million per year for state severance taxes, and $24.9 million per year for local ad valorem taxes. Because specific well locations are not known at this time, data are not sufficient to apportion the local tax receipts to individual counties; however, project-specific analyses will be able to provide this information. Table 4.83, "Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 $)" (p. 1464) summarizes tax revenues from oil and gas production under the alternatives.

Table 4.83. Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 $)

Tax Type	Alternative A	Alternative B	Alternative C	Alternative D
Federal mineral royalties	$47.6	$0.9	$82.4	$59.3
State severance taxes	$22.9	$0.4	$39.6	$28.5

Tax Type	Alternative A	Alternative B	Alternative C	Alternative D
Local ad valorem production taxes	$24.9	$0.5	$43.2	$31.1
Total	$95.4	$1.8	$165.2	$118.8
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				

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. In the context of overall tax collections, the differences in tax revenues from oil and gas development and production are relatively small, between alternatives A, C, and D. For instance, total state severance tax collections were $877 billion in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. The PRB Coal Review (ESNR 2005c) indicated that, from 2011 through 2015, severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over $400 million annually, and ad valorem tax revenues about $355 million annually, from coal mining, CBNG, and conventional oil and gas.

4.8.2.4. Alternative B

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative B for the modeled sectors (oil and gas, grazing, and recreation) would average approximately $4.8 million per year between 2009 and 2028, and regional output would average approximately $21.1 million per year, due to activities on BLM surface and federal mineral estate. The net present value of the stream of regional output, discounted at a seven percent real discount rate (Office of Management and Budget 2002), would be approximately $0.2 billion over 20 years. Table 4.81, "Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area" (p. 1463) shows sector-level breakouts for earnings and output. These dramatic reductions compared to Alternative A primarily reflect the BLM's prediction of lower oil and gas development on BLM-administered lands. The BLM's projection indicates that Alternative B would see a slightly higher amount of earnings, output, and employment from livestock grazing.

Under Alternative B, the BLM would withdraw or apply restrictions on locatable and salable minerals development on more acres than Alternative A. However, locatable and salable minerals would continue to contribute to economic activity in the planning area. In general, the BLM would attempt to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. However, given the planned restrictions on mineral entry in Alternative B, the BLM may not be able to meet this objective. If production of these minerals would be lower in Alternative B compared to Alternative A, then there could be some differences in employment and earnings associated with locatable and salable minerals. Even so, variations in employment and earnings would also be driven somewhat by market fluctuations, and the variation from those fluctuations could also be a substantial driver.

Under Alternative B, renewable-energy development projects would be excluded in areas closed to minerals leasing, closed to locatable and salable minerals, excluded from ROW development, and all other areas where surface disturbance would be prohibited. Alternative B would exclude more areas from renewable-energy development than Alternative A. However, given

that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable-energy development in this alternative. The data are not sufficient to determine how the overall economic activity associated with renewable-energy development and production would compare to Alternative A.

Regarding coal, under Alternative B, the BLM would allow coal exploration only on federal coal lands in the two areas with high development potential, subject to license stipulations necessary to protect other resource values. The BLM predicts 60 new exploration licenses would be issued during the planning period, all in areas with high potential for coal development. Non-conventional technologies such as in situ gasification and methane farming would not be permitted on federal coal lands. However, the BLM does not predict substantive production from these non-conventional production technologies over the life of the RMP. Thus, economic activity from coal exploration and development under Alternative B would likely be similar to that under Alternative A, based on the BLM forecast for leasing rate and production. According to this forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see Leasable Minerals – Coal for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative B for the modeled sectors would average approximately 137 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Table 4.82, "Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area" (p. 1464) provides information on how these jobs break out by sector. Average annual earnings per job would be the same under Alternative B as under Alternative A, and are described above.

Effects on Tax Revenue

Projected tax revenues under Alternative B due to oil and gas production on federal mineral estate would average $0.9 million per year for federal royalties, $0.4 million per year for state severance taxes, and $0.5 million per year for local ad valorem taxes. Because specific well locations are not known at this time, there are not sufficient data to apportion the local tax receipts to individual counties; however, project-specific analyses will be able to provide this information. Table 4.83, "Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 $)" (p. 1464) summarizes tax revenues from oil and gas production under the alternatives.

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. For instance, total state severance tax collections were $877 million in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. According to the PRB Coal Review (ESNR 2005c), from 2011 through 2015 severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over $400 million annually, and ad valorem tax revenues about $355 million annually, from coal mining, CBNG, and conventional oil and

gas. For Alternative B, the effect of reduced state, local and federal tax collections is more substantial in the context of overall revenue collections.

4.8.2.5. Alternative C

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative C for the modeled sectors (oil and gas, grazing, and recreation) would average approximately $242.8 million per year between 2009 and 2028, and regional output would average approximately $1,315.6 million per year, due to activities on BLM-administered lands and mineral estate. The net present value of the stream of regional output, discounted at a seven percent real discount rate (Office of Management and Budget 2002), would be approximately $12.2 billion over 20 years. Table 4.81, "Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area" (p. 1463) shows sector-level breakouts for earnings and output.

Under Alternative C, the BLM would recommend no withdrawals from locatable mineral entry, and would apply slightly more restrictions on areas open to salable minerals development without restrictions. In both cases, the BLM expects to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the operations would continue to meet market demand. Therefore, production of these minerals would not vary across the alternatives (with the possible exception of Alternative B as indicated in that section), and with this possible exception, the BLM does not expect differences in economic activity associated with each alternative. Variations in employment and earnings would be driven more by market fluctuations than BLM management decisions.

Under Alternative C, renewable-energy development projects would be allowed anywhere in the planning area as long as development would be consistent with other resource values. In addition, unlike alternatives A and B, Alternative C would not require transmission lines to be located within identified ROW corridor areas, which could result in decreased development times for projects and, ultimately, more development of renewable-energy resources. However, given that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable energy development under this alternative. The data are not sufficient to determine how the overall economic activity associated with renewable-energy development and production would compare to Alternative A.

Regarding coal, exploration would be allowed on all federal coal lands under Alternative C, and the BLM predicts 65 new exploration licenses would be issued during the planning period. Sixty of these licenses would be issued for areas with high potential for coal development, and five would be for other areas. Under Alternative C, the BLM would allow new development technologies, such as in situ gasification and methane farming, on federal coal lands. However, the BLM does not predict substantive production from these non-conventional production technologies over the life of the RMP. Thus, although this alternative would remove some restrictions included under Alternative A, the economic activity from coal exploration and development under Alternative C would likely be similar to that under Alternative A, based on the BLM forecast for leasing rate and production. According to the BLM forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see Leasable Minerals – Coal for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative C for the modeled sectors would average approximately 4,201 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Table 4.82, "Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area" (p. 1464) provides information on how these jobs break out by sector. Average annual earnings per job under Alternative C are the same as under Alternative A.

Effects on Tax Revenue

Projected tax revenues under Alternative C due to oil and gas production on federal mineral estate would average $82.4 million per year for federal royalties, $39.6 million per year for state severance taxes, and $43.2 million per year for local ad valorem taxes. Because specific well locations are not known at this time, data are not sufficient to apportion the local tax receipts to individual counties. Table 4.83, "Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 $)" (p. 1464) summarizes tax revenues from oil and gas production under each alternatives.

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. In the context of overall tax collections, the differences in tax revenues from oil and gas development and production are relatively small, between alternatives A, C, and D. For instance, total state severance tax collections were $877 million in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. According to the PRB Coal Review (ESNR 2005c), from 2011 through 2015 severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over $400 million annually, and ad valorem tax revenues about $355 million annually, from coal mining, CBNG, and conventional oil and gas.

4.8.2.6. Alternative D

Effects on Regional Earnings and Output

Based on the IMPLAN model, regional earnings under Alternative D for the modeled sectors (oil and gas, grazing, and recreation) would average approximately $206.2 million per year between 2009 and 2028, and regional output would average approximately $1,022.3 million per year, due to activities on BLM surface and federal mineral estate. The net present value of the stream of regional output, discounted at a 7% real discount rate (Office of Management and Budget 2002), would be approximately $9.5 billion over 20 years. Table 4.81, "Average Annual Impacts on Earnings and Output, by Sector and Alternative for the Planning Area" (p. 1463) shows sector-level breakouts for earnings and output.

Under Alternative D, the BLM would recommend or apply more withdrawals and restrictions on locatable and salable minerals development than under Alternative A. However, the BLM expects to respond to plans of operation to develop locatable minerals and applications for disposals [contract sales and free use permits] for salable minerals in the planning area in a way that the

operations would continue to meet market demand. Therefore, production of these minerals would not vary across the alternatives (with the exception of Alternative B as indicated in that section), and with this possible exception, the BLM does not expect differences in the economic activity associated with each alternative. Variations in employment and earnings would be driven more by market fluctuations than by BLM management decisions.

Compared to the other alternatives, Alternative D would exclude renewable energy development across more area than Alternative A or C. However, given that renewable-energy development in the planning area is in its infancy, it is not possible to estimate the level of economic activity, jobs, or labor earnings that could be associated with renewable energy development under this alternative. The data are not sufficient to determine the overall economic activity associated with renewable-energy development and production compared to Alternative A.

Regarding coal, exploration would be allowed on all federal coal lands under Alternative D, subject to multiple use constraints, and the BLM predicts 65 new exploration licenses would be issued during the planning period. Sixty of these licenses would be issued for areas with high potential for coal development, and five would be for other areas. Under Alternative D, the BLM would implement existing coal leasing authority when federal coal lands are requested for in situ gasification. The BLM would develop an appropriate coal use authorization that provides public compensation for the reduction in coal value resulting from methanogenesis. However, the BLM does not predict substantive production from these non-conventional production technologies over the life of the RMP. Thus, although this alternative would increase some restrictions compared to Alternative A, the economic activity from coal exploration and development under Alternative D would likely be similar to that under Alternative A, based on the BLM forecast for leasing rate and production. According to the BLM forecast, leasing would continue at a rate necessary to replace depleted reserves at the rates predicted in the PRB coal review study through 2020; from 2020 to 2030, the rate of production increase is conservatively predicted to be one percent per year (see Leasable Minerals – Coal for more information).

Effects on Employment

Employment is a function of the level of economic activity (sales and purchases) among and between economic sectors. Therefore, effects on employment are closely related to effects on economic output. An increase in output implies an increase in employment, and vice versa.

Based on the IMPLAN model, regional employment under Alternative D for the modeled sectors would average approximately 3,557 jobs per year between 2009 and 2028 due to activities on BLM surface and federal mineral estate. Table 4.82, "Average Annual Impacts on Employment, by Sector and Alternative for the Planning Area" (p. 1464) provides information on how these jobs break out by sector. Average annual earnings per job would be the same under Alternative D as under Alternative A.

Effects on Tax Revenue

Projected tax revenues under Alternative D due to oil and gas production on federal mineral estate would average $59.3 million per year for federal royalties, $28.5 million per year for state severance taxes, and $31.1 million per year for local ad valorem taxes. Because specific well locations are not known at this time, data are not sufficient to apportion the local tax receipts to individual counties. Table 4.83, "Estimated Oil and Gas Tax Revenues by Alternative for the Planning Area (millions of 2011 $)" (p. 1464) summarizes tax revenues from oil and gas production under the alternatives.

Tax revenues due to recreation and livestock grazing activities would be nearly identical across the alternatives, as is the case for earnings and employment for those activities. In the context of overall tax collections, the differences in tax revenues from oil and gas development and production are relatively small, between alternatives A, C, and D. For instance, total state severance tax collections were $877 million in Fiscal Year 2012 (see Chapter 3). This is in part because of the importance of tax revenues from other minerals, most notably coal, for which the alternatives would not result in a difference in production. According to the PRB Coal Review (ESNR 2005c), from 2011 through 2015 severance tax revenues in Campbell, Johnson, Sheridan, and Converse Counties are expected to be over $400 million annually, and ad valorem tax revenues about $400 million annually, from coal mining, CBNG, and conventional oil and gas.

4.8.2.7. Cumulative Impacts

This section discusses the cumulative impact of management actions and projected development on the economic and social conditions of local communities.

The assessment area for cumulative social and economic conditions consists of the three counties that overlap the planning area.

Analysis in this section primarily focuses on cumulative impacts related to oil and gas activity, ranching and livestock grazing, and quality of life, including non-market values.

The impacts of oil and gas drilling and production described in the *Economic Conditions* section of this chapter relate to activities on BLM surface and federal mineral estate within the planning area. However, oil and gas activity on private and state land is estimated to constitute a substantial portion of projected oil and gas activity in all alternatives; Table 4.84, "Cumulative (including State and Private) Impacts of Oil and Gas Development over the Life of the Plan in the Planning Area" (p. 1471) displays the cumulative impacts of oil and gas development on federal as well as state and private land over the life of the plan. Specifically, in alternatives A, C, and D, oil and gas drilling and production on state and private land would comprise between 49% and 72% of total activity (about 49% in Alternative C, 60% in Alternative D, and 72% in Alternative A), while in Alternative B, about 98% of total drilling and production activity is expected to occur on private and state land. This also means that the additional activity on state and private land in Alternative B would partially mitigate the sharp reduction in oil and gas production on federal lands, and the overall reduction in earnings, employment, and output would be proportionally smaller than the reduction in activity on federal lands would suggest. To see this, note that the analysis earlier in Chapter 4 showed $199 million in earnings and 3,366 jobs related to oil and gas drilling, completion, and production in Alternative A, and just $1.3 million in earnings and 23 jobs for the same activities in Alternative B – a reduction of over 99%. The comparable figures incorporating state and private production are $425 million and 7,222 jobs for Alternative A, and $227 million and 3,880 jobs for Alternative B – about a 46% reduction. While the reduction from Alternative A to Alternative B would still be substantial, the anticipated state and private production would moderate the change in BLM management actions.

Table 4.84. Cumulative (including State and Private) Impacts of Oil and Gas Development over the Life of the Plan in the Planning Area

Impact[1]	Alternative A	Alternative B	Alternative C	Alternative D
Annual Average Earnings	$424.9	$227.0	$465.2	$428.7
Annual Average Output	$2,130.9	$1,242.3	$2.537.3	$2,244.2
Net Present Value of Output	$19,847.2	$11,467.9	$23,429.4	$20,808.2
Annual Average Employment[2]	7,222	3,880	7,948	7,305
Change from Alternative A – Earnings	N/A	-$197.9	$40.3	$3.7
Change from Alternative A – Employment	N/A	-3,343	726	82
Percentage change from Alternative A (earnings, employment)	N/A	-47%	9%	1%
Percentage change from Alternative A (earnings, employment), for federal land only	N/A	-98%	20%	2%

Source: Calculated using the IMPLAN model, as described in the text. Includes oil and gas well drilling and completion, and production from new wells, as estimated in the BLM's Reasonably Foreseeable Development Scenario for federal, state, and private land.

[1]All dollar values are in millions of year 2011 dollars. Net present value of output is discounted at a 7% real discount rate, as recommended in OMB 2002.
[2]Employment is in annual job equivalents.

BLM Bureau of Land Management
IMPLAN Impact Analysis for Planning Model
N/A not applicable
OMB Office of Management and Budget

Under each alternative various management actions constrain mineral development on BLM-administered land for the protection of other resource values. These constraints can limit the mineral development activity on BLM surface and mineral estate, and constrict the minerals-based economy in the planning area. Table 4.85, "Reasonable Foreseeable Development Well Number Projections" (p. 1472) below summarizes the number of constrained federal wells and unconstrained non-federal wells for each alternative, including coalbed natural gas wells, over the life of the plan.

Table 4.85. Reasonable Foreseeable Development Well Number Projections

Well Type	Alternative A	Alternative B	Alternative C	Alternative D
Number of Projected New Federal Wells	2,731	108	7,270	4,494
Projected Number of Abandoned New Federal Wells	99	1	145	112
Projected Productive New Federal Wells	2,632	107	7,125	4,382
Number of Projected New Non-federal Wells	6,862	6,862	6,862	6,862
Projected Number of Abandoned New Non-federal Wells	137	137	137	136
Projected Productive New Non-federal Wells	6,725	6,725	6,725	6,726
Cumulative New Wells (Federal/Non-federal)	9,593	6,970	14,132	11,356
Cumulative Abandoned New Wells (Federal/Non-federal)	236	138	282	248
Cumulative Productive New Wells (Federal/Non-federal)	9,357	6,832	13,850	11,108
Source: Stilwell et al. 2012; Appendix G (p. 1671)				

The projected number of cumulative productive new wells is greatest under Alternative C (14,132) and the least under Alternative B (6,970). The percent increase/decrease from the number of new wells under Alternative A follows.

- Alternative B – 27% decrease
- Alternative C – 48% increase
- Alternative D – 19% increase

Increasing energy development and mining for mineral resources is likely to have a substantial social and economic impact within the planning area. As noted in the *Economic Conditions* section of this chapter, Alternative C is anticipated to result in the most substantial increase of economic opportunities with the highest projected forecasted job growth for the planning area followed by alternatives D, A, and B, in that order. Regional employment under Alternative C is also anticipated to average the greatest number of full and part-time jobs per year related to the oil and gas, livestock grazing, and recreation industries, which may result in beneficial impacts on quality of life as measured by economic opportunity. However, Alternative C may also result in adverse impacts to air quality, wildlife, and other resources that improve quality of life related to natural characteristics, as priorities would be placed on the use of resources such as oil and gas over the conservation of resources such as air quality and wildlife.

Comparatively, Alternative B would provide the least economic and social benefits as measured by jobs and income; priorities under this alternative are centered on conservation of land and existing environmental conditions. Alternative A would result in more opportunities than Alternative B, but fewer economic and social opportunities than Alternative C and Alternative

D; Alternative A essentially represents the continuation of current trends. Alternative D would continue BLM's current practice of allowing multiple uses, balancing the use of resources such as oil and gas reserves with the conservation of resources such as air quality, open space, and wildlife range areas while providing an increase in job opportunities dispersed geographically across the planning area.

Past, present, and reasonably foreseeable future actions in the planning area and surrounding geographic areas would also affect both traditional economic measures (earnings, jobs, output) and non-market values in the planning area. For example, the BLM Bighorn Basin Resource Management Plan, which is being updated concurrent with the present RMP, would update BLM's direction and management plans in the Cody and Worland Field Offices, which include land and resources in several counties that neighbor the BFO. Thus, the choice of alternatives in the Bighorn Basin RMP could directly affect social and economic conditions in the planning area for this RMP. However, based on past BLM actions and present policy of balanced management of land and resources, the combined effects within the planning area – either on traditional economic measures or non-market values – would not likely be different from those under alternatives A, B, C, and D in the existing plan.

4.8.2.8. Conclusion

Based on the data from the IMPLAN model and qualitative analysis of economic activity from other sectors, earnings, output, employment, and tax revenues due to activities on BLM surface and federal mineral estate would be highest under Alternative C and lowest under Alternative B. Under Alternative D, economic activity would be somewhat lower than under Alternative C, and under Alternative A, economic activity would be slightly lower than under Alternative D. The primary driver is projected oil and gas activity, which would be highest under Alternative C, followed by alternatives D, A, and B. Earnings, output, and employment from recreation would be identical across all the alternatives, and economic activity related to grazing would be highest under Alternative B and lowest under Alternative C. However, the lower amount of economic activity resulting from oil and gas drilling, completion, and production would counteract the larger amount from livestock grazing, resulting in a lower total economic output.

Economic activity related to other sectors not modeled using IMPLAN, including coal, renewable energy, locatable minerals, and salable minerals, would be similar across all the alternatives, at least in the first 5 to 10 years of the planning period. In the latter half of the planning period, economic activity from renewable energy could be somewhat higher under alternatives A, C, and D compared to Alternative B, but there are many uncertainties.

It is useful to compare the differences in earnings and employment across alternatives, not only in absolute terms, but also to the size of the regional economy. Table 4.86, "Comparison of Projected Earnings and Employment to 2011 Levels" (p. 1474) compares projected earnings and employment related to activities on BLM-administered lands to the levels in 2011 for the three-county region. Under alternatives A and D, average earnings from activities on BLM-administered lands analyzed in IMPLAN amount to 5.0% and 5.1% of 2011 personal income; under Alternative C, average earnings would be slightly higher at 6.0% of 2011 personal income; and under Alternative B, the corresponding figure is somewhat lower, 0.1%. Therefore, Alternative B would represent a substantial reduction in economic activity on BLM-administered lands by more than half compared to alternatives A, C, and D. Alternatives A or D would also represent a reduction compared to Alternative C, although this latter difference, when compared to the size of the overall economy, would be relatively minor (about 1% of overall earnings).

The comparison of employment among alternatives, and to the regional economy, produces similar conclusions. Under alternatives A and D, average employment from activities on BLM-administered lands analyzed in IMPLAN would amount to approximately 6.0 to 6.1% of 2011 total employment for the three-county planning area; under Alternative C, the figure is somewhat higher at 7.2%. Under Alternative B, the corresponding figure is 0.2%. The reduction in economic activity represented in Alternative B would be substantial compared to alternatives A, C, and D. This difference would be comparable to an increase in the unemployment rate of about 6.0%, which would be substantial and could lead to migration out of the area as people search for jobs elsewhere.

The difference between Alternative A and Alternative D would be barely noticeable in regional statistics. The difference between either of these alternatives and Alternative C would be noticeable, but would not likely lead to wholesale changes in regional economic activity (as can be seen by comparing the earnings and employment figures across alternatives A, C, and D). Other national, state, and regional policies and trends, such as the value of the dollar compared to other world currencies, federal fiscal and monetary policy, and global oil and gas prices, may have as meaningful an effect on economic activity in the planning area.

While the economic differences between alternatives are a relatively small part of regional statistics (except in Alternative B), the impacts are likely to be highly important from the perspective of individual operators and companies, as well as the individuals directly affected by loss of employment. In addition, the activities of BLM may be important within portions of the study region, depending on where the restrictions occur and where BLM's activities take place. Thus, the above discussion is not intended to minimize the impacts, rather to provide a perspective from the regional context.

Table 4.86. Comparison of Projected Earnings and Employment to 2011 Levels

Measure	Alternative A	Alternative B	Alternative C	Alternative D
Forecasted annual earnings due to activities on BLM surface[1]	$202.6	$4.8	$242.8	$206.2
Total personal income in 2011	$4,055	$4,055	$4,055	$4,055
Forecasted annual earnings / 2011 income	5.0%	0.1%	6.0%	5.1%
Forecasted annual employment due to activities on BLM surface[1]	3,478	137	4,201	3,557
Total employment in 2011	58,241	58,241	58,241	58,241

Measure	Alternative A	Alternative B	Alternative C	Alternative D
Forecasted annual employment / 2011 employment	6.0%	0.2%	7.2%	6.1%

Source: Forecasted annual earnings and employment are calculated based on the IMPLAN model, as described in the text. Earnings and employment for 2011 are from BEA (Bureau of Economic Analysis 2012a; Bureau of Economic Analysis 2012b). Earnings are in millions of year 2011 dollars.

[1]Estimate of annual earnings and employment includes direct, indirect, and induced economic activity (the multiplier effect).

IMPLAN Impact Analysis for Planning model

4.8.3. Health and Safety

Health and safety, as discussed in this section, includes abandoned mine lands (AMLs), coal seam fires, physical hazards, hazardous substances, and hydrogen sulfide gas.

The generation, use, disposal, or accidental release of hazardous substances are subject to the federal and state laws and regulations identified in Chapter 1 and Appendix A (p. 1569). In addition, Onshore Order #6 addresses requirements for conducting operations in areas that are known to or could produce hydrogen sulfide gas. These laws and regulations are designed to safeguard human health and safety and to protect the environment, and would minimize the short- and long-term risks associated with hazardous substances and hydrogen sulfide gas.

4.8.3.1. Methods and Assumptions

- Most 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 location with high visitor use (BLM 2000c). AML sites adversely affecting watersheds are also a high priority. The BLM continues to support the Wyoming DEQ AML Division in reclaiming AML sites on public surface.
- No assumptions were identified for physical hazards.
- All new hazardous materials and waste sites are identified and characterized.
- Resource development activities identify any possible generation of hazardous waste.
- With the transition from coalbed natural gas development to more conventional natural gas development, more hazardous materials use and waste generation will occur.
- The BLM Hazard Management and Resource Restoration Program responds to all hazardous material releases on public surface. Emergency cleanup actions are implemented on sites posing a substantial threat to the public and/or the environment.

4.8.3.2. Impacts Common to All Alternatives

Abandoned Mine Lands and Coal Seam Fires

To reduce the threat of physical and environmental impacts from AML sites and coal seam fires, the BLM will remediate sites based on risk.

Coal seam fires can be difficult to control and extinguish. Not being in close proximity to coal seam fires is the best way to reduce any potential exposure to their safety hazards. The

BLM will manage safety concerns through hazard monitoring and public education. Based on site-specific risks, fencing, warning signs, or other institutional controls may be required. All of these management actions would reduce the potential for human health and safety risks from coal seam fires.

Long-term beneficial impacts to health and safety would result from the Wyoming DEQ AML Division continuing to work with the BLM to mitigate hazards associated with AML sites and coal seam fires.

Implementation of the alternatives are not anticipated to result in additional AML sites or increase the risks at AML sites or coal seam fires that may adversely impact health and safety.

Physical Hazards

Physical hazards will be managed to reduce risks to the public by providing warnings and, where appropriate, developing mitigation measures to avoid and minimize effects associated with physical hazards.

Implementation of the alternatives would not result in an increase in the potential for physical hazards; however, management may decrease the risks and potential impacts on health and safety resulting from physical hazards.

Hazardous Substances

Increases in human presence and activity associated with recreation, minerals exploration and development activities, and ROW development increase risks associated with the generation, use, transportation, and disposal of hazardous substances. Minerals-related activities are the most likely activities to increase the risk of hazardous substances to health and safety.

Impacts to health and safety from the management of hazardous substances would be the same under all alternatives, as there are no separate management actions by alternative.

Implementing hazardous materials management activities will address human health and environmental risks from hazardous substances and hydrogen sulfide gas. Due to the increase in activity in oil and gas extraction, hydrogen sulfide (H_2S) poses an increasing threat to human health and safety. To reduce the risks to human health, all H_2S plans would comply with Onshore Order #6, which identifies "uniform national requirements and minimum standards of performance expected from operators when conducting operations involving oil or gas that is known or could reasonably be expected to contain hydrogen sulfide." In addition, the BLM will mitigate safety concerns associated with H_2S through signs, warning sirens, and public education. All of these management actions would reduce the potential for human health and safety risks from H_2S. Any potential effects on health and safety from H_2S would increase in relation to the level of minerals-related activities that releases H_2S.

Hazardous materials are managed to reduce risks to visitors, employees, and the environment; to restore contaminated land; and to perform emergency-response actions, in accordance with appropriate laws, policies, and regulations. Management to reduce risk and contamination would result in reduced potential effects on health and safety from hazardous substances. There could be substantive indirect impacts related to risks from hazardous substances during remediation could exist.

Reporting spills and releases of chemicals, petroleum products, and produced water to the Wyoming DEQ would reduce the potential for both short- and long-term impacts, and increase the potential for beneficial impacts on health and safety by controlling spills and facilitating an appropriate response to hazardous substance spills.

4.8.3.3. Cumulative Impacts

As described in Chapter 3, the potential for more hazardous material spills will increase primarily from the increase in mineral development, particularly with conventional natural gas development. Cumulative impacts will be negligible due to immediate response and cleanup activities. Physical hazards, coal seam fires, and abandoned mines, will be mitigated directly or through other institutional controls, to protect human health and safety.

4.8.3.4. Conclusion

There would be beneficial impacts to health and safety from management of AML sites and coal seam fires under all alternatives. Under all alternatives, the BLM and Wyoming DEQ will identify and plan for remediation or mitigation of AML and coal seam fire sites, which would reduce adverse impacts to health and safety.

Primary impacts to health and safety from physical hazards would result from management that increases activities in areas with physical hazards and subsequently increases the risk and potential for accidents in those areas. Providing warning signs or other institutional controls would result in similar beneficial impacts under all alternatives.

The impacts from management of hazardous substances would be the same under all alternatives. The potential for impacts may vary by alternative based on the level of mineral-related activities. Alternative C, with the greatest amount of mineral-related activities, could increase the generation, use, transportation, and disposal of hazardous substances. To reduce adverse impacts to health and safety, authorized users would adhere to hazardous spill response plans, stipulations, and all applicable laws and regulations pertaining to hazardous substances. These requirements would provide detailed strategy and process for responding to releases of hazardous substances, therefore reducing short-term impacts from contamination. Table 4.87, "Summary of Impacts to Health and Safety" (p. 1477) summarizes the effects on health and safety.

Table 4.87. Summary of Impacts to Health and Safety

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Physical Resources				
Air Quality	No effect	No effect	No effect	No effect
Soil	No effect	No effect	No effect	No effect
Water Resources	No effect	No effect	No effect	No effect
Cave and Karst Resources	No effect	No effect	No effect	No effect
Mineral Resources				
Locatable Minerals	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse
Leasable Minerals – Coal	Negligible adverse	Negligible adverse	Negligible adverse	Negligible adverse
Leasable Minerals – Fluids	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse
Salable Minerals	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Fire and Fuels Management				
Unplanned Fire (Wildfire)	No effect	No effect	No effect	No effect
Planned Fire (Prescribed Fire)	No effect	No effect	No effect	No effect
Biological Resources				
Vegetation – Forests and Woodlands	No effect	No effect	No effect	No effect
Vegetation – Grassland and Shrubland Communities	No effect	No effect	No effect	No effect
Vegetation – Riparian/Wetland Resources	No effect	No effect	No effect	No effect
Invasive Species and Pest Management	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Fish	No effect	No effect	No effect	No effect
Fish and Wildlife Resources – Wildlife	No effect	No effect	No effect	No effect
Special Status Species – Plants	No effect	No effect	No effect	No effect
Special Status Species – Fish	No effect	No effect	No effect	No effect
Special Status Species – Wildlife	No effect	No effect	No effect	No effect
Heritage and Visual Resources				
Cultural Resources	No effect	No effect	No effect	No effect
Paleontological Resources	No effect	No effect	No effect	No effect
Visual Resources	No effect	No effect	No effect	No effect
Land Resources				
Forest Products	No effect	No effect	No effect	No effect
Lands and Realty	No effect	No effect	No effect	No effect
Renewable Energy	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse
Rights-of-Way and Corridors	Negligible adverse	Negligible adverse	Minor adverse	Negligible adverse
Travel and Transportation Management	No effect	No effect	No effect	No effect
Recreation	No effect	No effect	No effect	No effect
Lands with Wilderness Characteristics	No effect	No effect	No effect	No effect
Livestock Grazing Management	No effect	No effect	No effect	No effect
Special Designations				
Areas of Critical Environmental Concern	No effect	No effect	No effect	No effect
Scenic or Back Country Byways	No effect	No effect	No effect	No effect
Wild and Scenic Rivers	No effect	No effect	No effect	No effect

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Wilderness Study Areas	No effect	No effect	No effect	No effect
Socioeconomic Resources				
Social and Economic Conditions	No effect	No effect	Negligible	No effect
Health and Safety	No effect	No effect	No effect	No effect

4.8.4. Environmental Justice

This section addresses the potential for the alternatives to have disproportionate adverse effects on minority and low-income populations, including direct, indirect, short-term, and long-term effects. Appendix A (p. 1569) lists the laws, regulations, EOs, policies, and guidance considered in the analysis of disproportionate adverse effects.

Because the analysis of disproportionate adverse effects depends on effects identified for other resources, definitions of adverse effects as they apply to environmental justice issues are closely related to the definitions of adverse effects in other resource areas (e.g., social resources). For example, the displacement of a mobile home park that houses a low-income population to build a new road could be a direct disproportionate effect. An example of an indirect disproportionate effect would be a reduction in social services to low-income individuals that could result from decreased tax revenues as a result of decreased minerals production.

4.8.4.1. Methods and Assumptions

Because the analysis of disproportionate adverse effects is based on other effects identified for other resources, the assumptions for this analysis implicitly include the assumptions of other resource areas as they relate to the identification and analysis of effects. In addition, this analysis assumes that the latest available demographic data from the U.S. Census and other sources accurately represent the population in the study area.

In accordance with BLM and 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 affected area exceeds 50% or the percentage of minority population in the affected area is meaningfully greater than the percentage in the general population. The “general population” is defined as a relevant comparison area, such as the state.

The minority population in the three planning area counties ranges from five percent (Johnson) to nine percent (Campbell), compared to a state average of 13%. Because none of the counties has a higher minority population than the state, they are not considered to contain a minority population concentration at the county level based on BLM and CEQ guidance. At the town level, two towns in the planning area (Arvada and Ranchester) had minority populations higher than the state average as of 2000 (more recent data are not available). These towns therefore have a relatively high concentration of minority population, as defined in BLM and CEQ guidance, compared to the state.

In terms of low-income populations, in 2007 all three counties had a poverty rate of less than 10%, which is the state level. Therefore, none of the counties has a minority population concentration at the county level. However, several towns had a higher poverty rate than the state in 2000 (the latest year for which town-level data are available): Arvada, Clearmont, Kaycee, Ranchester, and Story, and Sheridan’s poverty rate is the same as the state. Therefore, there are

concentrations of low-income populations in several regions of the planning area, as defined in BLM and CEQ guidance.

4.8.4.2. Impacts Common to All Alternatives

As noted above, demographic conditions in the planning area indicate concentrations of low-income populations in several towns, and concentrations of minority populations in the towns of Arvada and Ranchester. However, there are no direct or indirect effects under the alternatives that would affect these populations in a different way than the general population in the planning area. For example, the lower economic activity associated with Alternative B would cut across all sectors of the economy – from higher-skill managerial jobs to lower-skill service jobs. Therefore, there would be no identifiable environmental justice issues or direct or indirect effects associated with any of the alternatives that are specific to any minority or low-income community or population as defined in EO 12898 or BLM IM 2002-164 (BLM 2002b).

As noted in Chapter 3, the Crow Indian Reservation and the Northern Cheyenne Indian Reservation are just north of the planning area, over the state border in Montana. Populations from both reservations use Sheridan, in particular, as a destination for shopping and services. However, no significant adverse effects were identified that would affect the quality of Sheridan as a destination for these services. Thus, there would be no significant adverse effects on residents of these reservations attributable to the actions in any alternative.

While there are minority and low-income populations in the planning area, no particular BLM actions proposed under any alternative have been identified as causing disproportionate adverse effects on these populations.

Environmental justice principles also require that the BLM provide opportunities for people of all backgrounds to have a meaningful voice in the planning process. The BLM has provided numerous opportunities in a variety of different formats, and has considered all input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.4.3. Conclusion

The alternatives would be identical regarding potential effects on minority and low-income populations. No particular BLM actions proposed under any alternative would cause disproportionate adverse effects on minority or low-income populations. The BLM has considered all input from persons regardless of their race, ethnicity, income status, or other social and economic characteristics.

4.8.5. Tribal Treaty Rights

Effects on tribal treaty rights can include limitations on access to tribal hunting, fishing, or resource collection areas that were reserved by certain treaty. Effects on such resources are usually identified on a project-specific basis in consultation with the appropriate tribes. Any alternative that would affect wildlife, fish, or native plant communities in the planning area has the potential to affect the treaty rights of a tribe.

Some tribes claim they retain treaty rights that the U.S. Government fails to recognize. For example, the Supreme Court determined in United States v. Sioux Nation of Indians that the U.S. Government violated the terms of the Fort Laramie Treaty of 1868 by taking lands that were

entitled to the tribes by the treaty. The Sioux Nation declined to take compensation from the U.S. Government, because they did not want to give up their claim to the land. The entire planning area is within the original boundaries of the Sioux Nation as defined by the treaty.

4.9. Irreversible and Irretrievable Commitment of Resources

Section 102(2)(C) of NEPA and Section 1502.16 of the CEQ regulations for implementing NEPA require that the discussion of environmental consequences include a description of "…any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented." An irreversible commitment of a resource is one that cannot be reversed or cannot be renewed within a reasonable timeframe. Extinction of a species or disturbance to cultural resources would constitute irreversible impacts, as would extraction of sand, gravel, or oil or gas since these minerals resources cannot be renewed in the ground within a reasonable timeframe. An irretrievable commitment of a resource occurs when the resource or its use is lost for a period of time. For example, a decision not to treat juniper encroachment into adjacent sagebrush habitat results in the irretrievable loss of forage production from the grassland community. This action is not irreversible, because a treatment applied to the encroaching juniper could restore the forage production of the sagebrush habitat.

The decision to select one of the four alternatives described in this Draft RMP and EIS does not constitute an irreversible or irretrievable commitment of resources because the decision does not authorize implementation level activities. Instead, decisions made in the selected plan serve to guide future actions and subsequent site-specific decisions. Following the signing of the ROD for the RMP revision, subsequent implementation plans (activity- or project-specific) will be developed and implemented by the BLM. Implementation decisions require appropriate project-specific planning and NEPA analysis, and constitute the BLM's final approval authorizing on-the-ground activities to proceed.

Assuming the BLM selects one of the action alternatives, and that subsequent implementation decisions authorize activity- or project-specific plans, some irreversible and irretrievable commitment of resources would occur. However, the specific nature and extent of the impacts cannot be clearly defined since the location, scale, timing, rate of implementation, and relationship to other actions is currently unknown. Such impacts can be better assessed after site-specific implementation, including implementation of mitigation measures and assessment of the efficacy of the mitigation measures.

Even without the specifics of implementation plans, the likelihood of irreversible and irretrievable effects on some resources can be estimated. Effects from some actions may be both irreversible and irretrievable for some resources. Resources most likely to be affected include minerals and energy development; vegetation including forests, forest products, and noxious weeds; fish and wildlife and their habitat; soils; water; visual resources; wilderness characteristics; and cultural and paleontological resources. The management actions most likely to result in irreversible and/or irretrievable effects include those related to development and surface disturbance such as mineral extraction, energy development, timber harvesting/silvicultural treatments, livestock grazing, and transportation and access.

Additionally, the effects of management actions are interrelated and generally affect multiple resources concurrently. For example, mineral extraction would result in an irreversible and irretrievable loss of those minerals. The effects of extraction on vegetation, associated wildlife habitat, and livestock grazing would be irretrievable and potentially irreversible if reclamation

efforts prove unsuccessful. Irreversible effects on soils and water quality could occur, depending on the implementation of mitigation measures and their efficacy. Visual resources would be irretrievably affected during extraction activities, but the effects would not necessarily be irreversible. If the extraction activities occurred near a WSA or lands with wilderness characteristics, those qualities could be irretrievably lost during extraction and such effects could be irreversible. Any cultural or paleontological resources affected by extraction would be irretrievably and irreversibly lost. However, all of these effects would be localized and have the potential to be minimized through effective mitigation.

4.10. Unavoidable Adverse Impacts

Section 102(C) of NEPA also mandates disclosure of "any adverse environmental effects which cannot be avoided should the proposal be implemented." These are impacts for which there are no mitigation measures or for impacts that remain even after the implementation of mitigation measures. Implementation of the RMP and subsequent activity- or project-specific plan implementation would result in unavoidable adverse impacts to some resources. The impacts resulting from implementation of the RMP are described in detail in Chapter 4, Environmental Consequences, and summarized herein. As discussed under the preceding section on irreversible and irretrievable impacts, the specific nature and extent of the implementation-level impacts cannot be clearly defined due to unknowns regarding site-specific implementation and associated mitigation measures.

In general, development and surface-disturbing activities including those from mineral extraction, energy development, vegetation treatments or timber harvesting, livestock grazing, and transportation and access would result in unavoidable adverse impacts including soil compaction and erosion, loss of vegetative cover, spread of noxious weeds, disturbance to and displacement of wildlife, visual intrusions on the landscape, and potential loss of cultural or paleontological resources. Conversely, proposed restrictions on some activities such as energy development or livestock grazing intended to protect sensitive resources and resource values would have unavoidable adverse impacts on some users, operators, and permittees by limiting their ability to use public lands and potentially increasing their operating costs.