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Forest
Service

Black Hills National Forest
Bearlodge Ranger District

Burner Project

Environmental Assessment

March 2007

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Appendix A. Forest Plan Standards and Guidelines, Regional Watershed Conservation Practices, and Noxious Weed Prevention Practices Applicable to Implementation of the Burner Project

Appendix B. Vegetation Data and Treatment Proposals by Stand

Appendix C. Public Comments on Draft Environmental Assessment

1.0 PURPOSE OF AND NEED FOR ACTION

This chapter addresses six primary topics. First, it introduces the analysis and structure of the document. It then describes the project area and management areas within the project area. It lists the relevant goals and objectives from the 1997 Revised Land and Resource Management Plan (as amended). It describes the process used to involve the public and identifies the issues relevant to the analysis. Finally, it identifies the decisions to be made.

1.1 INTRODUCTION

The Burner project area is located on the Black Hills National Forest north of Sundance, Wyoming. Mountain pine beetles have infested ponderosa pine stands on over 600 acres in the project area in the last five years. The Burner project proposes to modify ponderosa pine stand structure through timber harvest, thinning, fuel reduction, and prescribed burning to address existing infestation, reduce potential for further infestation, reduce risk of large, intense wildfires, and increase vigor of forest stands.

Beetle infestation is a normal part of western pine forests. The mountain pine beetle is native to the Black Hills and was at one time known as the "Black Hills beetle". Many large-scale infestations have been recorded in the Black Hills and Bear Lodge Mountains, occurring on a cyclical basis and often associated with extended droughts such as the one currently affecting northeastern Wyoming and other parts of the northern Great Plains. Beetle infestation is currently widespread across the Black Hills in South Dakota and Wyoming, with major concentrations near Sturgis, Deerfield Lake, and Custer.

Beetles are most likely to attack pine trees at least eight inches in diameter in dense stands. Trees that are under stress due to drought, competition, or other factors are most vulnerable. When beetle populations are high, healthy trees and those in more open stands are also at risk. Mountain pine beetles bore through a tree's sapwood and carry spores of blue-stain fungus, which reduces the tree's sap flow. Trees are killed by the combination of fungus and beetles.

Epidemic populations of mountain pine beetle can kill large areas of pine forest. This can increase habitat for woodpeckers, forage for big game, and aspen and birch forest. At the same time, habitat for species that use dense, live pine forest decreases. Wildfires can burn with increased intensity in areas where beetle-killed trees retain dead needles. Fires that burn after the dead trees have fallen can have severe effects on soils. Scenic value can decrease, especially during the two to three years when red needles remain on trees.

The environmental analysis documented here incorporates by reference the 1997 Revised Land and Resource Management Plan (Forest Plan) for the Black Hills National Forest (USFS 2006a). The analysis is tiered to the Final Environmental Impact Statement (FEIS, USFS 1997) associated with the Forest Plan, and the Environmental Impact Statement (EIS) and Record of Decision for the Phase 2 Amendment to the Forest Plan (USFS 2006b). The Black Hills National Forest is implementing the Forest Plan as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA, P.L. 93-378) and the National Forest Management Act of 1976 (NFMA, P.L. 94-588).

This environmental assessment (EA) also references the Burner Project Area Analysis File. The analysis file documents the interdisciplinary team's evaluation of effects.

This EA documents the site-specific effects of implementing the proposed action and alternatives. The

FEIS, Forest Plan, and Phase 2 Amendment are available for review at the Bearlodge Ranger District Office in Sundance, Wyoming, as well as at the Forest Supervisor's Office in Custer, South Dakota.

1.2 DOCUMENT STRUCTURE

The Forest Service has prepared this EA in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental effects that would be caused by the proposed action and alternatives. This is not a decision document. The Responsible Official will document his or her decision in a separate Decision Notice.

This document is organized into six parts:

Purpose of and Need for Action: This chapter includes information on the history of the proposed project, reasons for the project, how the Forest Service informed the public of the proposal, how the public responded, and the resulting issues that drove development of alternatives to the proposal.

Proposed Action and Alternatives: This chapter provides a description of the agency's proposed action as well as alternative methods for achieving the stated purpose. The chapter closes with a summary table of the environmental consequences associated with each alternative.

Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and alternatives. This analysis is organized by resource area.

Glossary: This section describes and explains terms, abbreviations, and acronyms used throughout the EA.

Agencies and Persons Consulted: This chapter provides lists of preparers and parties consulted during the development of this EA.

Appendices: The appendices provide detailed information that supports the analyses presented in this EA.

Additional documentation, including detailed analyses of project area resources, may be found in the analysis file located at the Bearlodge Ranger District Office in Sundance, Wyoming.

1.3 PROJECT AREA LOCATION

The project area is located in Crook County, Wyoming, in the southern Bear Lodge Mountains (**Figure 1-1**). A legal description of the project area is shown in **Table 1-1.**

The project area encompasses 17,809 acres of National Forest System (NFS) land and 1,322 acres of private land, for a total of 19,131 acres. Landmarks include Warren Peak, Ogden Canyon, Bear Den Canyon, and Sheepnose Mountain. Proposed activities would occur on NFS lands. Log hauling may occur across areas of non-NFS lands on which the Forest Service has acquired right-of-way.

Figure 1-1. Burner Project Area and Management Areas

Table 1-1. Project Area Legal Description

Township	Range	Section(s)
51 North	62 West	6
51 North	63 West	1-5, 9, 11, 12
52 North	62 West	31
52 North	63 West	1, 8-36
53 North	62 West	31, 32
Sixth Principal Meridian		

1.4 MANAGEMENT AREAS

The Forest Plan assigns a management emphasis to each portion of the Forest to meet multiple-use objectives. For each designated management area (MA), Chapter 3 of the Forest Plan includes a description of desired future condition, goals, objectives, standards, and guidelines. The ID team reviewed the management area designations and found them appropriate. NFS land in the Burner project area is allocated to the following management areas (**Figure 1-1**):

3.32 – Backcountry Non-motorized Recreation (4,717 acres). These areas are managed to provide recreation opportunities in a semi-primitive setting.

5.1 – Resource Production Emphasis (4,586 acres). These areas are managed for wood products, water yield, and forage production, while providing other commercial products, visual quality, diversity of wildlife, and a variety of other goods and services. Numerous open roads provide commercial access and roaded recreation opportunities, while closed roads provide non-motorized recreation opportunities.

5.4 – Big Game Winter Range Emphasis (8,504 acres). These areas are managed to provide high-quality winter and transitional habitat for deer and elk, high-quality turkey habitat, habitat for other species, and a variety of multiple uses.

1.5 NEEDS AND OPPORTUNITIES

The actions proposed in the project area are based on objectives found in the Forest Plan and needs derived from a comparison of desired and existing conditions. This section reviews these site-specific comparisons and defines the purpose of and need for action in the project area.

1.5.1 Forest Plan Goals and Objectives

The Forest Plan includes multiple-use goals and objectives for management of the Black Hills National Forest. These goals and objectives are described in Chapter 1 of the Forest Plan. They include protecting basic resources, providing for a variety of life through diverse ecosystems, providing for sustained commodity uses, and providing scenic quality, recreational opportunities, and heritage resource protection. This section compares relevant Forest Plan goals and objectives to the conditions that currently exist in the project area. The comparisons show where needs or opportunities for action exist.

Forest-wide Goals and Objectives

Goal 1. Protect basic soil, air, water, and cave resources.

Objective 103: *Maintain or improve long-term stream health. Achieve and maintain the integrity of aquatic ecosystems to provide stream channel stability and aquatic habitats for water quality in accordance with state standards.*

Objective 104: *Maintain or enhance watershed conditions to foster favorable soil relationships and water quality… Achieve and maintain stable stream beds and banks, diverse riparian vegetation, and effective ground cover that controls runoff and erosion.*

There are approximately 58 miles of streams in the project area, most of which are intermittent or ephemeral. These drainages support beaver ponds, riparian areas, wetlands, and sensitive species. Mountain pine beetle infestation is widespread in the upper reaches of the Ogden Creek, Tent Canyon, and Bear Den Canyon watersheds. Trees killed by beetles provide fuel that can cause wildfires to burn intensely and spread to large areas. Severe fires at the headwaters of these streams would be likely to cause detrimental effects on stream health and watershed conditions. There is an opportunity to reduce the potential for these effects through reduction of beetle infestation and hazardous fuels.

Goal 2. Provide for a variety of life through management of biologically diverse ecosystems.

Objective 201: *Manage for a minimum of 92,000 acres of aspen (double current aspen acres), and 16,000 acres of bur oak (approximately 33 percent increase) in current bur oak during the life of the Plan. The highest priority for hardwood restoration is where conifers (e.g. spruce and pine) have out-competed aspen adjacent to riparian systems that once supported beaver. Increases in bur oak will be focused away from the Bear Lodge Mountains.*

Objective 204: *Conserve and manage birch/hazelnut, lodgepole pine, limber pine, and Douglas-fir.*

The Burner project area has a greater diversity of forest cover types than most other areas of the Black Hills National Forest. National Forest System lands in the project area include 2,926 acres of quaking aspen, 437 acres of bur oak, and 424 acres of mixed paper birch and other hardwoods such as hazel. In total, approximately 22 percent of the project area is forested with hardwoods. These stands are generally not being overgrown by conifers. Aspen and birch are naturally reforesting many of the pine stands where beetles have killed a large percentage of the pine trees. Most of the area burned by the 1936 Sundance Fire (MA 3.32) is forested with aspen. There is no need at this time to take actions to increase hardwood communities in the project area. There is an opportunity to conserve the integrity of existing hardwood stands during implementation of proposed activities.

Objective 205: *Manage for 122,000 acres of prairie grassland and 3,600 acres of meadow during the life of the Plan. Restored acres will not be considered suitable for timber production.*

There are 3,112 acres of grassland and meadow in the project area, or 17 percent of the NFS land. Openings are found on Warren Peak and in several areas burned by wildfires. While burn reforestation is gradually taking place, beetle infestation is creating additional openings. There is no need at this time to restore grasslands.

Objective 211: *Within a management area in conifer-forested portions of the Forest, provide an average of 3 hard snags greater than 9 inches in diameter at breast height (DBH) and 25 feet high per acre, well dispersed across the Forest, 25 percent of which are greater than 14 inches DBH.*

Quantitative data on existing snags are incomplete, but beetle infestation has created numerous snags across the project area in the last five years. Recent wildfires and storms also created snags. Field visits suggest that there are numerous snags of various sizes distributed across the project area. There is a need to provide snags for associated species and ecological processes and an opportunity to do so by leaving sufficient existing snags intact and providing a range of forest structures, and through application of prescribed fire.

Objective 212: *In conifer-forested portions of a planning unit, provide at least once during a rotation (approximately 100 years) an average of 5 to 10 tons per acre of down, dead woody material at least 3 inches in diameter, provided there is no conflict with fire or pest management objectives. In the shelterwood silvicultural system, accomplish this through commercial and precommercial treatments. Provided this tonnage no later than the removal cut (overstory removal) or a combination of removal cut and precommercial thinning of the established stand (thinning to be accomplished within 10 years of the removal cut).*

Most beetle-infested stands far exceed 5 to 10 tons per acre of down woody material. Recent storms have also resulted in down woody material. There is an opportunity to continue to provide sufficient down woody material where this will not conflict with the need to reduce hazardous fuels.

Objective 217: *Maintain habitat for game and fish populations in each planning unit at the state objectives in effect in 1996.*

The project area provides habitat for game species such as deer, elk, and wild turkey. Ogden Creek supports a small population of wild brook trout. Moderate open road density and lack of forage in forested areas currently compromise habitat values in parts of the project area for deer and elk. There is an opportunity to increase habitat values by enhancing distribution and quality of forage.

Objective 218: *Conserve or enhance habitat for resident and migratory non-game wildlife. Increase habitat capability for species when recommended in project-level analysis.*

Objective 219: *Maintain or improve instream fisheries habitat. Cooperate with state agencies in aquatic ecosystem improvements to meet mutually agreed-upon objectives.*

Objective 220: *Conserve or enhance habitat for federally listed threatened, endangered, and proposed species.*

Objective 221: *Conserve or enhance habitat for Region 2 (R2) sensitive species and species of local concern (SOLC). Monitoring will be conducted at a Forest-wide level, not at the project level, and will be done for habitats or populations.*

The bald eagle is the only threatened, endangered, or proposed species known to use the general area. This species has been observed in the project area in winter. No other threatened, endangered, or proposed species or their critical habitats are known to exist in the project area.

Five animal or fish species listed by Region 2 of the Forest Service as sensitive have been documented in the project area. Habitats for other sensitive plant and animal species, species of local concern, and management indicator species exist in the project area. There is a need to conserve or enhance habitats for these species and an opportunity to do so through thinning, fuel reduction, and prescribed fire.

Objective 230: *Eradicate or limit spread (acres) of new introductions of non-native pests (insects, diseases, plants) to minimize ecosystem disruption.*

Objective 231: *Prevent new infestations and manage to reduce established noxious weed infestations. Treat at least 8,000 acres per year during the next ten years to limit noxious weed infestations.*

Ground-disturbing activities associated with the proposed actions may increase the susceptibility of the project area to invasion and spread of noxious weeds. The potential for introduction and spread of noxious weeds could be reduced by application of standard resource protection, mitigation, and monitoring measures designed to prevent, detect, and eliminate noxious weed infestations in the project area.

Objective 238: *The following are objectives for management indicator species (MIS). MIS will be monitored using trends in habitat; however, when available, population trends may be used as a strong indicator of management response. Monitoring will be conducted at a Forest scale and not at the project level. Population monitoring will be discretionary as provided by 36 CFR 219.14(f).*

a. Maintain or enhance habitat for ruffed grouse, beaver, song sparrow, grasshopper sparrow, white-tailed deer and brown creeper, as outlined in specific direction pertaining to aspen, other hardwoods, riparian areas, grasslands, spruce and ponderosa pine (e.g., Objectives 201, 205, 211, 239-LVD, 5.1-204).

b. Maintain habitat opportunities for black-backed woodpeckers across the Forest, as outlined in specific direction pertaining to conifer habitat, snags and recently burned habitat (e.g., Objectives 211, 11-03, 5.1-204, Standard 2301).

c. Maintain habitat for golden-crowned kinglets, as outlined in specific direction pertaining to spruce habitat (e.g., Objective 239-LVD).

d. Maintain or enhance habitat quality and connectivity for mountain suckers, as outlined in specific direction pertaining to aquatic resources (e.g., Objectives 103, 104, 215, Standards 1201, 1203, 1205, Guideline 1115).

Habitat for ruffed grouse, beaver, song sparrow, grasshopper sparrow, white-tailed deer, brown creeper, and black-backed woodpecker exists in the project area. There are opportunities to maintain or enhance habitat for these species as described elsewhere in this section for the objectives listed above. Golden-crowned kinglet is highly associated with spruce, which is not found in the Bear Lodge Mountains. The project area does not provide habitat for mountain sucker.

Goal 3. Provide for sustained commodity uses in an environmentally acceptable manner.

Objective 303: *Offer the following allowable sale quantity (ASQ) of timber on suitable and available timber lands in the next decade…838 million board feet (MMBF) of sawtimber and 21 million cubic feet (MMCF) of roundwood….*

This objective applies to the entire Forest and has not yet been met for the current decade. There is a need to provide sawtimber and roundwood and an opportunity to do so through timber harvest.

Goal 4. Provide for scenic quality, and range of recreational opportunities, and protection of heritage resources in response to the needs of Black Hills National Forest visitors and local communities.

Objective 402: *Provide natural appearing landscapes with diverse scenery and enhance opportunities to enjoy attractive settings. .*

Much of the project area is visible in the background and on the skyline from Interstate 90 and Wyoming State Highway routes 14, 111, 116, and 585. The Warren Peak Highway traverses the project area and is a popular recreational access route in summer and snowmobile trail in winter. Warren Peak provides scenic views of the Bear Lodge Mountains, Black Hills, and adjacent prairie. The Carson Draw and Sundance trail systems are located in the project area. Dead stands and trees with red needles are visible from the highway and trails. There is a need to provide attractive landscapes and an opportunity to do so through control of the beetle infestation and diversification of forest structure.

Goal 10. Establish and maintain a mosaic of vegetative conditions to reduce the occurrences of stand-replacing fire and insect-and-disease events, and to facilitate insect-and-disease management and firefighting capability adjacent to at-risk communities, sensitive resources, and non-Federal land and generally across the Forest.

Objective 10-01: *Manage for 50- to 75-percent moderate-to-low fire hazard in the wildland-urban interface and reduce fire hazard within proximity of structures to current NFPA standards except in Management Area (MA) 1.1 Black Elk Wilderness, MA 2.2 Research Natural Areas, MA 3.1 Botanical Areas, MA 4.2B Peter Norbeck Scenic Byway, and MA 5.4A Peter Norbeck Wildlife Preserve. Manage the remainder of the Forest for 50 percent moderate-to-low except in MA 1.1 Black Elk Wilderness, MA 2.2 Research Natural Areas, MA 3.1 Botanical Areas, MA 3.7 Late-Successional Forest Landscapes, MA 4.2 Peter Norbeck Scenic Byway, and MA 5.4A Norbeck Wildlife Preserve.*

Approximately 180 acres (one percent of the project area) are technically within a wildland-urban interface area. Fifty-seven percent of this area has low to moderate fire hazard. Approximately 57 percent of the acres in the remainder of the project area are currently at low to moderate fire hazard. Most of the high to very high hazard stands are in the north-central through south-central parts of the project area, where beetle infestation is highest. There is an opportunity to decrease fire hazard, a need to reduce fuel accumulation, and an opportunity to do so using prescribed fire and mechanical treatments. Beetle infestation combined with years of fire suppression could increase wildfire spread and intensity. There is a need to reduce this potential in order to protect sensitive species habitat, timber values, private land, and visual quality.

Objective 10-04: *Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forest-wide Guideline 4110.*

The western section of the project area has high risk and hazard while the eastern half has low risk and hazard. Value is rated moderate across the project area. Guideline 4110 lists treatment options for areas identified as having moderate ratings for risk, hazard, or value: (1) reduce or otherwise treat all fuels (activity fuels within three years of cutting) so the potential fire line intensity does not exceed 300 BTUs/second/foot on 90 percent of the days when fires occur, or break up continuous fuel concentrations exceeding the above intensity into units 40 to 50 acres maximum size, surrounded by fuel breaks; and (2) interim activity fuel treatment will be accomplished by requiring all slash to be

lopped to 18 inches or less at the time of cutting.

Objective 10-07: *Where outbreaks of mountain pine beetle could present risks to management objectives for ponderosa pine, reduce acreage of ponderosa-pine stands that are in medium or high risk for infestation.*

Objective 10-08: *Using analyses of insect and disease occurrences, prioritize suppression strategies to meet management objectives and minimize value loss of tree vegetation affected by outbreaks of insect and disease pests.*

In the last five years, mountain pine beetles have infested ponderosa pine trees on over 600 acres in the project area. The heaviest infestations are around Warren Peak in the upper reaches of the Ogden, Tent, and Bear Den watersheds. The infestation has killed large patches of trees and is likely to continue to spread to additional pine stands. There is a need to reduce the potential for spread to other NFS, state, and private lands and an opportunity to do so by removing infested trees and thinning uninfested stands.

Management Area Goals and Objectives

The following goals and objectives apply only to the relevant Management Area.

Objective 3.32-401 (MA 3.32 only): *Emphasize visually appealing landscapes such as vista openings, rock outcroppings, and diversity of vegetation.*

Due to the 1936 Sundance Fire, MA 3.32 in the project area has vista openings, diverse vegetation, and other scenic attributes. Off-site pine stock planted after the fire in a few locations has stagnated and is not consistent with the surrounding landscape. There is an opportunity to improve scenic quality by non-commercially cutting or burning these plantations.

Goal 5.1-202 (MA 5.1 only): While meeting other objectives for this management area, provide variety in stand sizes, shape, crown closure, age structure, and interspersion.
Goal 5.4-201 (MA 5.4 only): Manage tree stands for wildlife habitat and vegetative diversity.

Objectives 5.1-204, and 5.4-206: *Manage for the following percentages of structural stages in ponderosa pine across the management area in a variety of sizes and shapes.*

SS1	*5%*	*SS4A*	*25%**
SS2	*5%*	*SS4B*	*25%**
SS3A	*10%*	*SS4C*	*5%**
SS3B	*15%*	*5*	*5%***
SS3C	*5%*		

**10% of the structural stage 4 ponderosa pine acreage in the management area will have an average tree size of "very large". Seek opportunities to increase understory shrubs in open-canopy structural stages.*
***Active management is allowed, and may be necessary, to provide desired late-successional characteristics.*

These objectives apply to MAs 5.1 and 5.4 across the Forest. There is an opportunity in the Burner project area to contribute towards meeting these objectives on a Forest-wide basis.

Objective 5.4-207 (MA 5.4 only): *Manage for an open-road density of 1 mile of road per square mile or less for general public travel from December 15 through May 15.*

Almost all roads in MA 5.4 in the project area are closed to wheeled vehicles in winter due to snow cover on public access roads. Some are used as part of a snowmobile trail system. Others at low elevation are accessible from outside the National Forest boundary, though use of these roads by wheeled vehicles in winter appears to be incidental.

1.5.2 Purpose of and Need for Action

The purpose of and need for action in the Burner project area is to address existing mountain pine beetle infestation and reduce the potential for further infestation and increased intensity and spread of wildfires while conserving habitat for a variety of plant and animal species and providing recreational opportunities. In MA 5.1, the purpose of the proposed action includes production of a sustainable supply of wood products. In MA 5.4, the purpose of the proposed action includes maintaining or enhancing big game winter range conditions and, where consistent with winter range values, providing wood products.

1.6 ISSUES

This section describes the public involvement process for the Burner project and lists the significant issues as determined by the project ID team.

1.6.1 Public Involvement

Public involvement in this project began in January 2005 when the Burner project was listed in the Black Hills National Forest's Quarterly Schedule of Proposed Actions. Public scoping was conducted in October 2005. Chapter 6 of this document contains a list of individuals and organizations contacted during scoping.

1.6.2 Identification of Significant Issues

The ID team identified issues relating to the proposed action based on input from Forest Service resource specialists, other agencies, organizations, landowners, and members of the public. The Forest Service separated the issues into two groups: significant (as directed by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and 1501.7)) and non-significant issues. The CEQ regulations for implementing NEPA require this delineation in Sec. 1501.7: "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review…" Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) not related to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. A list of non-significant issues and the reasons they were categorized as non-significant may be found in the project record.

The Forest Service identified four significant issues during scoping. These issues and the indicators used in this document to assess the project's response include:

1. Mountain Pine Beetle Infestation

- Mountain pine beetle infestation is causing loss of timber value and has potential to spread to other ownerships but also provides benefits for some species. Beetle infestation is creating hazardous fuels that could increase fire intensity and rate of spread.

  Indicators: Beetle infestation risk level in pine stands (p. 3-10); fire hazard (p. 3-93); effects on habitat for species associated with beetle infestation (p. 3-28).

2. Big Game Winter Range

- Big game winter range in the project area could be improved by creation of additional forage. Increased vehicle access could have negative effects on winter range.

  Indicators: Change in extent of foraging areas and quality of forage (pp. 3-45, 3-57); change in vehicle access to winter range (p. 3-90).

3. Diversity of Vegetation Species and Structure

- Greater diversity of age classes and forest cover type could increase resistance to widespread mountain pine beetle infestation and contribute to a long-term supply of timber.

  Indicators: Structural stage and cover type distributions (p. 3-11).

4. Recreation and Scenery

- There are a number of non-motorized and snowmobile trails in the project area and scenic views from Warren Peak. Both insect infestation and management actions can affect visual quality.

  Indicators: Effects in areas of high scenic quality (p. 3-99).

1.7 DECISIONS TO BE MADE

This EA does not document a decision. The purpose of this EA is to disclose the effects and consequences of the proposed action and alternatives. The District Ranger will decide on a course of action based on consideration of this analysis. Decisions to be made for this project are:

- Whether resource management activities such as thinning, sanitation, fuel reduction, prescribed fire, and associated actions should be implemented in the project area at this time.

- If these actions should occur, where in the project area they should take place, and what design criteria and mitigation measures should apply.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action, the no action alternative, two action alternatives, and several alternatives not considered in detail. Mitigation measures, design criteria, and monitoring common to all action alternatives are also described. This chapter also compares the alternatives in terms of their environmental effects and their achievement of Forest Plan goals and objectives.

2.1 ALTERNATIVE DEVELOPMENT PROCESS

The project planning team developed the proposed action to address needs and take advantage of opportunities identified through comparison of existing conditions and Forest Plan direction (see Section 1.5). The proposed action would take an "adaptive management" approach to addressing the ongoing mountain pine beetle infestation. Adaptive management allows flexibility in response to changing conditions. A beetle infestation can change stand conditions between the time when actions are first proposed and when they actually take place on the ground. In the Burner project, adaptive management would be applied to allow managers to take the appropriate action in infested stands, even if stand conditions have changed since the project was originally proposed. The proposed adaptive management is described further under Alternative 1 in the next section.

Alternatives to the proposed action were developed in response to concerns and ideas raised during public scoping. The alternatives include treatments that focus on treatments adjacent to other ownerships, timber production, and non-commercial treatments. In MA 5.1, Alternative 2 would emphasize silviculture for timber production, reduction of mountain pine beetle infestation risk, and value recovery. In MA 5.4, Alternative 2 would focus on improving big game winter range. Alternative 3 was not analyzed in detail and is discussed on page 2-28. Alternative 4 would emphasize reduction of mountain pine beetle infestation risk in MA 5.1 using non-commercial methods where possible, and includes fuel treatments adjacent to other ownerships.

2.2 DESCRIPTION OF THE ALTERNATIVES

This section describes the alternatives analyzed in detail. **Table 2-1** summarizes and compares the activities proposed under each alternative. Treatments are described in detail on the following pages.

Table 2-1. Summary of Proposed Actions by Alternative

Action	Alternative 0 (No Action)	Alternative 1	Alternative 2	Alternative 4
Vegetation Management (acres)				
Adaptive management treatments (see p. 2-4)	0	3,271	0	0
Adaptive management treatments followed by prescribed burning	0	938	0	0
Commercial and non-commercial thin/sanitation	0	0	0	1,723
Commercial thin/sanitation/salvage	0	0	1,732	0
Diameter-limit thin followed by prescribed burning	0	0	504	0
Non-commercial thin followed by prescribed burning	0	596	1,706	0
Prescribed burning	0	676	0	0
Sanitation	0	0	224	212
Sanitation/salvage/fuel treatment	0	0	464	0
Shelterwood seedcut	0	0	323	0
Uneven-age thin	0	0	357	0
Wildland-urban interface thin	0	0	0	1,487
Total mechanical treatment	0	4,805	5,310	3,422
Total prescribed burning	0	2,210	2,210	0
Transportation System/Travel Management (miles)				
Road construction	0.0	0.8	0.5	0.0
Road reconstruction – National Forest System roads	0.0	7.1	4.3	2.7
Road reconstruction – Unclassified roads (“construction”, convert to NFS road)	0.0	4.5	4.4	2.5
Pre-use maintenance	0.0	32.4	26.9	28.0
Use as is	0.0	16.9	16.5	16.1
Decommissioning – Unclassified roads	0.0	25.8	25.8	28.6

2.2.1 Alternative 0

This section describes Alternative 0 (no action), including the focus of the alternative and how it addresses the relevant issues.

Focus of Alternative 0

The Forest Service Handbook (FSH) requires that the Forest Service study a no action alternative in detail and use it as a baseline against which the effects of the action alternatives can be measured. Under this alternative, none of the specific management activities proposed in this document would occur. Ongoing activities such as recreation, fire suppression, and road maintenance would continue. Management activities analyzed under other environmental documents would continue to occur.

This alternative does not address objectives or needs related to beetle infestation or fuels.

How Alternative 0 Addresses Significant Issues

This section describes how Alternative 0 addresses each of the significant issues, as described in Chapter 1.

Mountain Pine Beetle Infestation

Under Alternative 0, the mountain pine beetle infestation would be likely to continue to spread and kill additional trees. This would result in further buildup of hazardous fuels and loss of timber value but would also create habitat for species associated with natural disturbances.

Big Game Winter Range

Most of the current beetle infestation is not in big game winter range. Alternative 0 would allow beetle infestation to continue to create some additional patches of forage, but lack of fire may allow forage quality and quantity to decrease.

Diversity of Vegetation Species and Structure

Pine stands unaffected by beetle infestation would continue to move towards older age classes and more dense structure. Forest regeneration occurring after additional infestation or widespread fire could result in large areas of pine of the same age, potentially leading again to heightened risk of widespread infestation in the future and causing uneven availability of timber. Aspen and birch forest would continue to expand where heavy infestation has cleared pine on north aspects.

Recreation and Scenery

Effects of beetle infestation, including red-needled and fallen trees, would continue to be visible from Warren Peak, main roads, and trails. If a severe fire occurred in the infested area, effects could be visible from the surrounding area for many years. All areas currently open to motorized travel would remain open.

2.2.2 Alternative 1

This section describes Alternative 1 (proposed action), including the focus of the alternative, a detailed description of the proposed treatments, and how it addresses the relevant issues.

Focus of Alternative 1 – Adaptive Management

The course of a mountain pine beetle infestation cannot be predicted with any degree of certainty. Weather, population dynamics, and other factors determine the infestation's exact progress. This lack of predictability poses a challenge when planning forest management projects to address beetle infestations. Conditions on the ground may change substantially between the time when a project is proposed and the time it actually takes place. Silvicultural treatments proposed when stands have low levels of beetle infestation may no longer be appropriate if the stand becomes heavily infested. To address this problem, Alternative 1 proposes use of adaptive management.

Adaptive management as proposed under Alternative 1 would allow flexibility in response to the continuing infestation. As applied here, adaptive management would allow forest managers to choose among several treatment options at the time treatments are applied on the ground. These treatment options would be applied only in specified areas. The specified areas are shown in Figure 2-1 and include 4,209 acres.

Adaptive management as applied here differs from adaptive management used for long-term, ongoing activities such as livestock grazing. In such cases, adaptive management is designed to modify the ongoing activities as necessary to achieve desired conditions. Close monitoring of resource conditions is necessary to determine when and how to modify the ongoing activities. Conversely, the Burner project proposes to take actions once, within a specified period of time. Alternative 1 would allow flexibility only in determining the needed treatment at the time the activities take place on the ground. It would not allow more than one treatment entry per stand. If additional infestation takes place following the completion of proposed activities, additional analysis and public involvement would be necessary prior to treatment.

Criteria used to select stands where these actions may take place vary by Management Area and are described below. Figure 2-1 displays the selected stands.

Criteria for Stand Selection

In **Management Area 5.1** (forest products emphasis), pine stands that are infested or are at moderate or high risk of beetle infestation were selected for adaptive treatment. Pine stands at low risk of infestation were selected for sanitation (cutting of green infested trees) or salvage (cutting of dead trees) as necessary. Mixed aspen and pine stands were selected for sanitation of infested pine as necessary. Road construction would occur. Road reconstruction and maintenance would be required. Stands meeting these selection criteria total 1,435 acres.

In **Management Area 5.4** (big game winter range emphasis), pine stands that are infested or are at moderate or high risk of beetle infestation and are accessible from existing roads were selected for treatment. No new road construction would take place. Road reconstruction and maintenance would occur as necessary. Stands meeting these selection criteria total 2,774 acres.

In **Management Area 3.32** (back-country non-motorized recreation emphasis), much of the pine planted after the 1936 Sundance Fire is infected with western gall rust. These areas would be non-commercially thinned and burned as necessary to eliminate gall rust and stagnated plantation stock. This treatment would take place on 612 acres.

Analysis Assumptions

Actual treatment levels under Alternative 1 would vary depending on infestation status. Analysis of effects required certain assumptions about minimum and maximum treatment levels. The analysis team assumed that under conditions of minimum infestation, adaptive treatments would consist of commercial thinning on 3,500 acres with little to no infestation, and salvage or fuel treatments on 709 acres with moderate to heavy infestation. Under conditions of maximum infestation, the team assumed that commercial thinning would take place on only 2,209 acres with little to no infestation, while sanitation, salvage, or fuel treatments would occur on 2,000 acres of moderate to heavy infestation. The analysis assumes that where commercial timber harvest takes place in stands with moderate to heavy infestation, 50 percent of the timber would be unmerchantable due to deterioration, 25 percent would be left standing, and 25 percent would be removed.

Adaptive Management Actions

The Forest Service would apply treatment to the selected stands based on the level of infestation at the time actions are implemented on the ground. Treatment could range from thinning live trees to chipping slash and brush using heavy equipment. Treatments are designed to reduce the risk of beetle infestation (preventive actions), slow the spread of existing infestation (suppression actions), or address fuel buildup (abatement actions). As described above, this alternative proposes only one entry, and treatment of any additional infestation following completion of proposed activities would require additional analysis. Proposed actions and circumstances under which they would be applied are described below.

Preventive Actions

Commercial thinning: This is a preventive treatment designed to increase stand vigor and reduce susceptibility to beetle infestation. Stand density would be reduced by approximately 25 to 65 percent (to no more than 60 square feet of basal area per acre) generally through removal of smaller trees. Thinning would be applied in stands with low levels of infestation. Thinning may occur anywhere within the 4,209 acres proposed for adaptive management actions. Given existing beetle-caused mortality in these stands, thinning is likely to occur on a maximum of approximately 3,500 acres. This figure may decrease as the infestation spreads and suppression or abatement actions are required.

Suppression Actions

Sanitation: During the period of time after mountain pine beetles infest a tree but before the new generation of beetles disperses, the tree shows signs of infestation such as pitch tubes but retains green needles. Removing the trees during this time, before beetle dispersal, is termed sanitation harvest and prevents the new generation of beetles from infesting more trees. Sanitation harvest would be applied along with commercial thinning where there are light to moderate levels of infestation. Where infestation levels are higher, sanitation would be applied with salvage (see below). Sanitation may take place anywhere within the 4,209 acres proposed for adaptive management, but is likely to be applied only in limited areas (scattered trees and pockets of five to ten trees) due to the limited period of time when this treatment is effective.

Salvage: Salvage would occur as necessary in MA 5.1. Dead trees with remaining commercial value would be cut. This treatment may take place anywhere within the 1,435 acres in MA 5.1 proposed for adaptive management, and also on 1,991 acres in Sundance Timber Sale units as necessary (**Figure 3-1**). Actual acreage of salvage is expected to be limited due to the rapid deterioration typical of beetle-killed ponderosa pine.

Sanitation at high-value sites: Infested trees would be removed as necessary in and adjacent to Reuter and Sundance Trails campgrounds to ensure safety and reduce risk of substantial change in campground appearance. Potentially affected area includes about 25 acres.

Abatement Actions

Mechanical fuel reduction: Where access is available and prescribed fire is not applied, heavy equipment would chip, crush, or otherwise reduce volume or continuity of fuels. This treatment would take place on a maximum of about 2,000 acres.

Jackpot burn: Concentrations of fuels would be burned in winter, using snow cover for control. This treatment may take place anywhere within the 3,271 acres proposed for adaptive management without prescribed broadcast burning.

Understory broadcast burn: Fuels would be burned across blocks of tens to hundreds of acres. Low- to moderate-intensity fire would be applied in thinned stands and open-canopy untreated stands to reduce surface and ladder fuels and improve browse in winter range. Fire control lines would be constructed if necessary, but existing roads would be used as fire lines when possible. Understory burns would take place on a maximum of 938 acres in specified areas.

In several areas, large patches of trees killed by beetles no longer have commercial value but still pose a fire hazard. Most of these areas are inaccessible for mechanical treatment. To address this hazard in a controlled situation rather than during a wildfire, broadcast burning would be applied. Pockets of high-intensity fire are likely. Burns would be buffered from perennial and intermittent streams. This treatment would take place where risk of fire spread to non-NFS lands, uninfested stands, and sensitive watersheds is low. This area is estimated to include about 500 of the 938 prescribed burn acres, located in the vicinity of upper Ogden and Tent Canyons.

Firewood cutting: Beetle-infested trees would be available to the public for use as firewood in designated areas along the Warren Peak Highway and open sections of National Forest system roads such as 839.1 and 899.1. Snags over 20 inches in diameter and those with cavities would not be available for cutting.

Fuelbreak maintenance: Brush and snow-damaged trees would be cleaned up in an existing 16-acre fuelbreak along the Warren Peak Highway.

Non-adaptive Actions

Understory broadcast burn: Fuels would be burned across blocks of tens to hundreds of acres. Low- to moderate-intensity fire would be applied in open-canopy untreated stands to reduce surface and ladder fuels and improve browse in winter range. Fire control lines would be constructed if necessary, but existing roads would be used as fire lines when possible. Understory burns will take place on about 676 acres.

Non-commercial thin and burn: In Management Area 3.32 (back-country non-motorized recreation emphasis), much of the pine planted after the 1936 Sundance Fire is infected with western gall rust. These areas would be non-commercially thinned and burned as necessary to eliminate gall rust and stagnated plantation stock. This treatment would take place on 612 acres.

Firewood cutting: Beetle-infested trees would be available to the public for use as firewood in designated areas along the Warren Peak Highway and open sections of National Forest System roads such as 839.1 and 899.1. Snags over 20 inches in diameter and those with cavities would not be available for cutting. Designated cutting areas would not exceed 15 acres.

Fuelbreak maintenance: Brush and snow-damaged trees would be removed in an existing 16-acre fuelbreak along the Warren Peak Highway.

Connected Actions

The following activities would take place to facilitate the proposed actions described above.

Transportation System and Travel Management

Construction of approximately 0.8 miles of new road would be necessary to carry out proposed vegetation management. These roads would extend existing roads on flat to gently sloping ridgetops to allow treatment on the adjacent slopes. These new roads would be stored (closed with barriers) after the project is complete. Also included as new road construction (as defined by 36 CFR §212.1) is conversion of 4.5 miles of non-National Forest System (unclassified) roads to National Forest System roads. These roads are likely to be needed for management on a recurring basis. Work needed to bring these roads up to standard would vary but would be less than that needed for construction of a completely new road.

Reconstruction of 7.1 miles of existing National Forest System roads would take place. This work would include actions such as improving drainage structures and applying gravel to a native-surface road.

Pre-use maintenance would take place on 32.4 miles of roads needing minor improvements or repair. Examples of pre-use maintenance include blading to remove ruts or addition of gravel in wet spots.

Decommissioning of non-NFS roads (unclassified roads on NFS lands) would take place as funding and opportunity allow. Decommissioning would consist of permanently closing the road through various means but may not include removal of any existing road template. This applies to the approximately 26 miles of non-NFS roads not proposed for addition to the official road system.

Area closure. Amended Forest Plan standard 5.4-9101 prohibits off-road motorized travel in MA 5.4 between December 15 and May 15. Standard 5.4-9103 restricts over-snow motorized travel to designated routes and areas. Alternative 1 would implement a closure of MA 5.4 in the project area to off-road motorized travel between December 15 and May 15 and restrict snowmobiles to designated trails. For consistency with the adjacent Dean project, the northeast corner of MA 5.4 would be closed to off-road motorized vehicle use year round (Figure 2-2).

Timber Stand Improvement

Weed and release (post-sale cutting of cull trees) would take place following most commercial harvest treatments.

Treatment of Activity Fuels

Fuels resulting from management actions are termed activity fuels. Many of the mechanical treatments described above would result in piles of tops at log landings. These would be burned after curing for a year or two, and the resulting disturbed area would be seeded and treated for noxious weed infestation if necessary. Piles may also be chipped and removed from the area.

Conventional harvest systems can result in tops and branches spread across a site rather than concentrated at a log landing. Where resulting fuel loading would exceed Forest Plan direction, fuels would be crushed, burned, or otherwise reduced. Whole-tree yarding systems would be used where possible to prevent accumulation of fuels.

Prescribed Fire Control Line Rehabilitation

Lines constructed for control of prescribed fires would be rehabilitated to prevent erosion and weed infestation. Methods may include construction of water bars, replacement of sod and brush, and seeding.

Treatment Timing

The National Forest Management Act generally prohibits the harvest of stands before they reach their maximum growth rate (16 U.S.C. 1604(m)). Exceptions in this law allow the harvest of individual trees, or even parts or whole stands of trees, before this time to thin and improve timber stands and salvage damaged stands of trees (16 U.S.C. 1604(m1)). Further exceptions are allowed in order to achieve multiple-use objectives other than timber harvest (16 U.S.C. 1604(m2)).

Alternatives 1, 2, and 4 would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in 16 U.S.C. 1604(m2), and include the following: thinning, sanitation, salvage, firewood cutting, fuelbreak maintenance, and fuel treatments. These treatments are proposed to meet the Forest Plan multiple-use objectives stated in Chapter 1.

Figure 2-1. Proposed Activities, Alternative 1

Figure 2-2. Travel Management Proposals

Design Criteria and Mitigation

Forest Plan standards and guidelines, Regional Watershed Conservation Practices (WCPs, Forest Service Handbook 2509.25), and other management requirements apply to these activities. Standard direction is listed in Appendix A and repeated here only if clarification is required. Other design criteria and mitigation applicable to activities proposed under Alternative 1 include the following.

Applies To:	Measure
All Activities	**Brush Disposal:** • Disposal of slash piles created through timber harvest or fuel treatments would be funded appropriately. Rehabilitation of pile sites would include site preparation and seeding to return the sites to productivity and control the spread of noxious weeds.
	Heritage Resources: • Known heritage sites would be protected (sites 48CK1480 and 48CK1660). No activities would take place within 30 meters (100 feet) of these sites. Heritage sites would be avoided during all proposed activities. • If previously unknown heritage resources are discovered during project activities, project staff would stop ground-disturbing actions within 50 meters of the site and notify the district archeologist before activities are resumed. • Leaders of project activities described in this EA would review heritage maps and implement mitigation measures for sites listed in the heritage resources file.
	Improvements: • All Forest Service-authorized improvements, such as fences, property corners, and water developments, would be shown as protected improvements on timber sale area maps and protected during management activities. Items requiring special attention include the following: • The Natural Resources Conservation Service (NRCS) Cole Canyon snow monitoring site in T52N R63W section 22. Any activities proposed within 400 feet of the site would be coordinated with the NRCS. • Vista West wells and water system in T51N R63W sections 4 and 9 and T52N R63W section 33. • Above-ground electrical junction boxes in Ogden and Reuter Canyons. Any activities proposed near these sites would be coordinated with Power River Electric Corporation.
	Noxious Weeds: • Contracts and permits issued as part of this project would include measures to limit spread of noxious weeds. Heavy equipment used for timber harvest would be washed before entering the timber sale area if the area it previously operated in is unknown or documented to be infested with noxious weeds. Where data are available, noxious weed infestations would be identified by District staff and designated on sale area maps for any timber sales associated with this project. • Where ground-disturbing activities would occur in areas infested with weeds and funding is available, weeds would be treated before project implementation to reduce future spread and establishment of noxious weeds. • Review of the area for noxious weed infestations would continue during the

Applies To:	Measure
All Activities	timber sale. If new noxious weed infestations that could be spread by timber sale activities are found during implementation, actions to minimize spread would be taken. • Infestations of tansy and yellow toadflax are present along many roads in the project area. Project managers would coordinate activities with district weed managers to avoid these infestations or minimize the potential for spread. • Weeds would be treated following project implementation as necessary.
	Public Safety: • Appropriate signing or other cautionary measures would be implemented in conjunction with all management activities for public safety. Implementation of these measures would be the responsibility of the person initiating the action (e.g., logging contractor, prescribed fire manager).
	Range: • Managers of vegetation treatment projects would consult with District range managers to ensure alteration of natural barriers does not allow livestock to circumvent fences.
	Rare Species: • All documented land snail colony locations would be protected with a buffer of no disturbance adequate to protect the colony and the microclimate of the area. Buffer size would be determined on a case-by-case basis depending on the size of the colony, the potential for adjacent areas to provide snail habitat, and the potential for negative effects to that specific colony. Colony locations are listed in the analysis file. • Disturbance of any newly discovered colonies of land snails would be avoided. The district wildlife biologist would determine a buffer area around newly discovered colonies based on site-specific conditions. • Any new goshawk nests found during project implementation would be protected in accordance with Forest Plan direction. • Any raptor nests found during project layout or implementation would be evaluated by a qualified biologist on a site-specific basis to determine if special requirements are warranted to protect site integrity. • Ground-disturbing activities, including construction of landings, skid trails, and firelines, would not take place in the montane grassland area on Warren Peak, shown on Map 1 attached to the botany biological evaluation contained in the analysis file. • Non-commercial thinning and burning are proposed adjacent to an occurrence of *Botrychium campestre*. No ground disturbing activities would take place in the area of the occurrence as shown on Map 2 attached to the botany biological evaluation contained in the analysis file. • Activities overlapping areas of suitable sensitive plant habitat would be designated on the ground in conjunction with a qualified botanist to ensure that habitat is protected from unacceptable levels of ground disturbance. Any removal of pine from birch-dominated communities would take place only if it can be accomplished without damaging the birch community. Affected areas are mapped in the analysis file and include parts of sites 010803-124; 010806-5, 37, 38, 39, and 64; 010903-14; and 010904-13 and 59.
	Recreation: • Reuter and Sundance campgrounds would be protected during proposed

Applies To:	Measure
	activities. Only sanitation and hazard-tree cutting would take place in Reuter campground and would occur only between Labor Day and Memorial Day. • Non-motorized trails would be shown as protected improvements on timber sale maps. Project administrators would ensure protection of trails during project implementation. • Snowmobile trails would be shown as improvements on timber sale area maps and protected during harvest operations. An evaluation of the potential for conflicts between logging and trail use would take place at the time of timber sale appraisal and contract preparation. If conflicts appear likely between use of the snowmobile trails and specific logging units or haul routes, logging would be restricted between December 15 and March 31 unless a logical and desirable alternative snowmobile route is identified. Only those units and/or roads in conflict would be restricted so that logging operations could proceed in the remainder of the sale area. • Winter operations of timber sale units that necessitate skidding across a snowmobile trail but do not otherwise affect the trail may be allowed. Determination would be made on a case-by-case basis, with crossings permitted only at locations approved by the sale administrator and with proper cautionary signing installed by the timber contractor.
All Activities	**Revegetation:** • Native vegetation would be retained to the maximum extent possible during proposed activities. • Disturbed soil would be revegetated in a manner that optimizes plant establishment for that specific site. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and placement of weed-free mulch as necessary. Revegetation would be initiated as soon as possible, generally not to exceed 6 months, after termination of ground-disturbing activities. All disturbed soils would be revegetated with native species when available using seed mixtures that are free of noxious weeds. On areas needing the immediate establishment of vegetation, non-native, non-aggressive annuals, non-aggressive perennials, or sterile perennials may be used until native perennials become established. These species can be used to prevent the spread of noxious weeds and prevent erosion. Only weed-free mulch would be used.
	Scenery: • Activity slash would be reduced to natural levels within 300 feet of the Warren Peak Highway or where visible from this road, whichever is less.
	Snags: • Except in salvage units, snags would be cut only for safety reasons and when necessary for construction of roads, skid trails, firelines, and log landings. Snags over 20 inches DBH and those with cavities would be cut only for safety reasons.
	Soil and Water: • Heavy equipment would not enter the water influence zone along perennial or intermittent streams (100 feet on either side of the stream) (standard 1301 and WCP management measure 3) except to conduct road work at designated locations. Timber harvest is proposed within 100 feet of Richardson Creek and the unnamed channel south of Richardson Draw (T52N, R63W, sec. 28). In these locations, logs would be removed using the method that results in the

Applies To:	Measure
	least ground disturbance, depending on site-specific conditions at the time of harvest. The analysis file contains maps of these locations. • Heavy equipment would not enter the meadows along Whitelaw and Whitetail Creeks adjacent to stand 0108030109 to prevent further rutting. • Adaptive management treatment in stands 0106050015, 0106050016, 0106090004, 0106090008, 0106090009 and 0109040043 would retain at least a third of the existing crown cover to minimize the potential for mass movement of soils.
	Wildlife: • While any projects resulting from this analysis are taking place, all gates that would normally be closed during big game firearm hunting seasons would be kept closed during these seasons and one week before the seasons except to allow administrative traffic to pass. Gates would be closed again immediately after traffic passes.
Timber Harvest	**Range:** • All pasture gates would be identified on timber sale area maps and kept closed during the grazing season (June through October). Maintained fences would be protected during logging operations. • If log hauling or movement of heavy equipment related to the proposed timber harvest causes damage to cattleguards, the timber purchaser would be responsible for repair.
	Rare Species: • To protect rare plants, logs would not be skidded through hardwood communities unless the hardwood stand is being treated. • Any skid trails, temporary roads, and landings in high-potential sensitive plant habitat would be designated in consultation with a qualified botanist. Any moist forest or riparian meadow communities outside of treatment units would be avoided unless approved by a qualified botanist for entry. Maps of these areas are in the analysis file.
	Recreation: • Treatments in stands 0108060017 and 0108060067 would be laid out to retain trees along the Carson Draw trail that discourage users from cutting across switchbacks. Sale layout personnel will coordinate unit design with North Zone engineering trails personnel.
	Road Restrictions: • Timber sale units would be laid out to facilitate existing road restrictions (for example, trees around gates and other barriers would be left uncut to maintain obstructions and discourage driving around the gate or barrier).
	Scenery: • Layout and marking of timber sale units would comply with forest-wide marking guides in effect at the time of implementation. • Where treatments would be visible from Interstate 90, edges of treatment units would be feathered into untreated stands to mimic natural forest/opening edge typically found in this landscape. Affected areas are mapped in the project file. • Where possible, treatments would be designed to reduce the chance of wind damage to residual trees. This may include retaining higher density of mature trees on exposed ridges, lee slopes, and other areas prone to high winds and

Applies To:	Measure
	heavy snow accumulation.
	Snags and Down Logs: • Where possible, any snags cut as safety hazards would be left on site rather than salvaged or skidded to landings. Timber sale contract provisions would be used to protect snags. • To ensure provision of down woody material, existing down material and cull logs would remain on-site following all commercial treatments.
Prescribed Fire	**Burn Plan:** • Prescribed burning would be implemented only under conditions defined in a prescribed burn plan.
	Heritage Resources: • Heritage resource inventory would be completed in proposed burn units prior to implementation per FS Agreement No. 01-MU-11020000-015 (Programmatic Agreement Among the Advisory Council on Historic Preservation, the Colorado, Wyoming, South Dakota, Nebraska, and Kansas SHPOs, and the USDA Forest Service Rocky Mountain Region Regarding Implementation of the Prescribed Fire Program).
	Improvements: • Utility lines would be protected during prescribed burns.
	Rare Species: • Fire control lines would not be located in high-potential sensitive plant habitat.
	Soil and Water: • See Appendix A.
Transportation System	**Dust Control:** • Dust control, if necessary, may be done with water, magnesium chloride, calcium chloride, or equivalent.
	Noxious Weeds: • District staff responsible for the noxious weed program would, in coordination with the project engineer, inspect gravel pits for noxious weed infestation before transport and use of gravel and other material. Infestations would be treated to prevent spread. • District staff responsible for the noxious weed program would inspect stockpiled gravel annually for weed infestation in coordination with the project engineer.
	Revegetation: • Timber sale roads would be seeded after construction but before timber harvest if any part of the gap between construction and harvest would occur between April and October. This may be accomplished under the road contract. If necessary, seeding would again occur after use of the road is complete. Seeding may be delayed until after completion of harvest if the gap between construction and harvest would be of short duration and hydrology, soils, engineering, and noxious weed specialists determine after field review that a delay would be acceptable.
	Soil and Water: • See Appendix A. • Reconstruction of NFSR 830.1B, NFSR 838.1E, NFSR 899.2, and U610112 may take place within water influence zones. A qualified hydrologist would

Applies To:	Measure
	be consulted during design and implementation of the reconstruction to ensure the integrity of the water influence zone is maintained.
	Travel Management: • All newly constructed roads and skid trails would be closed following construction until needed for timber sale or related activities and closed again after use. Roads needed for timber sale or related activities but normally closed to motorized vehicles would also be closed when not in use.

Monitoring

The Forest Service will monitor implementation of the selected alternative. The timber sale administrator or other contract administrators would complete some of the project implementation monitoring as part of standard sale administration duties. Other resource specialists would be involved in monitoring of specific measures relating to their particular resource area. Monitoring items are listed below.

- The district planning team would monitor implementation of Alternative 1 prior to offer of any resulting timber sale to verify that acreage of each treatment type is consistent with parameters described in this document.
- The district archeologist would monitor known heritage sites eligible or potentially eligible to the National Register of Historic Places before and after project implementation.
- Prescribed fire managers would establish photo points in prescribed burn units to compare pre- and post-treatment conditions and document fire behavior during implementation.
- Fuels staff would evaluate effectiveness of fuel treatments in reducing fuel loading.
- Fire managers would evaluate burned areas to establish a timeline for maintenance burning.
- Project managers would monitor revegetation of disturbed and burned areas to determine need for additional measures and noxious weed control.
- Wildlife staff would monitor known snail colonies to determine effectiveness of protective measures and need for any further measures.
- Wildlife staff would monitor known and suspected goshawk nests annually for nesting activity.
- If funds are available, engineering and hydrology/soils specialists would monitor effectiveness of erosion control measures (seeding, water bars, etc.) one and three years following installation.
- If funds are available, hydrology/soils staff would monitor soil compaction at a sample of timber sale landings and harvest units.
- Timber sale administrators and hydrology/soils specialists would monitor application and effectiveness of Best Management Practices.
- The district planning team would monitor project implementation following completion of activities.

How Alternative 1 Addresses the Significant Issues

This section describes how Alternative 1 addresses each of the significant issues, as described in Chapter 1.

Mountain Pine Beetle Infestation

Alternative 1 would address the mountain pine beetle infestation by reducing the number of infested trees and modifying stand structure to reduce the risk of further infestation. The flexibility of adaptive management would allow quick response to changing conditions. Beetle-related treatments would take place in Management Areas 5.1 and 5.4. This alternative would also reduce potential wildfire intensity and spread by decreasing amount and continuity of fuels.

Big Game Winter Range

Alternative 1 would improve winter range foraging conditions. Reduction of stand density in thinned areas would increase understory vegetation. Broadcast burns would increase forage quality and quantity. Closure of the area to motorized off-road travel in winter would reduce disturbance and improve security.

Diversity of Vegetation Species and Structure

Proposed actions would diversify forest structure by decreasing stand density. If treatments are successful, Alternative 1 would reduce loss of mature trees to infestation. Increased diversity of age classes would help ensure a continuous long-term supply of timber. Aspen and birch would continue to expand on infested north-facing slopes.

Recreation and Scenery

Visitors would see fewer red-needled and fallen trees. Effects of vegetation management would be visible from Warren Peak, main roads, and trails. Cable yarding on steep slopes would require road construction and may leave vertical corridors in the forest on hillsides, though this would be less obvious than the soil disturbance that would result from ground-based logging on these slopes. Cable yarding would also result in additional ridge-top roads. Log landings and scattered slash would be evident for a few years following activity. Prescribed burning would leave areas of ground temporarily bare and kill some low-growing vegetation, and has the potential to kill mature trees, but would result in additional vegetation growth within three to five years and expanded views.

2.2.3 Alternative 2

This section describes Alternative 2, including the focus of the alternative, a detailed description of the proposed treatments, and how it addresses the relevant issues.

Focus of Alternative 2

Alternative 2 prescribes specific treatments based on Management Area emphasis. In Management Area 5.1, treatments would focus on ensuring a supply of forest products. Silvicultural actions such as regeneration harvest would take place in addition to beetle infestation treatments. No broadcast burning would take place in MA 5.1. In Management Area 5.4, treatments would emphasize winter range improvement and include diameter-limit cuts, uneven-age management, and non-commercial

thinning. No actions would take place in uncut stands between recently cut Sundance Timber Sale units to provide structural diversity and hiding cover. In Management Area 3.32, non-commercial thinning and burning would take place to improve or eliminate stagnated plantation pine. This alternative does not propose adaptive management.

Detailed Description of Alternative 2

Proposed treatments are described below and displayed in **Figure 2-3**.

Management Area 5.1 Treatments

Commercial thin/sanitation/salvage: These treatments would take place on 1,773 acres in dense pine stands. The intent of commercial thinning is to increase stand vigor, reduce susceptibility to beetle infestation, and produce commercial timber. Stand density would be reduced to 40 to 60 square feet of basal area per acre (roughly 25 to 30 feet between trees averaging 12 inches in diameter). The larger and better-formed trees would be retained. Sanitation (cutting and removal of green, beetle-infested trees) would respond to recent infestation and prevent dispersal of the new generation of beetles. Salvage (cutting and removal of dead trees) would recover timber value.

Shelterwood seedcut: This treatment removes some of the mature trees to open the stand and allow young trees to regenerate and become established. Diagnosis of vegetation data indicates that regeneration is silviculturally appropriate in these stands. Shelterwood seedcut would be applied on 343 acres and would result in stands with about 45 feet between trees averaging 16 inches in diameter. This treatment would retain enough large trees to provide a seed source and future large-diameter snags. The primary objectives are establishment of pine regeneration and production of commercial timber.

Sanitation: Cutting of green infested trees would take place as necessary on 156 acres. Retention of high density is desired in these stands to protect various resources. Sanitation would reduce the probability that the stands would be lost to beetle infestation.

Sanitation/salvage/fuel treatments: One or more of these treatments would take place on 493 acres in stands that are expected to be heavily infested with little timber value remaining by the time treatment takes place. These treatments are also proposed in stands at moderate or high risk of insect infestation where no other vegetation management actions are proposed.

Management Area 5.4 Treatments

Uneven-age selection harvest and broadcast burn: The objective of this treatment is to increase openings and within-stand structural and spatial diversity in winter range. Uneven-age harvest would take place on 365 acres in winter range on south-facing slopes with existing access. This initial treatment would begin the process of developing multiple age classes and structures. The target basal area of no more than 60 square feet per acre would be distributed among size classes on an individual-stand basis using methods described in “Ecology, Silviculture, and Management of Black Hills Ponderosa Pine” (Shepperd and Battaglia 2002). Broadcast burning would follow where possible while retaining desired smaller size classes.

Diameter-limit harvest and broadcast burn: Ponderosa pine below a certain diameter would be cut, followed by broadcast burning. The objective of this treatment is to reduce hazardous fuels and risk of beetle infestation while maintaining the large-tree component and varying stand density. The diameter

limit would be determined for each stand based on individual site characteristics. Trees in the largest diameter classes would be retained up to an average stand basal area of 60 square feet per acre. Tree spacing would vary. Stands are primarily on west, south, and east aspects. Operations would avoid inclusions of hardwoods (other than oak) to maintain fire-resistant characteristics. This treatment is proposed on 504 acres.

Non-commercial thin and burn: Broadcast or jackpot burning is proposed on 1,208 acres of south-facing slopes without access for timber harvest. Non-commercial thinning would precede burning if necessary to control burn intensity and mortality of larger trees. Objectives are to provide additional forage in winter range, improve forage quality, and reduce fuel loading. Burning would take place in spring or fall using snow for control lines where possible.

Management Area 3.32 Treatments

Non-commercial thin and burn: Gall-rust infected pine planted after the 1936 Sundance Fire would be thinned and burned on 612 acres. Burning would take place in spring or fall using snow for control lines where possible.

Connected Actions

The following activities would take place to facilitate the proposed actions described above.

Transportation System

Construction of approximately 0.5 miles of new road would be necessary to carry out proposed vegetation management. These roads would extend existing roads on flat to gently sloping ridgetops to allow treatment on the adjacent slopes. These new roads would be stored (closed with barriers) after the project is complete. Also included as new road construction (as defined in 36 CFR §212.1) is conversion of 3.9 miles of non-National Forest System (unclassified) roads to National Forest System roads. These roads are likely to be needed for management on a recurring basis. Work needed to bring these roads up to standard would vary but would be less than that needed for construction of a completely new road.

Reconstruction of 4.3 miles of existing National Forest System roads would take place. This work would include actions such as converting a native-surface road to aggregate by improving drainage structures and applying gravel.

Pre-use maintenance would take place on 26.9 miles of roads needing minor improvements or repair. Examples of pre-use maintenance include blading to remove ruts or addition of gravel in wet spots.

Decommissioning of non-NFS roads would take place as funding and opportunity allow. Decommissioning would consist of permanently closing the road through various means but may not include removal of any existing road template. This applies to the approximately 26 miles of non-NFS roads not proposed for addition to the official road system.

Closure of MA 5.4 to motorized off-road vehicles in winter would take place as under Alternative 1 (page 2-7). In addition, the portion of MA 5.4 north of Tent Canyon (Figure 2-2) would be closed to off-road motorized vehicle use year round.

Timber Stand Improvement

Live cull trees, except those left for snag replacement, would be cut following shelterwood seedcuts.

Treatment of Activity Fuels

Fuels resulting from management actions are termed activity fuels. Many of the mechanical treatments described above would result in piles of tops at log landings. These would be burned after curing for a year or two, and the resulting disturbed area would be seeded and treated for noxious weed infestation if necessary. Piles may also be chipped and removed from the area.

Conventional harvest systems can result in tops and branches spread across a site rather than concentrated at a log landing. Where resulting fuel loading would exceed Forest Plan direction, fuels would be crushed, burned, or otherwise reduced. Whole-tree yarding systems would be used where possible to prevent accumulation of fuels.

Prescribed Fire Control Line Rehabilitation

Lines constructed for control of prescribed fires would be rehabilitated to prevent erosion and weed infestation. Methods may include construction of water bars, replacement of sod and brush, and seeding.

Design Criteria and Mitigation

Forest Plan standards and guidelines, Regional Watershed Conservation Practices, and other management requirements apply to these activities. Standard direction is listed in Appendix A and repeated here only if clarification is required. Other design criteria and mitigation applicable to activities proposed under Alternative 2 include the following in addition to measures listed starting on page 2-11.

Applies To:	Measure
All Activities	**Heritage Resources:** • Known heritage sites would be protected, including site 48CK1262. No activities would take place within 30 meters of these sites. Heritage sites would be avoided during all proposed activities.
	Soils: • Uneven-age management treatment in stands 0106050015, 0106050016, and 0106090009 and thinning/sanitation/salvage in stand 0106090010 would retain at least a third of the existing crown cover to minimize the potential for mass movement of soils.
Timber Harvest	**Reforestation:** • To ensure regeneration, stands proposed for shelterwood seedcut would be logged in the summer or early fall where feasible to maximize the site scarification provided by the skidding operation, provided there are no concerns related to riparian areas, noxious weeds, or sensitive plants. Cutting would be done in such a way that areas would be restocked with trees within five years after final harvest.

Monitoring

Proposed monitoring is described on page 2-16. The following additional measure would apply: Foresters would monitor conifer regeneration in shelterwood seedcuts one, three, and five years after harvest to assess stocking.

How Alternative 2 Addresses the Significant Issues

This section describes how Alternative 2 addresses each of the significant issues, as described in Chapter 1.

Mountain Pine Beetle Infestation

Alternative 2 would address the mountain pine beetle infestation by reducing the number of infested trees and modifying stand structure to reduce the risk of further infestation. Beetle-related treatments would take place mainly in Management Area 5.1. Treatment options would be less flexible than under Alternative 1. This alternative would also reduce potential wildfire intensity and spread by decreasing amount and continuity of fuels.

Big Game Winter Range

Alternative 2 would improve winter range through prescribed burning and variation of density within pine stands. Creation of uneven-age forest structure and variation of density in small-diameter stands would benefit winter range by providing additional forage in close proximity to hiding cover. Closure of the area to motorized off-road travel in winter would reduce disturbance and improve security.

Diversity of Vegetation Species and Structure

Proposed actions would diversify forest structure by thinning in MA 5.1 and through uneven-age treatments, diameter-limit cuts, and prescribed burning in MA 5.4. If beetle-related treatments in MA 5.1 are successful, Alternative 2 would reduce loss of mature trees to infestation. Increased diversity of age classes would help contribute to a continuous long-term supply of timber. Aspen and birch would be likely to expand on infested north-facing slopes.

Recreation and Scenery

Visitors would see fewer red-needled and fallen trees. Effects of vegetation management would be visible from Warren Peak, main roads, and trails. Treatments in MA 5.4 would result in more natural-appearing stands with unevenly spaced trees. Cable yarding on steep slopes in MA 5.1 would require road construction and may leave vertical corridors in the forest on hillsides, though this would be less obvious than the soil disturbance that would result from ground-based logging on these slopes. Log landings and scattered slash would be evident for a few years following activity. Prescribed burning would leave areas of ground temporarily bare and kill some low-growing vegetation but would result in additional vegetation growth and expanded views.

Figure 2-3. Proposed Activities, Alternative 2

2.2.4 Alternative 3

The planning team developed Alternative 3 based on scoping comments but did not analyze it in detail. Section 2.3 discusses this alternative further.

2.2.5 Alternative 4

This section describes Alternative 4, including the focus of the alternative, a detailed description of the proposed treatments, and how it addresses the relevant issues.

Focus of Alternative 4

Alternative 4 focuses on slowing the beetle infestation in Management Area 5.1 and reducing hazardous fuels in interface areas between NFS and non-NFS lands. This alternative emphasizes non-commercial methods. Activities in winter range would take place only in interface areas. No broadcast burning would take place. Less road construction is proposed.

Detailed Description of Alternative 4

Proposed treatments are described below and displayed in **Figure 2-4.**

Proposed Vegetation Treatments

Sanitation: Cutting of green infested trees would take place as necessary on 212 acres. Retention of high density is desired in these stands to protect various resources. Sanitation would reduce the probability that the stands would be lost to beetle infestation.

Thin/sanitation: Commercial and non-commercial thinning of uninfested trees would take place on 1,796 acres in Management Area 5.1. Because the sole objective of this alternative in MA 5.1 is to slow the beetle infestation, and beetles most commonly attack trees 7 to 14 inches in diameter (USFS 2006b), only trees less than 14 inches in diameter would be cut. Thinning would take place in pine stands with a moderate or high risk of beetle infestation and in other stands where infestation is present. Sanitation treatments would cut infested green trees of any size as necessary. Salvage of trees from which beetles have already dispersed would not take place because this would have no effect on slowing the progress of the infestation. These trees would provide snag/coarse woody debris habitat.

Interface thin and fuel reduction: Thinning and fuel treatment would take place as necessary on 1,504 acres in stands along boundaries with non-NFS lands. The objective of the treatment is to reduce the risk of beetle infestation and fire spreading to other ownerships. This treatment is not prescribed in every interface stand because some were recently treated and others are composed of aspen or grass. Commercial thinning would only take place where access currently exists.

Connected Actions

The following activities would take place to facilitate the proposed actions described above.

Transportation System

Construction - Included as new road construction (as defined in 36 CFR §212.1) is conversion of 2.5 miles of non-National Forest System (unclassified) roads to National Forest System roads. These roads are likely to be needed for management on a recurring basis. Work needed to bring these roads up to standard would vary but would be less than that needed for construction of a completely new road.

Reconstruction of 2.7 miles of existing National Forest System roads would take place. This work would include actions such as converting a native-surface road to aggregate by improving drainage structures and applying gravel.

Pre-use maintenance would take place on 28 miles of roads needing minor improvements or repair. Examples of pre-use maintenance include blading to remove ruts or addition of gravel in wet spots.

Decommissioning of non-NFS roads would take place as funding and opportunity allow. Decommissioning would consist of permanently closing the road through various means but may not include removal of any existing road template. This applies to the approximately 29 miles of non-NFS roads not proposed for addition to the official road system.

MA 5.4 would be closed to off-road motorized vehicle use year round.

Treatment of Activity Fuels

Fuels resulting from management actions are termed activity fuels. Thinning described above may result in piles of tops at log landings. These would be burned after curing for a year or two, and the resulting disturbed area would be seeded and treated for noxious weed infestation if necessary. Piles may also be chipped and removed from the area.

Conventional harvest systems can result in tops and branches spread across a site rather than concentrated at a log landing. Where resulting fuel loading would exceed Forest Plan direction, fuels would be crushed, burned, or otherwise reduced. Whole-tree yarding systems would be used where possible to prevent accumulation of fuels.

Monitoring

Proposed monitoring is described on page 2-16.

Design Criteria and Mitigation

Forest Plan standards and guidelines, Regional Watershed Conservation Practices, and other management requirements apply to these activities. Standard direction is listed in Appendix A and repeated here only if clarification is required. Other design criteria and mitigation applicable to activities proposed under Alternative 4 include the following in addition to measures listed starting on page 2-11.

Applies To:	Measure
All Activities	**Heritage Resources:** • Known heritage sites would be protected, including sites 48CK1262 and 48CK1480. No activities would take place within 30 meters of these sites. Heritage sites would be avoided during all proposed activities.
	Soils: • Wildland/urban interface thinning in stands 0106050013, 0106050015, 0106050016, 0106090008, 0106090009, and 0106090010 would retain at least a third of the existing crown cover to minimize the potential for mass movement of soils. • Reconstruction of unclassified road U610112 may take place within a water influence zone. A qualified hydrologist would be consulted during design and implementation of the reconstruction to ensure the integrity of the water influence zone is maintained.

Monitoring

Proposed monitoring is described on page 2-16.

How Alternative 4 Addresses the Significant Issues

This section describes how Alternative 4 addresses each of the significant issues, as described in Chapter 1.

Mountain Pine Beetle Infestation

Alternative 4 would address the mountain pine beetle infestation in Management Area 5.1 by reducing the number of infested trees and thinning trees in size classes most susceptible to attack to reduce the risk of further infestation. This alternative would not address existing or potential infestation in other Management Areas. It would reduce potential wildfire intensity and spread in treated areas.

Big Game Winter Range

Alternative 4 would improve winter range foraging conditions along the Forest boundary through interface thinning, which would provide additional forage. Beetle infestation would continue to modify forest structure and may result in additional openings. Closure of MA 5.4 to motorized off-road travel would reduce disturbance and improve security year round.

Diversity of Vegetation Species and Structure

Proposed actions would diversify forest structure by decreasing stand density. If treatments in MA 5.1 are successful, Alternative 4 would reduce loss of mature trees to infestation. Increased diversity of age classes would help ensure a continuous long-term supply of timber. Aspen and birch would continue to expand on infested north-facing slopes. Alternative 4 would have little effect on forest composition in MA 5.4.

Figure 2-4. Proposed Activities, Alternative 4

Recreation and Scenery

Visitors would see fewer red-needled and fallen trees in MA 5.1. Effects of vegetation management would be visible from Warren Peak, main roads, and trails. Log landings and scattered slash would be evident for a few years following activity. Beetle infestation and resulting visual effects may expand in MA 5.4.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

The planning team considered other alternatives to the proposed action. These were primarily generated from comments provided by the public during the scoping period. In some cases, portions of these alternatives were used in the alternatives considered in detail. Following are brief descriptions of the alternatives not considered in detail and the reasons that they were eliminated from detailed analysis. For some of these alternatives, an explanation is given for how parts of the alternative were incorporated into the alternatives considered in detail.

Focus on meeting structural stage objectives. A respondent requested an alternative that would move forest structural diversity in the project area toward conditions described in Forest Plan objectives 5.1-204 and 5.4-206. The decision maker chose not to analyze this alternative in detail because the project's primary purpose is to address mountain pine beetle infestation. The analysis does evaluate how each alternative would contribute toward these objectives (starting on page 3-11).

Increase diversity of forest structures and age classes through regeneration harvest. A respondent requested that the project "consider the spatial array of stand conditions when planning to harvest to reduce mountain pine beetle risk… We notice the absence of regeneration treatments… This is an important issue under Forest-wide standard 4201(d), as an important part of insect and wildfire resistant conditions at a landscape scale is the presence of immature structural stages along with mature stages…" Alternative 2 includes shelterwood seedcut, a form of regeneration treatment. Alternatives 1 and 4 include no regeneration treatments, but beetle infestation has created openings in the forest that will reforest with pine over time, providing young stands. In addition, the Sundance timber sale, completed in 2005, conducted regeneration harvest on 660 acres of pine in the project area. Alternative 2 includes other treatments in pine, such as uneven-age management, that would result in a variety of within-stand structures and age classes. Therefore, the decision maker chose not to place an emphasis on pine regeneration under any alternative.

Restore beaver habitat. A respondent requested that the project restore beaver habitat through large-scale expansion of hardwood communities. Increased beaver populations could expand habitat for finescale dace, a sensitive fish species. The decision maker chose not to analyze this alternative in detail partly because the project area is already more diverse than many areas of the National Forest, with about 20 percent aspen and birch cover and another 20 percent grassland, and the area of non-pine types is likely to increase (at least transitionally) as the beetle infestation expands. Hardwood communities are relevant to the project's purpose in that an increase in hardwoods could reduce future susceptibility to beetle infestation and slow the spread of fires. The proposed action and alternatives analyzed in detail would allow hardwoods to persist and expand. Large-scale forest type change and habitat restoration are beyond the scope of this project.

Conduct only sanitation. A respondent requested that the Forest Service cut beetle-infested trees but conduct no thinning due to the overall effect of similar past actions and blowdown in treated areas on Warren Peak. The decision maker chose not to analyze this alternative in detail because it would have a limited effect on the beetle infestation. Without thinning, susceptible stands are likely to continue to experience persistent infestation and tree mortality. This alternative would result in reactive management, following beetles from year to year in each new stand they infest. It would require a high investment of time to conduct surveys each year and develop treatment plans. The issue of blowdown is addressed in project design. Blowdown and cumulative effects of past timber sales are analyzed on page 3-16.

Alternative 3. The ID team developed Alternative 3 along with the other action alternatives to explore the tradeoffs involved in comprehensive, aggressive approach to beetle infestation and timber management in this project area. Alternative 3 included timber harvest to address beetle infestation risk and/or produce timber in all stands in both MAs 5.1 and 5.4 where silvicultural treatment could take place. The decision maker chose not to analyze Alternative 3 in detail because it would have required approximately 17 miles of new road construction and would have been likely to have adverse effects on unstable soils, scenery, and recreation.

No treatments to address beetle infestation. One respondent cited a recent report concluding that silvicultural treatments have little effect on beetle infestations (Black 2005). This report reviews a certain selection of the literature available on mountain pine beetle. Literature and documentation specific to the Black Hills, however, indicates that silvicultural treatments are effective in lowering beetle susceptibility in ponderosa pine stands (Allen 2005, Fettig and Klepzig 2006). The decision maker chose not to analyze this alternative in detail for this reason and because responding to the beetle infestation is the main purpose of this project.

2.4 CONSISTENCY WITH THE FOREST PLAN AND PHASE 2 AMENDMENT

The Forest Plan and Phase 2 Amendment contain direction in the form of Forest-wide and Management Area goals, objectives, standards, and guidelines. Standards are limitations on management activities. Deviation from a standard requires a Forest Plan amendment. A guideline is a preferred course of action, and deviation is permissible if the responsible official documents the reasons for the deviation. Goals are broad, general statements of desired results of management, and objectives describe measurable desired results to work towards achieving goals.

This project is within the scope of activities envisioned by the Forest Plan analysis and contains no actions not anticipated in that analysis. A full accounting of project compliance with Forest Plan and Phase 2 Amendment direction is located in the analysis file. All action alternatives analyzed in detail would work toward achievement of targeted Forest Plan and Phase 2 Amendment goals and objectives and would not move conditions away from any others. These alternatives also would comply with all Forest Plan and Phase 2 Amendment standards and guidelines.

2.5 COMPARISON OF ALTERNATIVES

The following section compares how the alternatives would address the significant issues, described in detail in Chapter 1. **Table 2-2** shows these differences for each significant issue and indicator.

Table 2-2. Response of Alternatives to Issues

Issue	Alt. 0	Alt.1 (maximum infestation scenario)	Alt. 1 (minimum infestation scenario)	Alt. 2	Alt. 4
Mountain Pine Beetle Infestation and Fire Hazard					
Beetle infestation risk (percent of pine acres)					
High	34	14	14	19	23
Moderate	47	29	60	57	51
Low	19	57	26	25	27
Crown fire hazard (percent of NFS acres in project area)					
Very High	17	8	8	13	14
High	25	14	14	20	16
Medium	19	28	35	28	32
Low	38	49	42	38	38
Effects on habitat for species associated with beetle infestation	Preferred habitat likely to continue to increase in project area.	Expanded infestation would create additional habitat for these species. Habitat would decrease in treated areas but likely to increase overall. Snags cut for safety reasons, salvage & firewood.	Habitat would decrease in treated areas. Likelihood of beetle infestation in next decade would decrease in thinned stands. Snags cut for safety reasons, salvage & firewood.	Expansion of preferred habitat likely to slow unless infestation expands beyond proposed treatment areas. Snags cut for safety reasons, salvage & firewood.	Expansion of preferred habitat likely to slow unless infestation expands beyond proposed treatment areas. Snags cut for safety reasons & firewood.
Big Game Winter Range					
Extent of foraging areas and quality of forage	Continuing infestation would reduce forest canopy, allowing additional growth of understory forage species.	Expanded infestation and treatment likely to create additional foraging areas. Burning likely to improve forage quality.	Thinning would open forest canopy, though to lesser degree than infestation. Burning likely to improve forage quality.	Thinning would open forest canopy on smaller area than Alt. 1. Burning likely to improve forage quality.	Thinning would open forest canopy of smallest area overall, but more in low-elevation areas likely to be used as winter range.

Table 2-2 (continued)

Issue	Alt. 0	Alt. 1 (maximum infestation scenario)	Alt. 1 (minimum infestation scenario)	Alt. 2	Alt. 4
Vehicle access to winter range (MA 5.4)	Off-road motorized use unrestricted in winter except by snow. Fallen trees likely to reduce access. No road construction.	Off-road motorized use restricted in MA 5.4 in winter (year-round in NE corner of project area). Fallen trees likely to reduce access; treatments may remove barriers that currently restrict access and would reduce number of fallen trees, though likely to be overall increase under this scenario. No road construction in winter range.	Off-road motorized use restricted in MA 5.4 in winter (year-round in NE corner of project area). Fallen trees likely to reduce access, though treatments may remove barriers that currently restrict access and would reduce number of fallen trees. No road construction in winter range.	Off-road motorized use restricted in MA 5.4 in winter (year-round north of Tent Canyon). Other effects similar to Alt. 1.	Off-road motorized use restricted year-round in MA 5.4. Fewer treatments and no road construction in winter range. Other effects similar to Alt. 1.
Diversity of Vegetation Species and Structure					
Pine structural distribution	Dominated by mature pine stands; heavily infested areas would eventually reforest with pine. Most dense stands would remain unless infestation expands.	Heavily infested areas likely to reforest with pine seedlings within 1-2 decades. Seedcuts would produce young pine stands. Mature pine would continue to dominate other areas; probably more mature pine remaining than under Alt. 0. Possibly fewest dense stands.	Heavily infested areas likely to reforest with pine seedlings within 1-2 decades. Seedcuts would produce young pine stands. Mature pine would continue to dominate more areas than under maximum infestation scenario; probably more dense stands than under max infestation scenario.	Heavily infested areas likely to reforest with pine seedlings within 1-2 decades. Seedcuts and uneven-age cuts would result in pine regeneration. More dense stands remaining unless infestation expands.	Heavily infested areas likely to reforest with pine seedlings within 1-2 decades. Mature pine would continue to dominate other areas; probably more mature pine remaining than under Alt. 0. More dense stands remaining unless infestation expands.
Cover type distribution	No immediate change; heavily infested areas likely to convert temporarily (1-2 decades) to hardwoods/grass.	Same as Alt. 0, though change likely to occur on smaller acreage. Prescribed fire may increase understory diversity.	Same as maximum infestation scenario, though change likely to occur on smaller acreage. Prescribed fire may increase understory diversity.	Same as Alt. 0, though change likely to occur on smaller acreage. Prescribed fire may increase understory diversity.	No immediate change, but heavily infested areas likely to convert temporarily to hardwoods or grass.

Table 2-2 (continued)

Issue	Alt. 0	Alt. 1 (maximum infestation scenario)	Alt. 1 (minimum infestation scenario)	Alt. 2	Alt. 4
Recreation and Scenery					
Effects on areas of high scenic integrity	Continuing infestation could reduce scenic integrity, espec-ially if followed by severe fire.	2-5 year reduction in scenic integrity in some treated and infested areas, mainly in MA 5.1. Effects less than Alt. 0 if infestation continues. Negligible effect in MA 3.32.	2-5 year reduction in scenic integrity in some treated and infested areas, mainly in MA 5.1, to lesser degree than max infestation. Negligible effect in MA 3.32.	2-5 year reduction in scenic integrity in some treated and infested areas, mainly in MA 5.1. Variable-density treatments in MA 5.4 would positive affect scenic integrity.	Reduction in scenic integrity less likely than under other alts due to smaller area of treatment and higher residual basal area, unless infestation continues to expand.

3.0 ENVIRONMENTAL CONSEQUENCES

This section forms the scientific and analytical basis for the comparison of the potential environmental effects of the alternatives. In determining potential environmental consequences of each alternative, the interdisciplinary team considered the following:

- The probable consequences of each alternative on environmental resources
- Achievement of project objectives
- Adherence to Forest Plan standards, guidelines and objectives
- Compliance with federal and state laws and regulations

The Forest Plan and Phase 2 Amendment FEISs discuss the short and long term effects, irreversible and irretrievable commitment of resources, and adverse environmental effects associated with implementing management practices in the Black Hills forest environment. The projects and effects described in this EA are the same as those anticipated by the FEISs and are not repeated here. This EA is tiered to the FEISs to avoid repetition and to allow this description to focus on the site-specific effects that would result from implementation of the proposed action and alternatives.

3.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

Various activities have already occurred, are occurring, or will occur in the future within the project area. Past activities have contributed to the current condition of resources as described in this chapter. Ongoing and future activities may contribute to effects to resources that would also be affected by the proposed project. The need to include these activities in the cumulative effects section of each individual resource analysis depends on the extent of the cumulative effects analysis area and the duration of effects on each resource. Future activities described in this section are not part of the decision to be made for this EA. Most have already been approved by other decisions or would require separate environmental analysis and public involvement. These activities are described below. Certain actions are displayed in **Figure 3-1**.

3.1.1 Past Activities

Black Hills forests have been subject to modification from their pre-settlement state since the 1870s. Humans have altered vegetation structure, composition and patterns by harvesting timber, suppressing fire, introducing exotic species, causing wildfires, nearly extirpating beaver, and grazing domestic livestock. As a result, more of the landscape is forested, though the trees are generally smaller (Parrish et al. 1996). The water table is likely to be lower in drainages now than when there were numerous beaver dams, causing changes in plant communities.

The project area is dominated by the ponderosa pine vegetation series, with smaller but substantial areas of quaking aspen, paper birch, open meadows, and bur oak (Shepperd and Battaglia 2002). Applications of silvicultural systems and fire suppression over the last 100 years are responsible for the structure, composition, and appearance of the majority of this existing forest, but the effects of wildfires and unregulated timber harvest in the late 1800s are still evident in places. The effects of the 1936 Sundance

Fire are still obvious on the eastern side of the Burner area.

Timber sales that have taken place completely or partly within the project area since 1990 include Sundance, Sunbugs, and Carson. Post-sale activities such as precommercial thinning and fuel treatment have also taken place. Due to the high-elevation, exposed nature of the Warren Peak area, snowstorms and wind regularly break off or blow down pockets of trees.

More than 102 miles of road have been developed in the project area on both public and private land. Private land has also been subject to timber harvest, livestock grazing, and water diversions. A military radar installation was formerly located on Warren Peak. The extent of each type of past activity is listed below.

Fuel Treatment

Under the Sundance Fuels project, mechanical fuel treatment took place along the National Forest boundary on approximately 300 acres east of Reuter Campground in 2005. Thinning took place on about 75 acres along NFSR 899.1. A fuel break along the Warren Peak Highway was maintained, and POL thinning took place on about 130 acres north of Richardson Creek, along Beaver Creek, and near Reuter Campground. Most of the slash piles resulting from the Sundance timber sale have been burned and the sites seeded.

Grazing

The project area was mostly open range through about 1960, when it was split into several allotments. Cattle and a limited number of sheep grazed the area.

Mining

Past mining-related activities in the project area consisted of mineral exploration in the form of trenching near Warren Peak (1980s), drilling near Bull Hill (2004), and historic mineral exploration in numerous locations. In 2006, some of the trenches were re-opened and closed again during further mineral exploration. Drilling of several exploration holes also took place in 2006, along with construction of drill pads. A collapsed mine entrance was opened and gated in 2005 to provide bat habitat.

Noxious Weeds

Herbicide application has occurred along roads and at timber sale landings and areas of livestock concentration. About 400 acres were treated in 2006.

Non-NFS Land In and Around the Project Area

Livestock grazing, haying, livestock water developments, and limited timber harvest have occurred on private lands. Section 16 in Township 52 North, Range 63 West is Wyoming state land. In the early 1980s, the state conducted timber harvest on this land due to beetle infestation. The state has sold post and pole material from this parcel since 2000.

Recreation

Hunting, sightseeing, snowmobiling, and trail riding have all been popular recreational uses of the project area.

Lands and Special Uses

A former nuclear-powered radar station, decommissioned in 1968, is located on Department of Defense property at Warren Peak.

Roads

Most roads in the project area have been in place for several decades. NFSRs 899.1C (0.6 miles) on Houston Ridge and 851.1A (0.2 miles) near Whitelaw Creek were constructed for the Sundance timber sale in the late 1990s.

Timber Harvest

The Sundance timber sale took place on 1,986 acres in the project area between 1997 and 2005. Prescriptions included shelterwood seedcut and thinning.

Wildfire

In 1936, the Sundance Fire burned about 8,400 acres and threatened the town of Sundance. The burned area is still in early successional stages and is forested mainly with aspen. The Forest Service planted pine in several areas of the Sundance Fire following the burn, but most of the plantation stock did not grow well. In 1985, the Bear Den and Reuter Fires burned 225 acres in the west and south parts of the Burner project area. The Houston Bear Den Fire burned 183 acres in 1989 near Warren Peak. The Lytle Creek fire burned 10 acres at the edge of the Houston Bear Den Fire in 1994, and the second Sundance Fire burned 282 acres in 2000. Small fires undoubtedly occurred in the project area between 1936 and 1985, but specific records are not available.

3.1.2 Ongoing Activities

A variety of activities are ongoing in the project area. Post-sale activities related to the Sundance timber sale are currently active on public land in the project area. Timber harvest is not known to be taking place on other ownerships. Livestock grazing occurs on National Forest System and private lands. No mining operations are currently active. Fire suppression takes place as needed. Maintenance of roads and electric utility lines continues. Water is diverted in various locations to livestock watering tanks. Common recreational activities include camping, hunting, driving, mountain biking, hiking, and snowmobiling. Development of private land is currently minimal. The extent of each type of ongoing activity is listed below.

Fuel Treatment

Mechanical thinning approved under the Sundance Fuels project is taking place on 225 acres in the Lost Houston and Carson drainages.

Grazing

Table 3-2 lists the current season of grazing use and numbers for allotments on public lands in the project area.

The Burner project area includes all or part of five grazing allotments (see **Figure 3-1**). Cole, Ogden, and Warren Peak allotments are completely within the project area. Portions of the Divide and Redwater allotments are in the project area. Cattle use these allotments from approximately June to October and are rotated through pastures within each allotment. The Warren Peak Allotment Management Plan was signed in 2006.

Table 3-1. Current Grazing Terms, Systems, and Numbers by Allotment

Allotment name	Term	System	Numbers
Cole	6/15-10/15	Season-long	39 yearlings
Divide	6/25-10/15	Two-pasture deferred	214 cow/calf
Ogden	6/16-10/15	Two-pasture (both season-long)	167 cow/calf
Redwater	6/11-10/7	Six-pasture deferred	256 cow/calf
Warren Peak	6/26-10/1	Season-long	390 cow/calf

Mining

No projects are currently under way.

Noxious Weeds

Noxious weed inventory and treatment are continuing as slash piles associated with the Sundance timber sale are burned.

Private Land In and Around the Project Area

Private land uses are similar to past uses (see above).

Lands and Special Uses

Permits are in effect for several uses of NFS lands in the project area, including wells and a water line for the Vista West subdivision; livestock water systems in Ogden and Cole Canyons; pasture grazing on a small parcel along the Forest boundary; buried telephone and power lines; a Natural Resources Conservation Service snow measurement site on Smith Ridge; and a communication site on Warren Peak. Easements exist on two roads along the project area's southern boundary. There is one outfitter-guide permit in the project area.

Recreation

There are approximately 53 miles of motorized and non-motorized trails in the project area. Approximately 18 miles of trails are on NFS roads and about four miles are on unclassified roads. Reuter and Sundance Campgrounds, both Forest Service facilities, are located at the edge of the Forest. Current recreational use is similar to past uses (see above). Based on casual observation and proliferation of user

groups, mountain biking and off-road motorized use appear to be increasing.

Timber Harvest

No commercial timber harvest is taking place at this time.

3.1.3 Reasonably Foreseeable Future Activities

Reasonably foreseeable future actions in the Burner project area include fire suppression, fuel treatment, vegetation management, treatment of noxious weeds, road decommissioning, road and utility maintenance, livestock grazing, and dispersed recreation. Other timber harvest may take place in the future on public lands, but specific locations and treatment types are not known at this time. The extent of each type of future activity is listed below.

Fuel Treatment

About a dozen large log-landing slash piles resulting from the Sundance timber sale remain to be burned. Moderate complexity prescribed burns will take place as part of the Sundance Fuels project on about 750 acres, mainly north of Warren Peak and in the Lost Houston and Bear Den drainages. Slash piles resulting from the Sundance Fuels project will be burned on about 150 acres. These activities are scheduled to take place in 2007 and 2008.

Grazing

New Allotment Management Plans (AMPs) for Cole, Ogden, and Redwater Allotments will be implemented in 2007. The AMPs will be based on the North Zone Range 05 analysis (Record of Decision signed September 28, 2006) and will use adaptive management. Planned changes to current grazing systems are described below. These changes will improve range and riparian condition.

Cole Allotment
The grazing system will change from season-long to single-pasture with a two-month grazing period with a variable season of use. Instead of the current set grazing season of June 15 through October 15, the earliest date cattle will enter the allotment will be June 15 and the latest date they leave will be September 15. A range rider may be used if necessary to maintain appropriate distribution of livestock.

Ogden Allotment
The season of use will change from June 16 through October 15 to an earliest “on” date of May 15 through a latest “off” date of October 15. The grazing period will be two and a half months with a variable season of use. Brush barriers will be constructed at the top and bottom of the north fork of Cole Canyon to prevent livestock use. Adaptive management options that may be used to achieve satisfactory conditions include a reduction of livestock numbers or season of use, resting pastures, use of range riders, fencing, and water tank installation.

Redwater Allotment
Adaptive management options will include reduction of livestock numbers or season, resting pastures, use of range riders, and changing to a rest-rotation grazing system.

Hardwood Treatment

Aspen will be regenerated on 148 acres by clearcutting small patches.

Mining

Drilling of about 20 mineral exploration holes has been proposed. Analysis of this project is scheduled to take place in 2007. Numerous other mineral claims have been filed, but the District has not received detailed proposals as of this writing.

Noxious Weeds

Continued treatment of known infestations and continued survey for new infestations of noxious weeds is anticipated.

Non-NFS Land In and Around the Project Area

The 418-acre parcel of private land on Warren Peak is currently for sale. Subdivision could occur with this sale. No other foreseeable changes to non-NFS land uses from current uses are anticipated.

Lands and Special Uses

No additional lands activities or special uses are proposed at this time.

Recreation

Future recreational use is expected to be similar to current uses. Off-road motorized recreation is increasing across the Forest and may increase in this project area. Mountain biking also is continuing the increase in popularity.

Roads

Four road segments totaling 0.94 miles are scheduled for decommissioning as a follow-up action to the Sundance timber sale. Scheduled road maintenance would continue.

Timber Harvest

Twenty-three acres of timber harvest will take place under the Sleez timber sale along the project area's northern boundary.

Timber Stand Improvement

Precommercial thinning is planned on 30 acres in the Sundance timber sale area within a commercial harvest unit.

Figure 3-1. Cumulative Effects Actions

3.2 BIOLOGICAL CONSEQUENCES

This section discusses resources that are primarily biological in nature, including vegetation, wildlife, sensitive plants, rangeland, and noxious weeds. The existing conditions of these resources in the project area are described and then the potential direct, indirect, and cumulative effects of the proposed action and alternatives are discussed.

3.2.1 Vegetation

This section summarizes the comprehensive analysis of the project area from a habitat structure and silvicultural perspective that is included in the silviculturist's report, which is located in the project file.

Existing Conditions

Mountain Pine Beetle Risk

Mountain pine beetles have infested over 600 acres of ponderosa pine in the project area in the last five years. Infestation levels are highest in and around Ogden and Tent Canyons and in the Bear Den drainage. A 2005 report concluded that the infestation in this area appears to be slowing (Allen 2005a), though field review in the summer of 2006 showed that it is still expanding (Schaupp 2006).

Beetle infestation is a normal part of western pine forests. The mountain pine beetle is native to the Black Hills and was at one time known as the "Black Hills beetle". Many large-scale infestations have been recorded in the Black Hills and Bear Lodge Mountains, occurring on a cyclical basis and often associated with extended droughts such as the one currently affecting northeastern Wyoming and other parts of the northern Great Plains. Beetle infestation is currently widespread across the Black Hills in South Dakota and Wyoming, with major concentrations near Sturgis, Deerfield Lake, and Custer.

Beetles are most likely to attack pine trees in dense stands. Trees that are under stress due to drought, competition, or other factors are most vulnerable. When beetle populations are high, healthy trees and those in more open stands are also at risk. Mountain pine beetles bore through a tree's sapwood and carry spores of blue-stain fungus, which reduces the tree's sap flow. Trees are killed by the combination of fungus and beetles. Epidemic populations of mountain pine beetle can kill large areas of pine forest. This can increase habitat for woodpeckers, forage for big game, and aspen and birch forest. At the same time, habitat for species that use dense, live pine forest decreases. Intense wildfire following infestation can damage soils and result in erosion on steep slopes. Scenic value can decrease, especially during the two to three years when red needles remain on trees.

Stands dominated by ponderosa pine account for 10,830 acres, or 61 percent of the project area. Stands of trees at least eight inches DBH with greater than 120 square feet of basal area per acre are assumed to be at highest risk, while stands with 80 to 120 square feet are considered to be at moderate risk (Schmid et al. 1994). Currently, 3,719 acres are considered to be at high risk of infestation, 5,049 acres at moderate risk, and 2,062 acres at low risk. These figures do not reflect modification of stand structure resulting from recent beetle infestation. Most of the heavily infested stands in the project area are composed of trees at least eight inches in diameter with high stand density, but beetles have also killed scattered pines growing in hardwood stands and along meadow edges, especially near Bull Hill. Infestation levels are generally low in stands cut during the Sundance timber sale (1997-2005).

Forest Structural Diversity

Existing habitat structural stage (SS) distribution found in the project area is shown in **Table 3-3**. Structural stages are defined as follows.

SS 1: Grasses and forbs
SS 2: Seedlings and saplings
SS 3A: Young forest, trees less than 9 inches DBH, crown cover less than 40 percent
SS 3B: Young forest, trees less than 9 inches DBH, crown cover 40 to 70 percent
SS 3C: Young forest, trees less than 9 inches DBH, crown cover greater than 70 percent
SS 4A: Mature forest, trees at least 9 inches DBH, crown cover less than 40 percent
SS 4B: Mature forest, trees at least 9 inches DBH, crown cover 40 to 70 percent
SS 4C: Mature forest, trees at least 9 inches DBH, crown cover greater than 70 percent
SS 5: Late-succession forest

About half of the project area is vegetated with pine in SS 4A, 4B, or 4C (trees at least 9 inches DBH). There are few pine stands composed of small, young trees.

Table 3-2. Current Structural Stage Distribution (Project Area NFS Lands)

Cover Type	Structural Stage (acres)								Total
	1	2	3A	3B	3C	4A	4B	4C	
Grass	3,112	0	0	0	0	0	0	0	3,112
Quaking Aspen	0	334	631	449	1,112	109	264	27	2,926
Bur Oak	0	0	50	191	65	0	70	61	437
Paper Birch	0	0	32	82	0	0	34	0	148
Other Hardwoods	0	0	0	24	0	53	68	131	276
Ponderosa Pine	326	102	70	182	315	2,982	3,783	3,070	10,830
Total	3,438	436	783	928	1,492	3,144	4,219	3,289	17,729*

*Does not include 77 acres of non-forested land.

Snags

Since 2001, mountain pine beetles have killed groups of trees and some entire stands on about 600 acres in the project area. Between 2003 and 2005, beetles killed about 14 trees per acre in surveyed areas on Warren Peak (Allen 2005a). Pre-infestation data show a mean of 2.5 hard snags and 9.5 soft snags per acre in pine stands. Snag density by diameter and height are not available, but due to the beetle infestation, snag levels appear to be well above those specified in Forst Plan objective 211. Many of the trees killed by the infestation are still standing, though snags created by beetles and the associated fungus tend to rot and fall within seven to ten years (Schmid et al. 1985). Scattered infestation is present throughout most of the project area. Snags created by repeated application of fire tend to last longer than beetle-killed snags and are still found in areas burned decades ago. Snowstorms in 2005 and 2006 also created pockets of snags, primarily on ridgetops and sheltered south-facing slopes. As demonstrated by structural stage distribution, mature trees that could become snags dominate the project area.

Late Succession Forest

The project area contains no stands designated for management of late-succession conditions. There are approximately 3,070 acres of dense, mature pine in the project area, though beetle infestation has reduced the density of some of these stands.

Silvicultural Treatments

All stands that were analyzed for commercial and non-commercial harvest for timber production purposes are suitable for timber production. Stands that would be treated by other methods (for example, prescribed fire) or for other reasons may not be suitable for timber production.

Effects Analysis

Mountain Pine Beetle Risk

Table 3-3 compares current mountain pine beetle risk for ponderosa pine stands to the estimated risk after implementation of each alternative. Currently about a third of the project area pine stands are at high risk of infestation and almost half are at moderate risk. The action alternatives would reduce acres at high risk and increase acres at low risk. Under either infestation scenario, Alternative 1 would reduce high risk acres the most. Under the least-infestation scenario, moderate risk stands would increase because more stands would be thinned, and thinning generally results in moderate risk rather than low risk because single-storied stands of mature pine are considered to be at moderate risk even when stand density is low (Stevens et al. 1980). Under the most-infestation scenario, low-risk stands would increase to 56 percent of the pine acres due to the assumption that few mature trees would remain in heavily infested stands after treatment. If Alternative 1 were selected, the actual results would probably fall between these two scenarios.

Alternative 2 would decrease high risk and increase low risk stands to a lesser degree than either Alternative 1 scenario. Alternative 4 would decrease high risk stands the least across the project area as a whole, but would address infestation by placing treatments adjacent to non-NFS lands and high-value sites. These alternatives are less flexible than Alternative 1 in responding to new infestations, which may mean longer response times and further spread of infestation.

Table 3-3. Mountain Pine Beetle Risk by Alternative – Acres and Percent of Pine Stands

Risk Class	Current Condition	Alternative 1 (most infestation)	Alternative 1 (least infestation)	Alternative 2	Alternative 4
Low	2,062 acres (19%)	6,124 acres (57%)	2,793 acres (26%)	2,672 acres (25%)	2,878 acres (27%)
Moderate	5,049 acres (47%)	3,182 acres (29%)	6,513 acres (60%)	6,127 acres (57%)	5,541 acres (51%)
High	3,719 acres (34%)	1,524 acres (14%)	1,524 acres (14%)	2,031 acres (19%)	2,411 acres (23%)

Structural Diversity (Project Area)

Alternative 0 would not alter the current SS distribution shown above in Table 3-3 except through further beetle infestation and other disturbances such as wildfire. If the beetle infestation continues to expand rapidly, acres of ponderosa pine in stages 3C, 4B, and 4C would continue to decrease. Epidemic populations could also affect smaller trees and those in stands with lower density. Table 3-4, Table 3-6, Table 3-7, and Table 3-7 show estimated SS distribution following implementation of Alternatives 1 (most infestation), 1 (least infestation), 2, and 4, respectively.

Table 3-4. Structural Stage Distribution after Implementation of Alternative 1, Most Infestation Scenario (Project Area)

Cover Type	Structural Stage (acres)								Total
	1	2	3A	3B	3C	4A	4B	4C	
Grass	3,112	0	0	0	0	0	0	0	3,112
Quaking Aspen	0	334	637	527	1,028	109	264	27	2,926
Bur Oak	0	0	50	191	65	0	70	61	437
Paper Birch	0	0	32	82	0	0	34	0	148
Other Hardwoods	0	0	0	24	0	70	93	89	276
Ponderosa Pine	2,326	102	226	203	262	3,829	1,989	1,893	10,830
Total	5,438	436	945	1,027	1,355	4,132	2,388	2,008	17,729*

*Does not include 77 acres of non-forested land.

Table 3-5. Structural Stage Distribution after Implementation of Alternative 1, Least Infestation Scenario (Project Area)

Cover Type	Structural Stage (acres)								Total
	1	2	3A	3B	3C	4A	4B	4C	
Grass	3,112	0	0	0	0	0	0	0	3,112
Quaking Aspen	0	334	637	527	1,028	109	264	27	2,926
Bur Oak	0	0	50	191	65	0	70	61	437
Paper Birch	0	0	32	82	0	0	34	0	148
Other Hardwoods	0	0	0	24	0	70	93	89	276
Ponderosa Pine	1,035	102	226	203	262	5,244	1,989	1,893	10,830
Total	4,147	436	945	1,027	1,355	5,423	2,450	2,070	17,729*

*Does not include 77 acres of non-forested land.

Under either scenario, Alternative 1 would substantially increase SS 1 and decrease 4B and 4C. Higher levels of infestation would result in more SS 1 and less 4A as affected stands lose most or all mature pines.

Table 3-6. Structural Stage Distribution after Implementation of Alternative 2 (Project Area)

Cover Type	Structural Stage (acres)								Total
	1	2	3A	3B	3C	4A	4B	4C	
Grass	3,112	0	0	0	0	0	0	0	3,112
Quaking Aspen	0	334	721	443	1,028	109	264	27	2,926
Bur Oak	0	0	50	191	65	0	70	61	437
Paper Birch	0	0	32	82	0	0	34	0	148
Other Hardwoods	0	0	0	24	0	81	40	131	276
Ponderosa Pine	326	102	227	182	158	4,553	3,120	2,162	10,830
Total	3,438	436	1,030	922	1,251	4,743	3,528	2,381	17,729*

*Does not include 77 acres of non-forested land.

In the absence of further infestation, Alternative 2 would retain more dense, mature stands than Alternative 1 and result in fewer SS 1 areas. If the infestation continues to increase, structural stage results could resemble those of Alternative 1, with fewer dense, mature stands and more open areas.

A change not reflected in the table would result from the proposed 357 acres of uneven-aged management. In treated stands, this prescription would gradually create variety in tree age, size, and spacing not well represented by structural stage classification. Alternative 2 also includes 323 acres of shelterwood seedcut, which would result in additional young forest within five to 10 years.

Table 3-7. Structural Stage Distribution after Implementation of Alternative 4 (Project Area)

Cover Type	Structural Stage (acres)								Total
	1	2	3A	3B	3C	4A	4B	4C	
Grass	3,112	0	0	0	0	0	0	0	3,112
Quaking Aspen	0	334	631	449	1,112	109	264	27	2,926
Bur Oak	0	0	56	185	65	0	70	61	437
Paper Birch	0	0	32	82	0	0	34	0	148
Other Hardwoods	0	0	0	24	0	81	40	131	276
Ponderosa Pine	326	102	230	182	155	5,166	2,111	2,558	10,830
Total	3,438	436	949	922	1,332	5,356	2,519	2,777	17,729*

*Does not include 77 acres of non-forested land.

By focusing treatments in MAs 3.32 and 5.4 adjacent to non-NFS lands and high-value sites, Alternative 4 would address beetle infestation risk in these areas while retaining more mature, dense stands as compared to Alternatives 1 and 2. The emphasis on thinning only trees less than 12 inches DBH in MA 5.1 would also reduce stand density less than the other alternatives. If the infestation continues to increase, however, structural stage results could resemble those of Alternative 1, with fewer dense, mature stands and more open areas.

The net change in pine structural stage acres from the current distribution is shown in **Table 3-8.**

Table 3-8. Changes in Pine Structural Stage Condition (Project Area)

Alternative	Structural Stage (acres)							
	1	2	3A	3B	3C	4A	4B	4C
Alternative 1 (most infestation)	2,000 ac (613%)	0	156 ac (223%)	21 ac (12%)	-53 ac (-17%)	847 ac (28%)	-1,794 ac (-47%)	-1,177 ac (-38%)
Alternative 1 (least infestation)	709 ac (117%)	0	156 ac (223%)	21 ac (12%)	-53 ac (-17%)	2,262 ac (76%)	-1,794 ac (-47%)	-1,177 ac (-38%)
Alternative 2	0	0	157 ac (224%)	0	-157 ac (-50%)	1,574 ac (53%)	-648 ac (-17%)	-908 ac (-30%)
Alternative 4	0	0	160 ac (228%)	0	-160 ac (-51%)	2,157 ac (72%)	-1,645 ac (-44%)	-512 ac (-17%)

Structural Diversity (Forest-wide by Management Area)

The Phase 2 Amendment includes objectives for distribution of pine stand structure and tree size. These objectives are applied on a management area basis. The objective is identical for MAs 5.1 and 5.4. There is no structural stage objective for MA 3.32.

> *Objective 5.1-204 and 5.4-206. Manage for the following percentages of structural stages in ponderosa pine across the management area in a variety of sizes and shapes.*

SS1	*5%*	*SS4A*	*25%**
SS2	*5%*	*SS4B*	*25%**
SS3A	*10%*	*SS4C*	*5%**
SS3B	*15%*	*SS5*	*5%*
SS3C	*5%*		

**10% of the structural stage 4 ponderosa pine acreage in the management area will have an average tree size of "very large". Seek opportunities to increase understory shrubs in open-canopy structural stages.*
***Active management is allowed, and may be necessary, to provide desired late-successional characteristics.*

As defined in forest vegetation databases, stands of "very large" trees have an average tree diameter at breast height (DBH) of at least 9 inches and, of the trees over 9 inches DBH, the average DBH is at least 16 inches.

Management Area 5.1

To demonstrate how the Burner project contributes to objective 5.1-204, **Table 3-9** displays existing structural stage distribution in MA 5.1 across the Forest and how the Burner alternatives would affect this distribution.

Table 3-9. Ponderosa Pine Structural Stage Distribution in MA 5.1 (Forest-wide)

Structural Stage	Objective (%)	Existing		Alternative 1 (max)*		Alternative 1 (min)**		Alternative 2		Alternative 4	
		Acres	%	Acres	%	Acres	%	Acres	%		
1	5	61,938	13	62,709	13	62,179	13	61,938	13	61,938	13
2	5	10,324	2	10,324	2	10,324	2	10,324	2	10,324	2
3A	10	18,833	4	18,921	4	18,921	4	18,990	4	18,993	4
3B	15	27,966	6	27,987	6	27,987	6	27,966	6	27,966	6
3C	5	12,934	3	12,825	3	12,825	3	12,777	3	12,774	3
4A	25	172,401	36	172,508	36	173,038	36	173,589	36	173,624	36
4B	25	126,491	27	125,904	26	125,904	26	125,689	26	125,648	26
4C	5	44,721	9	44,430	9	44,430	9	44,335	9	44,341	9
5	5	442	<1	442	<1	442	<1	442	<1	442	<1
Total	100	476,050	100	476,050	100	476,050	100	476,050	100	476,050	100

*Maximum infestation scenario
**Minimum infestation scenario

The table above shows that the Burner proposed action and alternatives would have little effect on overall distribution of pine structural stages in MA 5.1 across the Forest. All alternatives would contribute

toward meeting the objective by increasing stage 3A and decreasing stages 4B and 4C. All alternatives would, however, increase stage 4A, which is already well above the objective, and decrease stage 3C, which is below the objective. These changes are necessary in this area in order to respond to existing beetle infestation and to decrease the risk of further infestation.

Table 3-10 displays Forest-wide acres and percentages of very large trees in structural stage 4 in MA 5.1, and how these figures would change as a result of the Burner project. All of the proposed treatments in uninfested stands would remove smaller trees, increasing the average tree diameter present in these stands. If the beetle infestation continues to expand, acreage of very large trees could decrease under all alternatives, including no action. If this occurs, the action alternatives, especially Alternative 1, could decrease the loss of very large trees as compared to the no action alternative by decreasing risk of infestation.

Table 3-10. "Very Large" Tree Distribution in MA 5.1 (Forest-wide)

Objec-tive	Existing		Alternative 1 (most)		Alternative 1 (least)		Alternative 2		Alternative 4	
% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4
10%	40,635	12	40,635	12	40,635	12	40,635	12	40,635	12

Management Area 5.4

To demonstrate how the Burner project contributes to objective 5.4-206, **Table 3-11** displays existing structural stage distribution in MA 5.4 across the Forest and how the Burner alternatives would affect this distribution.

Table 3-11. Ponderosa Pine Structural Stage Distribution in MA 5.4 (Forest-wide)

Struc-tural Stage	Objec-tive (%)	Existing		Alternative 1 (max)		Alternative 1 (min)		Alternative 2		Alternative 4	
		Acres	%	Acres	%	Acres	%	Acres	%		
1	5	74,055	22	75,284	22	74,523	22	74,055	22	74,055	22
2	5	6,669	2	6,669	2	6,669	2	6,669	2	6,669	2
3A	10	24,107	7	24,175	7	24,175	7	24,107	7	24,107	7
3B	15	29,822	9	29,844	9	29,844	9	29,844	9	29,844	9
3C	5	21,159	6	21,091	6	21,091	6	21,159	6	21,159	6
4A	25	78,077	23	78,941	23	79,680	23	78,463	23	79,011	23
4B	25	69,604	20	68,397	20	68,397	20	69,740	20	68,802	20
4C	5	37,221	11	36,335	11	36,335	11	36,699	11	37,089	11
5	5	507	<1	507	<1	507	<1	507	<1	507	<1
Total	100	341,221	100	341,221	100	341,221	100	341,221	100	341,221	100

*Maximum infestation scenario
**Minimum infestation scenario

The table above shows that the Burner proposed action and alternatives would have little effect on overall distribution of pine structural stages in MA 5.4 across the Forest. All alternatives would contribute toward meeting the objective by increasing stages 3B and 4A and decreasing 4C. Alternative 1 would contribute toward meeting the objective by increasing stage 3A and decreasing stage 3C. Alternatives 1

and 4 would move stage 4B further from the objective as a result of treatments designed to reduce risk of beetle infestation.

Table 3-12 displays Forest-wide acres and percentages of very large trees in structural stage 4 in MA 5.4, and how these figures would change as a result of the Burner project. All of the proposed treatments in uninfested stands would remove smaller trees, increasing the average tree diameter present in these stands. If the beetle infestation continues to expand, acreage of very large trees could decrease under all alternatives, including no action. If this occurs, the action alternatives, especially Alternative 1, could decrease the loss of very large trees as compared to the no action alternative by decreasing risk of infestation.

Table 3-12. "Very Large" Tree Distribution in MA 5.4 (Forest-wide)

Objec-tive	Existing		Alternative 1 (most)		Alternative 1 (least)		Alternative 2		Alternative 4	
% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4
10%	17,505	9	17,505	9	17,505	9	17,505	9	17,505	9

Snags

The ongoing mountain pine beetle infestation has created numerous snags across the project area, with some stands containing hundreds of dead trees. Snag densities in the project area appear to be well above the levels specified in Forest Plan objective 211 (three snags per acre meeting certain diameter and height requirements). Proposed activities would result in the loss of some of these snags, but all alternatives would comply with standard 2301 by retaining non-hazardous snags over 20 inches DBH. Hazardous snags would be cut where necessary to ensure worker safety. In salvage areas, dead trees that are less than 20 inches DBH, show no signs of cavity nesting, and have remaining commercial value would be cut, which is allowable under standard 2301. Alternative 4 does not include salvage or prescribed fire and would result in loss of the fewest snags. Under the Alternative 1 maximum infestation scenario, more snags are likely to be cut, but many more would also be created by the infestation. Alternative 2 and the Alternative 1 minimum infestation scenario would have about equal potential for snag loss. Prescribed burning proposed under Alternatives 1 and 2 may create additional snags. In stands where treatment or infestation reduces canopy substantially, increased exposure to wind may reduce the lifespan of soft snags; wind and snowstorms also may break the tops off some of the remaining live trees, creating additional snags.

Mature live trees would continue to dominate stands across the project area and provide opportunities for development of future snags. Thinning reduces trees' susceptibility to beetles and fire, however, and may reduce mortality rates, which could affect future snag densities in the project area. None of the alternatives would, however, be expected to affect achievement of Forest-wide objective 211. Due to recent fire and beetle infestation events, the number of snags on the Forest as a whole has substantially increased. In some of the disturbed areas, including some stands in the Burner area, only snags exist. According to the Phase 2 FEIS, the forest vegetation database shows more than three dead trees per acre greater than 9 inches DBH in each structural stage. Therefore, snag recruitment (future snags) would be provided by the diversity of structural stages in the structural stage objectives (Objectives 5.1-204 and 5.4-206). All Burner alternatives would contribute to these objectives with exceptions (discussed above) designed to reduce infestation risk. The number of snags per acre across the landscape is presently being met and is likely to be met in the future under all alternatives.

Late-Succession Forest

The project area contains no stands designated for management as late succession. There are approximately 3,070 acres of dense, mature pine in the project area, though beetle infestation has reduced the density of some of these stands. There are no stands designated for management as late succession. Alternative 1 would reduce this figure to 1,177 acres, Alternative 2 to 2,162 acres, and Alternative 4 to 2,558 acres. Most structural stage 4C stands are at high risk of infestation, so acreage of these stands would probably decrease under the no action alternative as well.

Timber Volume Production

Table 3-5 displays the estimated merchantable timber volume to be harvested under each alternative. Values were generated using the Forest Vegetation Simulator (FVS). Mechanical fuel reduction was categorized as a non-commercial treatment. Alternatives 1, 2, and 4 would contribute to the Forest's allowable sale quantity for the second decade of the revised Forest Plan.

Table 3-13. Estimated Timber Volume by Alternative

Product	Alternative 1*	Alternative 2	Alternative 4
Sawtimber	17,200,000 to 18,300,000 board feet (3,440,000 to 3,660,000 cubic feet)	8,800,000 board feet (1,760,000 cubic feet)	12,700,000 board feet (2,540,000 cubic feet)

*Figures are presented for the low and high infestation scenarios.

Culmination of Mean Annual Increment

The National Forest Management Act generally prohibits the harvest of stands before they reach their maximum growth rate, or culmination of mean annual increment (16 U.S.C. 1604(m)). Exceptions in this law allow the harvest of individual trees, or even parts or whole stands of trees, before this time in order to thin and improve timber stands and salvage damaged stands of trees (16 U.S.C. 1604(m1)). Further exceptions are allowed in order to achieve multiple-use objectives other than timber harvest (16 U.S.C. 1604(m2)).

Alternatives 1, 2, and 4 would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in 16 U.S.C. 1604(m2), and include the following: thinning, sanitation, salvage, firewood cutting, fuelbreak maintenance, and fuel treatments. These treatments are proposed to meet the Forest Plan multiple-use objectives stated in Chapter 1.

Cumulative Effects

The cumulative effects boundary for the vegetation resource is the project area boundary, including private land inholdings.

Recent timber sales are described in Section 3.1. Cumulatively, these projects reduced area of mature, closed canopy stands while increasing mature stands with open to moderately open canopies, often with an understory of regenerating pine, oak brush, or other hardwoods. Fire suppression and livestock grazing allowed open areas to become overgrown with trees. The Sundance Fuels project is reducing

fuels and reducing density of small-diameter trees. Larger wildfires (see page 3-3) resulted in some of the diversity of vegetation found in the project area today.

The proposed treatments would reduce the density of pine stands. This landscape would be less prone to mountain pine beetle infestation. The cumulative effect would be a forest composed of mature, fairly open, single-storied pine stands, interspersed with aspen, birch, oak, and openings. The size of open areas would vary depending on the course of the beetle infestation, and are likely to be largest under the no action alternative. This alternative would not add to cumulative effects of vegetation management. Alternative 1 is likely to add to the cumulative effects of vegetation management by maintaining mature pine forest rather than allowing beetle infestation to set back forest succession. Prescribed fire included with this alternative would reduce cumulative effects by reducing fuel loading and smaller stems and rejuvenating grasses and forbs. Alternative 2 would make a similar contribution to cumulative effects as Alternative 1, though on a smaller scale. Regeneration cutting proposed under Alternative 2 would result in younger pine stands, which are rare in the project area due to past management and fire suppression. Alternative 4 would have the smallest additive effect due to the limited scale of treatments and lack of prescribed fire.

3.2.2 Wildlife

This section summarizes the wildlife biologist's report, biological evaluation, and biological assessment, which are located in the project file. The full reports contain detailed data and descriptions of habitat associations for threatened, endangered, sensitive, and management indicator species, species of local concern, game species, and migratory birds.

Common to all species are the potential effects of mountain pine beetle infestation, fuel loads, and fire hazard on the availability of preferred structural stages. Fuel loads would be highest under the no action alternative, lowest under Alternative 1, and moderate under Alternatives 2 and 4. Fire hazard ratings would be highest under the no action alternative, lowest under Alternative 1, and moderate under Alternatives 2 and 4. Mountain pine beetle risk would be highest under the no action alternative, lowest under Alternative 1, and moderate under Alternatives 2 and 4. Collectively, a large-scale crown fire or insect outbreak would be most likely under the no action alternative and less likely under Alternatives 1, 2, and 4.

The cumulative effects analysis area for species discussed below is all lands within the project area regardless of ownership.

Federally Listed Species

Twenty-one federally listed wildlife species have been identified by Region 6 of the U. S. Fish and Wildlife Service (USFWS). Of these, the black-footed ferret and bald eagle are the only species that have the potential to occur on the Black Hills National Forest (USFWS 2004). One federally listed species, the bald eagle, is known to occur in the project area.

Bald Eagle

In the Black Hills, this species is a winter resident (Tallman et al. 2002). Bald eagles have been observed in the project area in winter. Nesting was not known to have been attempted in the Black Hills until early 2004, when a pair was observed displaying nesting behavior near a lake in the southern Black Hills. The eagles left the area in spring without nesting successfully. Reasons for the nest failure are not known. Bald eagles have also been documented nesting in Meade County, South Dakota, to the east of the Black Hills. No nesting, winter roosting, or roost trees have been documented in the project area. There is no likely nesting habitat in the project area due to lack of large water features.

There is one confirmed communal winter roost site in the Black Hills (Staab 2006, pers. comm.). The roost site is approximately 60 miles from the project area near a large lake. The ponderosa pine landscape in the project area provides abundant suitable roost structures that are used on a transitory basis. Transitory roost sites do not appear to be a limiting factor on the Forest.

Bald eagles occur sporadically in winter and spring across the Forest, and their presence appears to be determined more by the availability of carrion than any other factor. Reported observations of bald eagles on the Black Hills National Forest totaled 37 in the winter of 1997-98, 82 in 1998-99, 47 in 1999-2000, 27 in 2000-01, 75 in 2001-02, and 98 in 2002-03 (USFS 2004b). On the Bearlodge District, 15 bald eagles were documented in the winter of 1999-2000, 15 in 2002-03, 35 in 2003-04, and 34 in 2004-05. Populations appear to be stable to increasing.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct or indirect effects on bald eagles because no new activities would occur. Bald eagle use of the project area would not be affected. Under Alternatives 1, 2, and 4, proposed activities would have no effect on bald eagles because there are no known or expected eagle nests or traditional winter roost sites in the project area. Transitory roost sites are not a limiting factor in the project area, so removal of any when not in use by bald eagles would have no consequences for eagle reproduction or survival. If any traditional or transitory roost sites are found in the project area during project layout or implementation, they would be protected from disturbance in accordance with the Endangered Species Act and Forest Plan standard 3101 (Appendix A). Habitat for bald eagles would be conserved under all alternatives in accordance with Forest Plan objective 220 (USFS 2005).

Cumulative: No cumulative effects are anticipated. Under all alternatives, there would be no effect on habitat for wintering and migrating eagles and no effect on potential nesting habitat. Populations of wintering eagles would likely continue to be well supported in and around the Forest and in the project area. Deer carrion, bald eagles' primary winter food source in the Black Hills, would continue to be available. Eagle populations are likely to remain stable or continue to increase across the Forest. None of the alternatives would affect trend of eagle habitat or population. All alternatives would conserve eagle habitat in accordance with objective 220.

Determination

Implementation of Alternative 0 would have no effect on the bald eagle. This determination is based on the lack of new activities. Activities proposed under Alternative 1, 2, or 4 would have no effect on the bald eagle because there are no known or expected eagle nests or traditional winter roost sites in the project area or on the District. Transitory roost sites are not a limiting factor in the project area or on the Forest, so inadvertent removal of any when not in use by bald eagles would have no consequences for eagle reproduction or survival. Any traditional or transitory roost sites identified in the Burner project area during project layout or implementation would be protected from disturbance in accordance with the Endangered Species Act and Forest Plan direction.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Emphasis Species – Region 2 Sensitive Wildlife Species

Twenty-six sensitive species have been identified as potentially occurring on the Forest (USFS 2003). The full list is contained in the Burner Project Biological Evaluation, located in the analysis file. Of these, 16 species or their habitats (**Table 3-14**) may occur in the project area and are discussed in this section. Occurrence of five of these species has been documented in the project area.

Table 3-14. Sensitive Wildlife Species Evaluated

Common Name	Scientific Name	Documented in Project Area
Black Hills redbelly snake	*Storeria occipitomaculata pahasapae*	Yes
Black-backed woodpecker	*Picoides arcticus*	No
Cooper's Rocky Mountain snail	*Oreohelix strigosa cooperi*	No
Finescale dace	*Phoxinus neogaeus*	Yes
Flammulated owl	*Otus flammeolus*	No
Fringed myotis	*Myotis thysanodes*	No
Grasshopper sparrow	*Ammodramus savannarum*	Yes
Lewis's woodpecker	*Melanerpes lewis*	No
Loggerhead shrike	*Lanius ludovicianus*	No
Mountain sucker	*Catostomus platyrhynchus*	No
Northern goshawk	*Accipiter gentilis*	Yes
Northern leopard frog	*Rana pipiens*	Yes
Peregrine falcon	*Falco peregrinus*	No
Regal fritillary butterfly	*Speyeria idalia*	No
Townsend's big-eared bat	*Corynorhinus townsendii*	No
Yellow-billed cuckoo	*Coccyzus americanus*	No

Black-backed woodpecker, grasshopper sparrow, and mountain sucker are also designated as Management Indicator Species (MIS), and are discussed both in the sensitive species and MIS sections of this document.

Fringed Myotis

This discussion of fringed myotis is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 264-268. Detailed information on fringed myotis status and habitat contained in Appendix C is incorporated here by reference.

This bat is a late evening flyer, feeding mainly on small moths high in the forest canopy or over dense vegetation close to the ground; it will occasionally glean insects from leaves. It roosts near entrances to mines and caves that are used for hibernating. Tree cavities may occasionally be used as daytime roosts. Caves with high humidity, cool temperatures, and numerous crevices and fractures are preferred for hibernation. This species has been documented in Crook County (Fertig and Beauvais 1999) and is a year-round Black Hills resident (SDBWG 2004). It is active from April through September (Barbour and Davis 1969). Threats include disturbance to hibernacula and maternity roosts, and loss of habitat due to mine closure/collapse (Schmidt 2003). There are no known hibernacula in the Burner project area.

The Forest monitors this species at winter roost sites (hibernacula) across the Black Hills National Forest. Ten individuals were found during winter surveys between 1992 and 1995. Eight of these were roosting individually in rock crevices. Summer bat surveys during the same time period yielded 75 individuals (Tigner and Dowd Stukel 2003). In 1997, three fringed myotis were mist-netted on Bearlodge District.

In FY 2003, five hibernacula were monitored across the Forest, with this species found at one location. Because this species tends to hibernate individually, most often in cracks and crevices, and to change roost sites often in summer, it can be difficult to locate; consequently, few observations have occurred despite monitoring efforts. In 2003, the Forest installed or repaired gates at seven roost sites to protect the species from human disturbance, and in 2005 Bearlodge District re-opened a mine in the project area and installed a gate to protect the habitat for use by bats. This protection reflects an upward trend in known/potential bat habitat and demonstrates active management to successfully accomplish the intent of objective 221 (USFS 2004b).

Analysis of Effects

Direct and Indirect: No known caves occur in the project area. One collapsed mine entrance was re-opened and gated in 2005 to provide bat habitat. No other mines suitable for bat use are known. Bat use of the re-opened mine has not yet been assessed, but no activities that would affect the mine are proposed under any alternative. Rock crevices exist in cliffs, but these areas also would not be affected by any proposed activities. Under Alternative 0, mature stands would provide day roost opportunities, but little foraging habitat. Under the action alternatives, treatments that remove mature and dense canopy stands may reduce the availability of day roosts. Inadvertent loss of some individuals or snags with cavities is unlikely but possible under Alternatives 1, 2, and 4 if undetected roosts are present in treated areas. Snag removal would be allowed to protect worker safety, and for construction of roads, skid trails, and firelines. Dead trees less than 20 inches DBH without cavities would also be cut during salvage operations if commercial value remains. Snags would also persist in untreated stands, including areas of untreated beetle infestation. Mature trees would continue to dominate pine stands, and management towards structural stage objectives would provide snags through time. Alternative 1 would affect the most potential day roost habitat. Alternatives 2 and 4 would affect less of the potential habitat than Alternative 1.

Cumulative: Impacts over time on maternity, hibernating, and roosting habitat have probably been negligible due to the lack of caves and few mines within the project area. Snag distribution on the landscape has been altered through fire suppression and removal of snags during past timber harvest and firewood cutting. Alternative 1 has the greatest chance of affecting fringed myotis habitat due to the potential scale of treatments. Snag retention criteria would reduce the potential for landscape-level impacts to this species. All alternatives would conserve habitat for this species (objective 221).

None of the alternatives would affect availability of undisturbed caves and mines, this species' most critical and vulnerable habitat. Other species, such as the brown creeper and black-backed woodpecker, depend more on snag habitat than fringed myotis and for this project are more indicative of potential effects on snag-dependent wildlife.

Determination

Implementation of Alternative 0 would have no impact on the fringed myotis. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individual fringed myotis bats, but is not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing. This determination is based on the limited potential to harm individual bats and remove suitable habitats, including day roost sites.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with

Forest Plan direction is included in the wildlife specialist's report.

Townsend's Big-eared Bat

This discussion of Townsend's big-eared bat is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 271-275. Detailed information on big-eared bat status and habitat contained in Appendix C is incorporated here by reference.

This species inhabits shrub-steppe, forest edge, pinyon-juniper, and dry forest types (Higgins et al. 2000). It typically roosts in caves, mineshafts, rock outcrops, lava tubes, and buildings. It is not known to use snags in the Black Hills (USFS 2000) and depends on underground roosts year-round (Schmidt 2003a). Big-eared bats primarily consume moths, and riparian areas provide abundant prey. In the Black Hills, this species is the most commonly encountered hibernating bat. Disturbance by humans, especially in hibernacula and maternity roosts, can threaten survival of these animals (Barbour and Davis 1969).

Between 1992 and 1995, 105 Townsend's bats were banded in the Black Hills (Tigner and Dowd Stukel 2003). Winter surveying at one Black Hills cave yielded 300 Townsend's bats in 2000, 218 in 2001, 235 in 2002, and 260 in 2003 (USFS 2004b).

Forest-wide populations appear to be relatively stable or slightly increasing (USFS 2004b). The Forest has installed or repaired gates at a number of mines and caves in recent years, including seven in 2003 and one in the project area in 2005 (at a previously collapsed mine entrance). This protection represents improvement of known and potential bat habitat and demonstrates active management to successfully accomplish the intent of Forest Plan objective 221 (USFS 2004b).

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effect on Townsend's big-eared bats because no new activities would occur. Treatments proposed under Alternative 1, 2, or 4 are unlikely to directly affect this species because, though bats may forage in the project area, there are no known hibernacula or maternity roosts. The re-opened and gated mine has not yet been assessed for bat use, but none of the alternatives propose activities near it. Inadvertent loss of some individuals or roosts is unlikely but possible if undetected roosts are present in treated areas. Prescribed fire and some mechanical vegetation treatments may increase prey availability (Cerovski 2002, Dykstra et al. 1999).

Cumulative: Impacts over time on maternity, hibernating, and roosting habitat have probably been negligible due to a lack of caves and mines in the cumulative effects area. None of the alternatives would affect availability of undisturbed caves and mines, this species' most critical and vulnerable habitat. All alternatives are in accordance with objective 221.

Determination

Implementation of Alternative 0 would have no impact on the Townsend's big-eared bat. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing. This determination is based on the possibility that individual bats could be harmed being remote due to lack of known caves and mines.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives.

All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Goshawk

This discussion of northern goshawk is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation). Detailed information on goshawk status and habitat contained in Appendix C is incorporated here by reference.

Goshawks generally occur in mature or old growth aspen, conifer, or mixed aspen/conifer forests. They nest primarily in mature and old growth forest with large trees and high canopy closure (habitat structural stages 4B, 4C, and dense 5), suggesting that these areas are particularly important to northern goshawks (Reynolds et al. 1982, Hayward and Escano 1989, Squires and Ruggiero 1996). Preferred nesting habitat for goshawk in the Black Hills is mature ponderosa pine stands with more than 50 percent canopy closure (Bartelt 1977, Erickson 1987). Although uncommon, goshawk has consistently been the most frequently observed accipiter in the Black Hills (Panjabi 2005). They are considered a rare to uncommon resident in the northern Black Hills (Bartelt 1977).

Goshawk territory occupancy was last assessed in the Fiscal Year 2003 Black Hills National Forest Monitoring Report (USFS 2004b). Territory occupancy in 2003 was higher across the Forest than any year since 1999 (USFS 2004b). Population trend appears to be relatively stable or slightly decreasing due to habitat loss to wildfires. Goshawk nesting activity (and territoriality/ detectability) is known to fluctuate annually and may depend on weather and other random or variable events. Goshawk habitat appears to have been relatively stable over the five-year reporting period, but observed natural events and management activities have caused some reduction in nesting habitat. New or previously unknown nests have also been discovered.

Goshawk surveys have been conducted in the project area annually since 2002. Goshawk surveys followed the Southwestern Region Goshawk Inventory Protocol (Lloyd 1992) and survey methodology outlined in Bosakowski (1999). Three territories are thought to exist. The northern territory includes a nest that was active in 2004 and 2005. The central territory includes a nest found in 2003 and active in 2003, 2004, and 2005. In 2004, the nesting attempt failed for unknown reasons. The southern territory has not been active since it was first recorded in 2002. Reasons for lack of activity are not known. There were no known, new disturbances at the nest sites or widespread across the territory. If any new nest sites are discovered during project implementation, they would be protected in accordance with the Forest Plan and Phase 2 Amendment. The central territory and nest stands are located in the most heavily beetle-infested part of the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 is likely to result in loss of many live trees in the nest stands in the central territory and possibly the southern territory due to beetle infestation. If expansion of the beetle infestation slows, succession of vegetation communities would provide an increase in the amount of suitable nesting habitat but a decrease in the amount of suitable foraging habitat. Small pockets of infestation could, however, provide open foraging areas. If the beetle infestation expands quickly, density of some potential nest stands could decrease substantially.

No treatments are proposed under any alternative in nest stands in the north territory.

In the central territory nest stands, Alternatives 2 and 4 propose sanitation. Sanitation would remove green infested trees to reduce the spread of the infestation and keep as many mature trees alive as

possible. To provide snags for prey habitat and down woody material, salvage would not take place. This treatment would maintain the stands' value for goshawks. If the nest is active the year or years when treatments are implemented, timing restrictions would apply (Forest Plan standard 3111). Alternative 1 proposes no action in these stands. If they escape heavy infestation, they would continue to provide high-quality nesting habitat in an area where goshawks have been active the past several years. If infestation kills a high percentage of the mature trees, goshawks would probably be displaced.

Alternative 1 proposes adaptive treatment and/or prescribed burning in 118 of the 180 acres in the southern territory nest stands. Removal of mature trees would not normally be proposed in nest stands, but continued beetle infestation that leads to loss of most or all live trees in a nest stand could have a long-term negative effect due to the high site fidelity of goshawks. Therefore, the treatment would maintain the stands' value for goshawks. The remaining acres are at risk of infestation, but no treatment is proposed due to the presence of steep, unstable soils. Loss of the stands may be less likely under the no action alternative than in the central territory because infestation is currently not as heavy in this area. Alternatives 2 and 4 would take no action in any of the southern territory nest stands.

Design criteria to restrict the timing of activities near goshawk nests would be applied under all alternatives (Chapter 2 and Appendix A). Nevertheless, foraging goshawks may be displaced or disturbed by project activities. All action alternatives could result in mortality of individuals if trees with currently unknown, occupied nests were cut. This is unlikely to occur because goshawks are defensive and vocal around nests, and any newly discovered nests would be protected in accordance with Forest Plan direction. Alternatives that reduce density of the most mature stands would have the greatest potential to affect goshawk nesting habitats. Alternative 1 would affect the most structural stage 4B and 4C, followed by Alternative 2, and then Alternative 4. There is a higher potential for a large-scale fire or insect outbreak to destroy goshawk nesting and foraging habitats under Alternative 0 than under Alternative 1, 2, or 4. The potential for these large-scale events to occur would normally be low but is currently moderate due to the beetle infestation.

Cumulative: Past timber harvest, beetle infestation, and wildfires in the project area have decreased suitable goshawk nesting habitat while improving habitats for prey species such as red squirrels and ruffed grouse. Proposed activities would reduce density of some mature stands, possibly reducing suitability as goshawk nesting habitat. The no action alternative is also likely to decrease stand density due to continued beetle infestation. By reducing risk of infestation and potential fire intensity and spread, the action alternatives would decrease risk of widespread loss of goshawk nesting and foraging habitat. All action alternatives would open up forest understories, acting against the cumulative trend of loss of these foraging areas due to fire suppression. The project would therefore conserve or enhance habitat for this species (objective 221).

Foreseeable actions on non-NFS lands in the project area are not expected to affect this species. Regarding the two largest parcels of non-NFS land, the Warren Peak block is mostly open grassland, and no known activities are planned on the state land in section 16.

Determination

Implementation of Alternative 0, 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to disrupt goshawk behavior and to modify preferred nesting and foraging habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that goshawk is likely to persist on the Forest over the next 50

years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Peregrine Falcon

This discussion of peregrine falcon is tiered to the Phase II Amendment FEIS, Appendix C, pages 246 - 248. Detailed information on peregrine falcon status and habitat contained in Appendix C (Biological Assessment/Biological Evaluation) is incorporated here by reference.

This bird inhabits open country and is often associated with cliffs. It may also nest in old hawk or raven nests or on tall buildings (DeGraff et al. 1991). The peregrine falcon was delisted by the U.S. Fish and Wildlife Service in 1999 and is considered recovered from endangered status in many areas, but is listed as a species of concern in Wyoming.

In the Black Hills, peregrine falcons are uncommon spring migrants, rare fall migrants, and rare winter visitors (Tallman et al. 2002). Historical records suggest nesting in Dark Canyon near Rapid City in 1948 and 1956, and a juvenile bird was banded in 1960 (Pettingill and Whitney 1965). There are no confirmed breeding records since that time despite sporadic reports of peregrines in Spearfish Canyon. This species has not been documented in the Burner project area.

Analysis of Effects

Direct and Indirect: The no action alternative would have no direct effect on the peregrine falcon because no new activities would occur and the ongoing beetle infestation would not affect preferred habitat. There is a remote possibility that nests could be affected under the action alternatives if old hawk nests are used. Any newly discovered raptor nests would be protected (Forest Plan standard 3204, Appendix A). Due to mobility of adults and lack of activities in preferred cliff habitat, direct effects are unlikely to occur. Both beetle infestation and proposed treatments could create marginally suitable foraging habitat.

Cumulative: Peregrine falcons have not been observed in four years of monitoring across the Forest (USFS 2004b). Past activities in the project area are unlikely to have affected peregrine falcons due to shortage of suitable cliff habitat and lack of activities in these areas. Proposed activities are equally unlikely to affect this species' habitat. All alternatives would conserve or enhance habitat for this species (objective 221).

Determination

Implementation of the no action alternative would have no impact on peregrine falcons. This determination is based on the lack of new activities in the project area. Implementation of the action alternatives may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the very small potential of each alternative to disrupt nesting.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase II Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Flammulated Owl

This discussion of flammulated owl is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 211-215. Detailed information on flammulated owl status and habitat contained in Appendix C is incorporated here by reference.

This species primarily inhabits mature, open ponderosa pine forests, or dry montane conifer or aspen forests, often with dense saplings, oak, or other brushy understories. This owl is primarily insectivorous, eating moths, crickets, grasshoppers, and beetles, but is also known to prey on small mammals and birds. It hunts exclusively at night. Flammulated owl nests are located in natural cavities or abandoned woodpecker holes and are reused year after year. Nests sites providing open, mature canopy conditions (open flight path to nest) appear to be preferred (McCallum 1994).

One unverified report of a flammulated owl in the southern Black Hills was made during the early 1990s (Tallman et al. 2002). The species was not reported again until 2002, this time in the northern Black Hills. In 2003, the South Dakota Department of Game, Fish and Parks contracted biologists to monitor and survey for owls; the contractors did not locate any flammulated owls. The mixed results could mean flammulated owls occur here at very low density within very specific habitat types or only during migration or transient periods (USFS 2004b).

No owl surveys have been conducted in the project area. There is no information suggesting that flammulated owls are established or breeding in the area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effect on the flammulated owl because no new activities would occur. Mature stands would provide preferred flammulated owl habitats. Continued beetle infestation may create more open-canopy stands or convert pine stands to grass or hardwood cover. Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Under Alternatives 1, 2, and 4, commercial thinning would create preferred nesting and foraging conditions for this species by promoting open, mature stands. Alternative 1 may increase flammulated owl habitat the most by nearly doubling the acreage of structural stage 4A. Similar habitat effects would occur under Alternatives 2 and 4, but to a lesser extent, with Alternative 2 providing the smallest increase in stage 4A.

Cumulative: Past timber harvest in the project area has often resulted in potential flammulated owl habitat in the form of mature stands of relatively low density. Ongoing and foreseeable activities other than beetle infestation would have little effect on this type of habitat. Proposed thinning treatments applied across the landscape would add to this cumulative effect. All alternatives would conserve or enhance potential flammulated owl habitat in accordance with Forest Plan objective 221.

Determination

Implementation of Alternative 0 would have no impact on the flammulated owl. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the small potential for occupied trees to be cut and potential improvements to preferred habitat.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that possible colonization or establishment of flammulated owls on the Forest would not be affected if standards and guidelines are followed, and if conditions move towards

management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Yellow-billed Cuckoo

This discussion of yellow-billed cuckoo is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 248-251. Detailed information on yellow-billed cuckoo status and habitat contained in Appendix C is incorporated here by reference.

This species favors moderately dense thickets near watercourses, second-growth woodlands, deserted farmlands overgrown with shrubs and brush, and brushy orchards for habitat. The cuckoo also inhabits open woods, avoiding extremely dense woods and high elevations (Haldeman 1980). In the Black Hills area, it is associated with lower-elevation riparian forests of cottonwood, willow, and oak. This habitat is found primarily on the periphery of the Black Hills.

The range of the yellow-billed cuckoo includes interior California and northern Utah to southwest Quebec and southern New Brunswick, south to southern Arizona and into Mexico. Yellow-billed cuckoos winter in South America (DeGraaf et al. 1991). There are scattered records in southwest South Dakota and no records in the higher Black Hills (SDOU 1991). During 2002, a Rocky Mountain Bird Observatory technician observed at least three yellow-billed cuckoos in bur oak along Beaver Creek in the Bear Lodge Mountains, outside the project area. None have been observed by RMBO in subsequent years. This species is rare but nevertheless apparently occurs in the Bear Lodge Mountains and possibly elsewhere in the Black Hills (Panjabi 2003).

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effect on the yellow-billed cuckoo because no new activities would occur. Most bur oak in the project area is in the form of brush rather than trees; these oak stands would generally persist and possibly stagnate in the absence of management influences, though they may expand where beetle infestation kills overstory pine. Under Alternatives 1, 2, and 4, proposed treatments would open the forest canopy and allow understory species such as oak to increase. Oak also responds well to burning, which is proposed under Alternatives 1 and 2.

Cumulative: Past activities in the project area have probably increased acreage of oak brush but may have decreased mature oak and riparian communities through fire suppression and pine encroachment. Proposed treatments may increase coverage of oak and other hardwood species, improving potential cuckoo habitat. All alternatives would conserve or enhance habitat for this species (objective 221).

Determination

Implementation of Alternative 0 would have no impact on the yellow-billed cuckoo. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on a small potential for disturbance of nests.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black-backed Woodpecker

This discussion of black-backed woodpecker is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 196-205. Detailed information on black-backed woodpecker status and habitat contained in Appendix C is incorporated here by reference.

Suitable habitat for black-backed woodpecker includes mature and immature pine stands with canopy cover of at least 60 percent (Mohren and Anderson 2001). This species is associated with fires and insect outbreaks. In the Black Hills, this species is considered a rare permanent resident in higher elevations (Tallman et al. 2002) and has been documented most often in recently burned areas (Panjabi 2005). This species' preference for burned forests in a time of fire suppression, its eruptive populations, and lack of population information has identified it as a species of concern (Finch 1992). Black-backed woodpeckers have not been documented in the project area. Suitable habitat in the project area is found in pine stands infested by mountain pine beetles as well as uninfested dense stands.

The Forest monitors this species through the Rocky Mountain Bird Observatory (RMBO). Other woodpecker studies have been conducted in the Black Hills in the last five years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed 24 black-backed woodpeckers in 2001 and 134 in 2002. Seventy-five were observed in 2003. In 2004 and 2005, 68 and 46 were observed (respectively) in fewer habitat types than were surveyed in previous years (Panjabi 2005).

Analysis of Effects

Direct: Alternative 0 would increase potential habitat for black-backed woodpeckers. Beetle infestation, particularly in dense stands, would provide preferred habitat. The suitability of this habitat is likely to decline after two to three years, since black-backs are associated with the early stages of decay. Any wildfires following the infestation would further improve habitat.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and large fires compared with Alternative 0. All alternatives, including no action, would also reduce dense, mature pine stands; Alternative 1 may have the greatest effect, especially under the least-infestation scenario, as more stands would be preventively thinned (see structural stage discussion starting on page 3-11). Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nesting trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety and during salvage and fuelwood harvest. Snags over 20 inches DBH and those with cavities would be retained. For further discussion of effects on snags, see page 3-15.

Cumulative: Beetle infestation has created suitable black-backed woodpecker habitat in the project area, acting to some degree against the cumulative effect of past actions. Fire suppression has allowed mature stands to persist in some areas, while timber harvest and other activities have decreased density of other mature stands and reduced snag numbers. Under the no action alternative, beetles are likely to continue converting pine stands into preferred black-back habitat. Beetle infestation would also continue under the action alternatives, though on a smaller scale. The suitability of some potential habitat would decrease, adding to cumulative effects. Proposed prescribed burning would probably create small, scattered pockets of black-backed woodpecker habitat, but generally would not kill mature trees or add substantially to habitat for this bird. The amended Forest Plan includes direction to provide suitable

habitat across the Forest by retaining up to 10,000 acres of burned or infested forest (objective 11-03), ensuring continued availability of habitat regardless of the effect of this project.

Determination

Implementation of Alternative 0 would have a beneficial impact on the black-backed woodpecker. This determination is based on the likelihood that the beetle infestation will continue to create preferred habitat. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential for project activities to harm individuals and remove suitable habitats while allowing continued infestation in some areas and complying with Forest Plan standards and guidelines.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that black-backed woodpeckers are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Lewis's Woodpecker

This discussion of Lewis's woodpecker is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 220-225. Detailed information on this woodpecker's status and habitat contained in Appendix C is incorporated here by reference.

Lewis's woodpecker inhabits open country with scattered trees. Open, park-like ponderosa pine forests are believed to be primary breeding habitat (Anderson 2003, DeGraaf et al. 1991). This species is known to nest in burned areas. In a ponderosa pine forest in southeastern Wyoming, Linder and Anderson (1998) found 98 percent of nests were surrounded by burned ponderosa pine. Lewis's woodpeckers also inhabit mature cottonwood riparian areas and oak woodlands. In southeastern Colorado, this woodpecker used large dead or decaying cottonwoods for nesting and winter mast storage, and tended to avoid dense stands of trees throughout the year (Vierling 1997). Snags at least 12 inches in diameter are preferred for nesting (Thomas et al. 1979). This species is vulnerable to loss of large snags and large-diameter trees through timber harvest. Lewis's woodpecker has not been observed in the project area.

Analysis of Effects

Direct and Indirect: Burned areas provide the most suitable Lewis's woodpecker habitat in the project area, though most of these areas have probably aged too much to still provide preferred habitat. None of the alternatives would affect burned stands. Beetle-infested stands may provide marginal habitat, though Lewis's woodpeckers tend to prefer older snags. Alternative 0 is likely to continue to provide new areas of infestation. Any wildfires following the infestation would create highly suitable habitat for this species.

Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Snags over 20 inches DBH and those with cavities would not be cut except where necessary for safety reasons. Prescribed burning proposed under Alternatives 1 and 2 may create some suitable habitat, but the burns are not intended to kill large areas of mature trees. The chance of discernable effects under any alternative is small due to the marginal habitat provided by beetle infestation.

Cumulative: Nine Lewis's woodpeckers were detected during 2003 Rocky Mountain Bird Observatory efforts, all within burned areas. This was the largest number of Lewis' woodpeckers observed in the Black Hills since the start of the bird monitoring program. Four were observed in 2004 and eight in 2005. This species prefers nesting in older snags; therefore, habitat is expected to increase as recent burns age (USFS 2004b). Past timber harvest and fire suppression have generally discouraged formation of optimal habitat for this species. Because proposed activities would not create large burned areas and would decrease the chance of stand-replacing fires, they would add minimally to cumulative effects in the project area and affect Forest-wide habitat for Lewis's woodpeckers negligibly. All alternatives would conserve or enhance habitat for this species (objective 221).

Determination

Implementation of Alternative 0 would have no impact on the Lewis's woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the small potential for loss of nests and suitable nest sites during project implementation.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Loggerhead Shrike

This discussion of loggerhead shrike is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 225-229. Detailed information on loggerhead shrike status and habitat contained in Appendix C is incorporated here by reference.

This bird inhabits brushy savannah areas with a limited number of trees. Shrikes are not very abundant in forested habitats (USFS 2000). Across the Forest, loggerhead shrikes have been observed by Rocky Mountain Bird Observatory technicians only twice during 2001-2005 surveys, once in shrubland in the southwestern Black Hills and once in riparian habitat east of Deadwood, South Dakota (Panjabi 2001). Another shrike was observed by a Forest Service biologist in 2003 in a southern Black Hills grassland (USFS 2004b). Evidence of nesting in Crook County is circumstantial (WGFD 2004). Loggerhead shrikes have not been observed in the project area. Open, shrubby areas in old burns in the project area may provide suitable habitat.

Analysis of Effects

Direct and Indirect: Alternative 0 would not affect loggerhead shrikes because no new activities would take place. Alternatives 1 and 2 propose prescribed burning in potentially suitable habitat, but this treatment is unlikely to take place during the breeding season. Alternative 4 does not propose activities in potentially suitable habitat. Any effects on this species would be negligible.

Cumulative: Past fire suppression has increased forest cover in the project area, possibly decreasing shrike habitat. Proposed burning would enhance some of the existing open areas and would have no more than a negligible effect on Forest-wide habitat for loggerhead shrikes. All alternatives would contribute to achieving objective 221 by conserving or enhancing habitat for this species.

Determination

Implementation of Alternative 0 would have no impact on the loggerhead shrike. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area or cause a trend toward federal listing. This determination is based on limited potential for direct and indirect effects.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that loggerhead shrike is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Grasshopper Sparrow

This discussion of grasshopper sparrow is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 215-220. Detailed information on grasshopper sparrow status and habitat contained in Appendix C is incorporated here by reference.

The grasshopper sparrow breeds from southern Canada through the majority of the United States (Sibley 2003). It winters in the southern United States and Mexico. In Wyoming, this species breeds mainly in the eastern portion of the state, and occurs almost statewide (Cerovski et al. 2004). In South Dakota, there are breeding records throughout the state, including in the Black Hills. This species is considered a locally common migrant and summer resident (Tallman et al. 2002).

Grasshopper sparrows have been monitored on the Black Hills since 2002 in cooperation with the Rocky Mountain Bird Observatory (Panjabi 2003, 2005). They occur widely in native mixed-grass prairies in the southern Black Hills and locally further north in the central Black Hills (Panjabi 2005, USFS 2005). Panjabi (2005) found them in the highest density in mixed-grass prairie habitat. They may also occur in other types of grasslands (Panjabi 2003). Using Panjabi's relative densities and acres of existing grasslands, current population estimates range from approximately 6,500 to 17,000 birds associated with grassland habitat (USFS 2005). This species has been observed on the extreme western edge of the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. The beetle infestation could create marginally suitable habitat. Areas of grassland habitat could also decline due to fire suppression and the encroachment of trees into meadows.

The action alternatives are unlikely to have discernable effects on grasshopper sparrows or their habitat. Habitat in the project area is fairly marginal and burning is the only treatment proposed in grasslands. Prescribed burning would not occur during the breeding season. Continued large-scale beetle infestation could create transitory open areas, but these are unlikely to provide high-quality grasshopper sparrow habitat due to the large amounts of coarse woody debris that may be present and probable rapid reforestation.

Cumulative: Fire suppression and resulting pine encroachment have decreased grasslands in parts of the project area. The no action alternative could have a slight effect on this trend by opening up areas of forest. Alternatives 1 and 2 would work against the cumulative effect of loss of grassland habitat through prescribed burning.

Determination

Implementation of Alternative 0 would have no impact on the grasshopper sparrow. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on limited potential for direct or indirect effects.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that grasshopper sparrow is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Leopard Frog

This discussion of northern leopard frog is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 180-186. Detailed information on this frog's status and habitat contained in Appendix C is incorporated here by reference.

The northern leopard frog is found in freshwater sites with profuse vegetation, brackish marshes, and moist fields. This species is primarily nocturnal and is found throughout northern North America except on the West Coast (Behler and King 1979). During the spring, they can be found in ephemeral pools and streams. Adults may disperse into upland sites during the summer (Smith 2003). Leopard frogs are common throughout the Black Hills and occur across the Bearlodge Ranger District in permanent and semi-permanent water sources. This species has been observed in the project area. Threats include habitat loss/alteration from overgrazing, predation, and reduced water quality/quantity.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effects on the northern leopard frog because no new activities would occur. The continuing beetle infestation would have little influence on frogs or their habitat unless a severe wildfire followed; this could cause negative watershed effects. Treatments included under Alternatives 1, 2, and 4 would avoid suitable aquatic frog habitats through implementation

of Regional Watershed Conservation Practices (USFS 2006c; Appendix A). Proposed timber harvest and prescribed fire could affect individuals using upland habitats. Alternatives 1 and 2 propose road construction and all action alternatives propose timber harvest. With application of design criteria and mitigation, these activities would cause minimal sedimentation and subsequent effects on frog habitat. All water sources and their associated riparian areas are protected under the Clean Water Act, and Regional Watershed Conservation Practices.

Cumulative: Backlund (*in* USFS 2000) identifies uncontrolled grazing as having detrimental impacts on leopard frogs. Past grazing, road construction, and fire suppression (through decreased water yield) have probably had negative effects on frog habitat. The action alternatives would not change grazing practices, though ongoing and foreseeable actions related to allotment management plan revision should reduce impacts of grazing in riparian areas. With application of BMPs and other design criteria, proposed activities are not expected to add to these cumulative effects.

A total of 73 leopard frog index sites have been monitored on the Black Hills National Forest since 2001. There was no previous systematic sampling at most of these waters; therefore, the data are considered baseline. Current leopard frog distribution appears reasonably high. Sixty percent (43/73) of all index sites were occupied by the species (USFS 2004b). Proposed activities are not expected to affect leopard frog habitat, and would maintain or enhance habitat (objective 221).

Determination

Implementation of Alternative 0 would have no impact on the northern leopard frog. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on limited potential for direct effects, avoidance of aquatic habitats, and application of conservation measures intended to avoid indirect effects on aquatic habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that leopard frog is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black Hills Redbelly Snake

This discussion of Black Hills redbelly snake is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 187-189. Detailed information on this snake's status and habitat contained in Appendix C is incorporated here by reference.

This subspecies of the redbelly snake is only known to occur in the Black Hills. It is found in moist woodlands with adequate cover, such as rocks, logs, tree bark, sphagnum bogs, or leaf litter. It feeds on slugs, earthworms, and soft-bodied insects. Black Hills redbelly snakes are found throughout the higher elevations of the Black Hills (Smith and Stephens 2003), and have been documented in all Black Hills counties (Thompson and Backlund, no date). Little is known on distribution, abundance, and dispersal due to secretive behaviors. Vehicle traffic can cause mortality to this species. Redbelly snakes can also be susceptible to predation where ground cover is lacking. This species has been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effect on the Black Hills redbelly snake because no new activities would occur. Continued beetle infestation may have positive effects by providing down woody debris or negative effects if a severe fire followed. Treatments proposed under Alternatives 1, 2, and to a lesser degree 4 may disturb small areas of suitable redbelly snake habitat and could impact individual snakes. Riparian areas and other water influence zones would be protected through implementation of Regional Watershed Conservation Practices (Appendix A).

Displacement of individuals may occur under the action alternatives as down woody debris may be moved during skidding operations, but debris would not be removed from the site. Down woody debris would be maintained as required by Forest Plan standard 2308. No barriers adjacent to wetlands would be created under any action alternative (standard 3116). Prescribed burning proposed under Alternatives 1 and 2 may temporarily impact snake distribution by affecting ground vegetation characteristics and causing snake dispersal, increasing vulnerability to predation and vehicles.

Cumulative: Past road construction between riparian areas and potential hibernacula increased the potential for snake mortality. Livestock grazing in riparian areas has often reduced cover, increasing vulnerability to predation. Open roads would continue to pose a hazard, but open road density would decrease under the action alternatives. All alternatives would conserve redbelly snake habitat (objective 221).

Determination

Implementation of Alternative 0 would have no impact on the Black Hills redbelly snake. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to harm individual snakes and temporarily disturb suitable snake habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Finescale Dace

This discussion of finescale dace is tiered to the Phase 2 Amendment FEIS, Appendix C, pages 161-167. Detailed information on finescale dace status and habitat contained in Appendix C (Biological Assessment/Biological Evaluation) is incorporated here by reference along with relevant new information that has become available since the Phase 2 Amendment FEIS was completed.

Stasiak and Cunningham (2006) and Isaak et al. (2003) assessed the status of finescale dace in the Rocky Mountain Region and the Black Hills, respectively. This species occurs as a disjunct population in the Black Hills due to past glaciation. In the Black Hills, the distribution of finescale dace was historically and is currently limited to a small area in the northern Black Hills, primarily the Redwater Creek drainage (Isaak et al. 2003), with exception of an isolated occurrence in Fall River (SDGFP 2006). In Crook County, Wyoming, finescale dace were reported in 1997 from the following creeks: Richardson, Tent Canyon, Ogden, Rocky Ford, Cow, Redwater (including Hemler Reservoir), and Spotted Tail (WYNDD 2002). Evidence from the 1980s suggested populations might also exist in Geis Reservoir (Isaak et al.

2003). Of these, only Richardson, Tent, and Ogden Creeks are in the Burner project area; the others are mentioned only to describe the distribution of the species.

Finescale dace habitat includes pools, boggy headwaters, creeks, ponds, and especially beaver ponds over silt and near vegetation. They are found most often in standing water habitats such as decadent beaver ponds. The two major threats to finescale dace include habitat alteration and introduction of non-native fishes (Stasiak and Cunningham 2006).

Analysis of Effects

Direct and Indirect: Alternative 0 could have positive or negative effects on finescale dace depending on the course of the beetle infestation and subsequent events. If beetle infestation decreases and there are no large-scale, severe wildfires, the no action alternative would have no discernable effect on finescale dace. If beetle infestation continues to expand, a resulting temporary increase in water yield and expansion of early-seral species such as aspen could have a beneficial effect on this species through improvement of beaver habitat. If, however, widespread infestation is followed by a large-scale, severe wildfire, resulting increased sedimentation and changes in channel morphology could negatively affect finescale dace populations in the project area by reducing the amount and/or suitability of aquatic habitat.

The action alternatives would result in few measurable effects on finescale dace or their habitat. Effects on the physical and chemical features of aquatic and riparian ecosystems equate to the indirect effects on finescale dace. These effects are summarized here and further described in the Water Resources section of this EA. If the beetle infestation continues to expand, Alternative 1 could result in an increase in water yield in small, heavily infested watersheds such as Richardson Creek while reducing potential fire intensity and spread. Timber harvest or fuel treatment would take place near Richardson Creek under the action alternatives but equipment would not cross the creek or operate in the water influence zone. No road construction would take place in water influence zones under any alternative. Limited timber harvest would take place at the edge of water influence zones along three drainages in the most heavily beetle-infested part of the project area under Alternative 1, but mechanized equipment would not enter the water influence zone. Road pre-use maintenance and decommissioning conducted in these areas would implement Forest Plan standards and guidelines and Regional Watershed Conservation Practices (Appendix A) to minimize negative effects on streams and riparian areas.

Cumulative: Historic near-extirpation of beaver and introduction of predatory game fish have negatively affected habitat for this species. Recent increase in beaver activity, especially in the Bear Lodge Mountains, is likely to benefit finescale dace. None of the alternatives is expected to increase the introduction of non-native fish species. Ogden Creek supports a small but viable wild brook trout population (WGFD 1996). None of the alternatives is anticipated to substantially change the abundance or distribution of brook trout. Thus, there would be no additive incremental impact that would negatively affect finescale dace. Livestock grazing, mining, water diversion, road construction, and motorized vehicle use in wet areas have had and continue to have negative effects on fish habitat. Implementation of Forest Plan standards and guidelines and Regional Watershed Conservation Practices are anticipated to avoid and minimize negative impacts to water quality and aquatic habitat. Overall, habitat trend appears to be stable or slightly declining (USFS 2004). With implementation of design criteria, all action alternatives are expected to maintain or enhance habitat (objective 221).

Determination

Implementation of the no action alternative would have no impact if mountain pine beetle activity decreases. It may have a beneficial impact if mountain pine beetle activity increases without subsequent severe wildfire. If a severe wildfire occurs following a widespread beetle infestation, the no action alternative may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to harm individual fish.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that finescale dace are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Regal Fritillary Butterfly

This discussion of regal fritillary is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 157-161. Detailed information on regal fritillary status and habitat contained in Appendix C is incorporated here by reference.

The regal fritillary is found most often in native tall-grass prairies but also inhabits dry, undisturbed prairies. Larval host plants include violets (*Viola* spp.). Foraging habitat includes a variety of flowers, such as coneflowers (*Echinacea* spp. and *Rudbeckia* spp.), thistles (*Cirsium* spp.), and milkweeds (*Asclepias* spp.) (Marrone 2002). The project area is primarily forested, but open areas in lower elevations may provide habitat. This species has not been documented in the project area. Threats include conversion of native tall-grass prairie habitat to other uses, tree encroachment, weed infestation, and grazing. Fire can negatively affect this species if host plants are burned.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no effect on the regal fritillary because no new activities would occur. The little potential habitat in the project area would be minimally affected under any of the action alternatives. None of the alternatives would convert potential regal fritillary habitat to another use or vegetation type. Prescribed fire proposed under Alternatives 1 and 2 would set back forestation of existing openings and stimulate growth of grasses. There is a small chance that butterflies could be negatively affected by prescribed burning; to minimize the potential, burn managers would consult the District wildlife biologist when preparing burn plans to determine the need for surveys and conservation measures on a site-specific basis.

Cumulative: Alternative 0 would not contribute to cumulative effects. Alternatives 1, 2, and 4 would not contribute to habitat loss and may improve regal fritillary habitat. All alternatives would maintain or enhance habitat (objective 221).

Determination

Implementation of the no action alternative would have no impact on the regal fritillary butterfly. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to harm individual butterflies.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Cooper's Rocky Mountain Snail

This discussion of Cooper's Rocky Mountain snail is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 153-157. Detailed information on this snail's status and habitat contained in Appendix C is incorporated here by reference.

Cooper's Rocky Mountain snail is loosely tied to calcareous soils, limestone outcrops, and certain soil conditions (Frest and Johannes 1993, 2000). Colonies are typically associated with closed canopy ponderosa pine stands with a secondary deciduous component and a diverse understory. This species forages on decayed deciduous tree leaves and other herbaceous vegetation. Under suitable conditions, this snail is found on downed wood, tree trunks, and limestone talus.

Distribution data for the United States and Canadian provinces are known to be incomplete. This species' current identified distribution includes the Black Hills. Potential threats include habitat loss caused by logging, grazing, forest fires, road construction, or any other disturbance that reduces the moist microclimate necessary for this species. Herbicide and pesticide spraying can also negatively affect this species.

Surveys conducted by Frest and Johannes (1993) documented live and recently dead individuals of this species just outside the project area on private land. Forest Plan standard 3103 protects known colonies of Cooper's Rocky Mountain snail from adverse effects of management actions.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effect on the Cooper's Rocky Mountain snail because no new activities would occur. A severe wildfire in infested stands could negatively affect snail habitat. Treatments prescribed under Alternatives 1, 2, and 4 may affect this species if unknown colonies occur within treatment areas. Unoccupied suitable habitats that occur within the treatment units may be altered by soil compaction, increased insolation, and alterations to the detrital layer. Exclusion of damp sites and deciduous forest from most treatments reduces the area of potential direct effects. The known colony would not be affected under any alternative. Any colonies discovered during implementation would be protected with disturbance-free buffer zones.

Cumulative: Past actions across the landscape, including cattle grazing and timber harvest, were identified by Frest and Johannes (2002) as factors in restricting habitat available to this and several other land mollusk species. Because known and high-probability sites would not be disturbed under any alternative, habitat would be maintained or enhanced (objective 221).

Determination

Implementation of Alternative 0 would have no impact on the Cooper's Rocky Mountain snail. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 4 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to disturb suitable, but unoccupied, snail habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Emphasis Species – Management Indicator Species

Management indicator species (MIS) can be used to indicate the welfare of other species with similar habitat needs. These species are designated as surrogates for other species with similar life histories or habitat requirements in order to assess the effects of management activities. Associations of vertebrate species, related primarily to grass/forb/shrub stage (early forest succession) or the mature and old growth stages (late forest succession) were selected for analysis.

Table 3-15 lists MIS for the Forest, as provided in the Forest Plan and modified by the Phase 2 Amendment. Each species was evaluated for its potential to be affected by the proposed project. Species without suitable habitat present in the project area were not evaluated further.

Table 3-15. Management Indicator Species

Common Name	Scientific Name	Habitat Present	Species Recorded
Beaver	*Castor canadensis*	Yes	Yes
Black-backed woodpecker	*Picoides dorsalis*	Yes	No
Brown creeper	*Certhia americana*	Yes	Yes
Golden-crowned kinglet	*Regulus satrapa*	No	No
Grasshopper sparrow	*Ammodramus savannarum*	Yes	Yes
Mountain sucker	*Catostomus platyrhynchus*	No	No
Ruffed grouse	*Bonasa umbellus*	Yes	Yes
Song sparrow	*Melospiza melodia*	Yes	Yes
White-tailed deer	*Odocoileus virginianus*	Yes	Yes

Beaver

This discussion of beaver is tiered to the Phase 2 Amendment FEIS, pages III-284 through III-290.

The beaver is selected as an MIS for this project because of its association with riparian habitat and adjacent hardwood forest. Beaver are found in riparian habitat throughout North America except Florida, southwestern deserts, and the Arctic tundra. The beaver is North America's largest rodent, with adults weighing 30 to 60 pounds (Higgins et al. 2000). Beavers are semi-aquatic and widely distributed in large

rivers and lakes with constant water levels, marshes, small lakes, and streams with weak flows adequate for damming (Higgins et al. 2000). Beaver require a permanent, relatively constant flow of water with accessible foods such as willow and aspen. Historically, they played an immense ecological role in sustaining wetlands and riparian habitat in the Black Hills. Beavers were heavily trapped by early explorers and by the late 1800s populations were low and restricted to remote portions of the Black Hills. Populations have increased with the advent of game regulations and management, but have not reached historical numbers (USFS 2005).

Observations across the District suggest that beaver colonies are expanding into suitable habitat. Beaver numbers are increasing and habitat trend appears stable. Estimated population in 2004 was 250-390 individuals. The long-term beaver population trend in the Black Hills has been upward since regulations moderated heavy trapping. Surveys conducted in 2004 will serve as a baseline comparison for determining future trends. Although riparian habitats have decreased since the pre-settlement era, short-term habitat trend is unknown. Changes in habitats and populations will likely be slow, and may take decades to distinguish (USFS 2005). No beaver colonies are known to exist in the project area, probably due to limited amounts of surface water.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Continued beetle infestation could temporarily increase water flows in heavily infested small watersheds. Potential severity and spread of wildfires would remain elevated. A severe fire would have short-term (less than 5-year) negative effects such as accelerated erosion, bank erosion, and channel filling, and ultimately positive effects through increased hardwood habitat and possibly increased water yield.

Alternatives 1, 2, and 4 include the very slight potential for individual mortality due to management activities if unknown colonies are present. Possible indirect impacts include habitat loss or disturbance that may occur from incidental activities in riparian areas. The risk of these effects would be minimal due to avoidance of water influence zones and application of Regional Watershed Conservation Practices (Appendix A) and project-specific design criteria to minimize soil and vegetation disturbance in riparian areas (Chapter 2). Alternatives 1 and 2 could benefit potential beaver habitat beaver through a possible temporary increase in water yield, especially in the Ogden Creek drainage.

Cumulative: The greatest impacts to beaver are caused by human trapping and hunting. Other predators such as mountain lions are also known to kill beaver. Fire suppression has allowed pine forest to expand in the project area, decreasing aspen and other hardwoods and decreasing water available to riparian habitat. Activities such as road construction and mining have sometimes negatively impact beaver habitat by increasing sediment delivery to streams or altering subsurface hydrology. Some riparian areas and hardwood stands have been negatively impacted due to periodic overutilization and trampling by livestock.

Alternative 0 would not add to cumulative effects on beaver. If continued infestation contributes to a large wildfire, this alternative has the potential to act against cumulative effects by decreasing pine cover and expanding hardwoods. Alternatives 1, 2, and 4 may act against cumulative effects by decreasing sediment delivery through road decommissioning and by a temporary increase in water yield. With application of design criteria to avoid impacts to riparian areas and streams, proposed activities are unlikely to add to negative cumulative effects.

Beaver was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on riparian and hardwood habitats. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that beaver are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction (objective 201). Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black-backed Woodpecker

This discussion of black-backed woodpecker is tiered to the Phase 2 Amendment FEIS, pages III-238 through III-247.

Black-backed woodpecker was selected as an MIS for this project because of its association with snags, burned forest, and mature forest. In the Black Hills, black-backed woodpecker distribution and abundance are closely associated with recent stand-replacing fires. They are associated with pine habitats that have high populations of their main prey, larvae of wood-boring and bark beetles. This species is considered a rare permanent resident in higher elevations of the Black Hills (Tallman et al. 2002). Forest monitoring data indicate that habitat is relatively abundant (habitat has increased considerably over the last 10-25 years but decreased slightly in the last few years) and that amended Forest Plan objective 238b is being met (USDA Forest Service 2006).

Black-backed woodpeckers have not been recorded in the project area. Suitable habitat in the project area is found in dense, mature pine (3,070 acres) and beetle-killed trees (estimated 600 acres).

Analysis of Effects

Direct: Alternative 0 would increase potential habitat for black-backed woodpeckers. Beetle infestation, particularly in dense stands, would provide preferred habitat. The suitability of this habitat is likely to decline after two to three years, since black-backs are associated with the early stages of decay. Any wildfires following the infestation would further improve habitat.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and large fires compared with Alternative 0. All alternatives, including no action, would also reduce dense, mature pine stands; Alternative 1 may have the greatest effect, as preventively thinning would reduce acreage of SS 4C stands by 38 percent. Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nesting trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all proposed activities, except salvage, cutting of snags would generally be prohibited except to protect worker safety. Snags over 20 inches DBH and those with cavities would be retained. For further discussion of effects on snags, see page 3-15.

Cumulative: Beetle infestation has created suitable black-backed woodpecker habitat in the project area, acting to some degree against the cumulative effect of past actions. Fire suppression has allowed mature stands to persist in some areas, while timber harvest and other activities have decreased density of other mature stands and reduced snag numbers. The no action alternative is likely to continue converting pine stands into preferred black-back habitat. Beetle infestation would continue under the action alternatives, though on a smaller scale. The suitability of some potential habitat would decrease, adding to cumulative effects. Proposed prescribed burning would probably create small, scattered pockets of black-backed woodpecker habitat, but generally would not kill mature trees or add substantially to habitat for this bird.

Due to continuing infestation in the project area and Forest-level objectives for retention of burned or infested trees, the action alternatives are likely to have minimal effects on preferred habitat across the Forest.

Black-backed woodpecker was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on mature and late-successional forest, burned forest, insects, and snags. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that black-backed woodpeckers are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Brown Creeper

This discussion of brown creeper is tiered to the Phase 2 Amendment FEIS, pages III-248 through III-257.

Brown creepers are found in dense, mature coniferous forests in summer and deciduous forests during the winter (Kistler and Fager 1981). Forest characteristics preferred by creepers include large, unfragmented, mature and old growth stands with large trees and snags (Wiggins 2005). Snags at least 10 inches in diameter, with loose bark or old woodpecker cavities, are required for nesting (Wiggins 2005, DeGraaf et al. 1991). Studies on the effects of timber harvesting on creepers in the Rocky Mountains suggested creepers are less abundant in harvested than unharvested forest types (Dykstra et al. 1999, Hutto and Young 1999). Mannan and Meslow (1984) also suggest creepers occur more frequently in old growth than in managed (thinned) stands.

Brown creepers occur in low abundance throughout the Black Hills (USFS 2004b). They are found in mature stands. At least 90 percent of all Rocky Mountain Bird Observatory creeper observations in each of the past three years have occurred in mature or late-successional habitats. Forest-wide habitat trends appear to be stable (USFS 2006).

This species has been observed in the project area. There are approximately 3,070 acres of dense, mature pine forest.

Analysis of Effects

Direct and Indirect: Alternative 0 would leave uninfested dense, mature pine stands intact, but the chance of beetle infestation would remain high. Infested stands would continue to decline in density as the infestation progresses.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and large fires compared with Alternative 0. All alternatives, including no action, would also reduce dense, mature pine stands. These stands would decrease by about 47 percent under Alternative 1, 30 percent under Alternative 2, and 17 percent under Alternative 4. Additional beetle infestation may cause further reduction of dense, mature stands. Inadvertent loss of some individual birds or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nesting trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety, except during salvage and fuelwood harvest. Snags over 20 inches DBH and those with cavities would be

retained. For further discussion of effects on snags, see page 3-15.

Cumulative: Beetle infestation in the project area has reduced the suitability of some habitat for brown creepers, adding to some degree to the cumulative effect of past actions. Fire suppression has allowed mature stands to persist in some areas, while timber harvest and other activities have decreased density of other mature stands and reduced snag numbers. The no action alternative is likely to continue decreasing acreage of potential brown creeper habitat. Beetle infestation would continue under the action alternatives, though on a smaller scale. The suitability of some potential habitat would decrease, adding to cumulative effects. If the beetle infestation continues to expand, the no action alternative would add the most to cumulative effects on this bird. If beetle populations decrease, Alternative 1 would have a greater additive effect than the other alternatives.

Brown creeper was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on mature and late-successional forest and snags. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that brown creepers are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Grasshopper Sparrow

This discussion of grasshopper sparrow is tiered to the Phase 2 Amendment FEIS, pages III-264 through III-268.

Grasshopper sparrow is selected as an MIS because this bird appears to be a good indicator of prairie grassland habitat condition. The grasshopper sparrow breeds from southern Canada through the majority of the United States (Sibley 2003). It winters in the southern United States and Mexico. In Wyoming, this species breeds mainly in the eastern portion of the state, and occurs almost statewide (Cerovski et al. 2004). In South Dakota, there are breeding records throughout the state, including in the Black Hills. This species is considered a locally common migrant and summer resident (Tallman et al. 2002).

Grasshopper sparrows have been monitored on the Black Hills since 2002 in cooperation with the Rocky Mountain Bird Observatory (Panjabi 2003, 2005). They occur widely in native mixed-grass prairies in the southern Black Hills and locally further north in the central Black Hills (Panjabi 2005, USFS 2005). Panjabi (2005) found them in the highest density in mixed-grass prairie habitat. They may also occur in other types of grasslands (Panjabi 2003). Using Panjabi's relative densities and acres of existing grasslands, current population estimates range from approximately 6,500 to 17,000 birds associated with grassland habitat (USFS 2005). Habitat trend may be upward (USFS 2006). This species has been observed on the extreme western edge of the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. The beetle infestation could create marginally suitable habitat. Areas of grassland habitat could also decline due to fire suppression and the encroachment of trees into meadows.

The action alternatives are unlikely to have discernable effects on grasshopper sparrows or their habitat. Habitat in the project area is fairly marginal and burning is the only treatment proposed in grasslands. Prescribed burning would not occur during the breeding season.

Cumulative: Fire suppression and resulting pine encroachment have decreased grasslands in parts of the project area. The no action alternative could have a slight effect on this trend by opening up areas of forest. Alternatives 1 and 2 would work against the cumulative effect of loss of grassland habitat through prescribed burning.

Grasshopper sparrow was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on grassland habitat. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that grasshopper sparrows are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Ruffed Grouse

This discussion of ruffed grouse is tiered to the Phase 2 Amendment FEIS, pages III-269 through III-274.

Ruffed grouse was selected as an MIS because of its association and dependence on aspen habitat. This bird is a suitable indicator of aspen quantity and vigor in pure and mixed stands. Ruffed grouse occur throughout much of North America including Alaska and most of Canada. They occur across the central and northern United States but is absent from the more southern states. Ruffed grouse are year-round residents in the Black Hills and occur widely but in low abundance (Panjabi 2003). Distribution in the Black Hills roughly correlates to the distribution of aspen. Aspen is abundant in the northern and central Black Hills and Bear Lodge Mountains and scarce in the southern Black Hills.

Ruffed grouse are classified by Wyoming and South Dakota state wildlife agencies as an upland game bird. There is an annual fall hunting season. Harvest data from the Wyoming Black Hills suggest ruffed grouse numbers are increasing (Sandrini 2005), though these data need to be viewed in light of the low ruffed grouse densities in the Bear Lodge Mountains. While harvest rates have fluctuated over the past few decades, and any trends or causes are not clear, years with high harvest rates may reflect years with good brood production. Ruffed grouse densities vary over the range of the species in the state, and this probably is a function of habitat quality in local areas. Little is known about habitat selection or preference by the species in Wyoming, but young aspen and mixed aspen-conifer stands probably provide the best habitat in much of the state. A new ruffed grouse monitoring protocol will be tested across the National Forest in 2007; the data collected through this protocol will serve as baseline data for Forest-wide trend assessments. Forest-wide habitat trend over the last 11 years is slightly downward (USFS 2006). Young aspen stands make up approximately 14 percent of the project area and 86 percent of the aspen acres in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Indirect impacts to grouse habitat include an increase in aspen and other early-succession species in response to beetle infestation of pine. Habitat is expected to gradually increase under this alternative. Stand-replacing fire events would have short-term (less than 5-year) negative impacts but ultimately beneficial impacts by expanding and rejuvenating aspen stands.

Alternatives 1, 2, and 4 include the slight potential for individual mortality due to management activities. Potential habitat loss or disturbance could occur during commercial and non-commercial timber harvest, fuel treatment, prescribed burning, and road work in aspen areas. Proposed activities would have an overall positive effect in the next 10 to 20 years by decreasing pine cover and encouraging the growth and expansion of aspen stands (not shown in cover type analysis starting on page 3-11, which reflects conditions immediately following project implementation). This would contribute to a slight increase in suitable aspen habitat across the Forest. Habitat improvement may facilitate an increase of ruffed grouse numbers in the project area and a negligible increase Forest-wide.

Cumulative: Past actions, particularly fire suppression and reduction in beaver numbers, have resulted in reduction of healthy aspen stands. Conversely, past disturbances that set back forest succession have positively affected potential ruffed grouse habitat. Hunting also has an impact on grouse in the project area and across the Bearlodge District. Proposed activities would act against negative cumulative effects by decreasing density of pine stands and reintroducing fire.

Ruffed grouse was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on aspen habitat. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that ruffed grouse are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives, including hardwood restoration (objective 201). All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Song Sparrow

This discussion of song sparrow is tiered to the Phase 2 Amendment FEIS, pages III-275 through III-283.

Song sparrow is selected as an MIS because of its dependence on riparian areas across much of its range. Panjabi (2001) found song sparrow to be closely associated with riparian and wetland habitat on the Forest. It is an uncommon and local resident in the Black Hills (Tallman et al. 2002). Panjabi (2003) suggests it is an excellent indicator of riparian habitat. Song sparrows breed throughout the United States, from Newfoundland to the Aleutian Islands, and winter in the southern United States to central Mexico (Udvardy and Farrand 1994).

Song sparrows are found throughout the Black Hills but are more common in the north. They occur mainly in streamside thickets, especially willows (Panjabi 2001). Breeding Bird Survey data show that song sparrow populations are stable to slightly increasing in the Black Hills (Sauer at al. 2003). Population estimates range from approximately 8,000 to 14,000 birds (USFS 2005). Habitat trend may be slightly upward (USFS 2006). This species has been observed in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Beetle infestation and risk of stand-replacing fire are likely to continue to increase. A stand-replacing fire may have short-term (less than 5-year) negative effects but ultimately positive effects through increased hardwood habitat and possibly increased water yield.

Alternatives 1, 2, and 4 include the very slight potential for individual mortality due to management activities. Possible indirect impacts include habitat loss or disturbance that may occur from incidental activities in riparian areas. The risk of these effects would be minimal due to avoidance of water influence zones and application of Regional Watershed Conservation Practices and project-specific

design criteria to minimize soil and vegetation disturbance in riparian areas.

Implementation of these alternatives would have little effect on suitable song sparrow habitat across the Forest. Effects on song sparrow numbers would be negligible.

Cumulative: Fire suppression has allowed pine forest to expand in the project area, crowding out aspen and other hardwoods. Some riparian areas and hardwood stands have been negatively impacted due to periodic overutilization and trampling by livestock. With application of design criteria to avoid impacts to riparian areas, proposed activities are unlikely to add to negative cumulative effects.

Song sparrow was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on riparian habitat. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that song sparrow is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

White-tailed Deer

This discussion of white-tailed deer is tiered to the Phase 2 Amendment FEIS, pages III-291 through III-299.

White-tailed deer inhabit a wide variety of habitats and are extremely adaptable, making this species the most widespread cervid in North America. White-tailed deer live in every habitat type, including grasslands, mountains, deserts, tropical rainforests, swamps, and urban settings (Higgins et al. 2000). In the Black Hills, white-tailed deer inhabit a variety of forest types and structural stages. The Forest has designated the white-tailed deer as an MIS for early-successional forest. White-tailed deer in the Black Hills migrate between distinct summer and winter ranges. Hardwood stands of aspen and birch are prominent features in white-tailed deer's selection of home ranges and their use of sites within these ranges (Stefanich 1995). Kennedy (1992) suggested aspen stands are highly selected during fawning. During winter, deer move to winter ranges that include lower-elevation forests offering cover and browse and open habitats adjacent to wooded draws (Stefanich 1995). The project area includes 2,926 acres of aspen, much of it in the 1936 Sundance Fire area. Topography and vegetation cover are diverse in low-elevation (winter range) parts of the project area.

Harvest statistics and Wyoming Game and Fish Department observations suggest that white-tailed deer populations dropped in 2004 but rebounded in 2005. Modeling indicated that the 2005 post-hunting season population was 36,917 animals, slightly below the state objective, but the model may not produce reliable estimates (Sandrini 2006). Forest-wide summer habitat trend is upward while winter habitat trend is stable to slightly decreasing (USFS 2006).

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effects on deer because no new activities would occur. Continuing beetle infestation would gradually increase forage availability.

Treatments proposed under Alternatives 1, 2, and 4 would affect deer foraging and security habitats. Within three to five years of treatment, near-ground cover would increase in treated stands as understory species grow. Forage quality is likely to increase following prescribed burning (not proposed under Alternative 4). Aspen stands would see little effect from any alternative. For several years after timber treatments or beetle infestation, the availability of effective winter cover would be reduced. Increased activity during implementation of proposed activities could disturb wintering deer and lead to additional hunter traffic on roads that would not otherwise be cleared of snow, but application of design criteria such as requiring closure of gates during timber harvest should reduce this effect. Closure of MA 5.4 (big game winter range) to off-road and off-trail motorized use in winter under all alternatives would increase habitat security. Under Alternative 4, closure of MA 5.4 to off-road motorized use all year may benefit deer by reducing disturbance of fawning habitat.

Cumulative: Fire suppression and pine encroachment have decreased habitat diversity in parts of the Burner project area. Beneficial effects have resulted from removal of commercial timber, thinning of pine, prescribed burns, beetle infestation, and wildfires through creation of more meadow openings and early successional stages.

White-tailed deer was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on early successional forest. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that deer are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Species of Local Concern (SOLC)

Region 2 defines SOLC as species that are documented or suspected to be at risk at a local scale within Region 2 but do not meet the criteria for regional sensitive species designation. SOLC need to be addressed during project design and effects evaluated. Risk analyses are completed only for those species that occur in the project area or whose habitat may be impacted by the project. **Table 3-16** displays Black Hills SOLC.

Table 3-16. Species of Local Concern

Common Name	Scientific Name	Habitat Present	Species Recorded
Invertebrates			
Atlantis fritillary	*Speyeria atlantis pahasapa*	No	No
Tawny crescent	*Phyciodes batesii*	Yes	No
Callused vertigo	*Vertigo arthuri*	Yes	No
Mystery vertigo	*Vertigo paradoxa*	Yes	No
Frigid ambersnail	*Catinella gelida*	No	No
Striate disc	*Discus shimekii*	Yes	Yes
Birds			
Sharp-shinned hawk	*Accipiter striatus*	Yes	No
Cooper's hawk	*Accipiter cooperii*	Yes	Yes
Broad-winged hawk	*Buteo platypterus*	Yes	Yes

Common Name	Scientific Name	Habitat Present	Species Recorded
Northern saw-whet owl	*Aegolius acadicus*	Yes	No
Pygmy nuthatch	*Sitta pygmaea*	Yes	No
American dipper	*Cinclus mexicanus*	No	No
Black-and-white warbler	*Mniotitla varia*	Yes	Yes
Mammals			
Northern myotis	*Myotis septentrionalis*	Yes	Yes
Small-footed myotis	*Myotis ciliolabrum*	Yes	No
Long-eared myotis	*Myotis evotis*	Yes	Yes
Long-legged myotis	*Myotis volans*	Yes	Yes
Northern flying squirrel	*Glaucomys sabrinus*	Yes	No
Meadow jumping mouse	*Zapus hudsonius campestris*	Yes	No
Mountain goat	*Oreamnos americanus*	No	No
Bighorn sheep	*Ovis canadensis*	No	No

Tawny Crescent

This discussion of tawny crescent is tiered to the Phase 2 Amendment FEIS, pages III-172 through III-174.

The tawny crescent occurs in all counties in the Black Hills (Ferris 1971, Marrone 2002). It is found in open meadows, stream bottoms, roads, trails, and riparian woodlands (Stefanich 2001). It is also found in mesic forest corridors across an ecotone between mixed-grass meadows or prairie grasslands and adjacent woodlands (Royer and Marrone 1992). Adults nectar on a variety of forbs, including dogbane, leafy spurge and various composite flowers. Tawny crescent larvae appear to depend on asters as a food source, although the specific host species, and their relationship remain unclear (Stefanich 2001). This species has not been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Continued beetle infestation would expand habitat such as openings dominated by grass and forbs, including larval host plants. Risk of wildfire would gradually increase. The impacts of wildfire would be short-term (less than two-year) negative impacts (loss of forbs and cover, possible riparian degradation) but ultimate benefits (decreased pine cover, increases in forbs, enhanced riparian conditions) (USFS 1996).

Alternatives 1, 2, and 4 could cause individual butterfly mortality due to management activities. Impacts are more likely to occur under Alternative 1 due to the larger area treated. One- to two-year habitat reduction or disturbance may occur due to logging, fuel reduction, thinning, prescribed burning, and road work in or near meadow areas. Proposed treatments would have mostly beneficial impacts by decreasing pine stand density. Prescribed burning may have negative impacts for one season but would ultimately expand butterfly habitat.

Cumulative: Forest succession, fire suppression, and pine encroachment have decreased meadow communities throughout the project area. Conversely, beneficial impacts have resulted or will result from

past, current and future beetle infestation, removal of commercial timber, prescribed burns, and wildfires through creation of additional meadow openings and slowing of forest succession. Riparian and upland meadow habitats have been negatively impacted in some areas due to periodic overutilization and bank trampling by livestock. In other locations, moderate livestock grazing has improved butterfly habitat by decreasing grass cover and encouraging forbs such as aster. Proposed activities would generally add to positive cumulative effects by enhancing openings and reducing pine stand density.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that tawny crescent is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Callused Vertigo and Mystery Vertigo

This discussion of callused vertigo and mystery vertigo is tiered to the Phase 2 Amendment FEIS, pages III-156 through III-160 and III-164 through III-167.

These snail species are addressed together because they are often found in the same colonies. Habitat characteristics are similar. They are found in wet, relatively undisturbed forest, primarily on north aspects with deciduous litter (Frest and Johannes 2002). Essential habitat features include a limestone or schist substrate, shaded forest floor, organic surface litter, downed logs, and mesic site conditions. They are associated with spruce, pine, hardwood, and riparian ecosystems (Frest and Johannes 2002). They are found in the central and northern Black Hills and the Bear Lodge Mountains. Live callused vertigo were documented just outside the project area on private land (Frest site 54). Mystery vertigo has not been recorded in or near the project area.

Analysis of Effects

Direct and Indirect: There would be no direct impacts under Alternative 0 because no new activities would occur. If the beetle infestation continues, potential habitat could be negatively affected by site drying and possible wildfire. Under Alternatives 1, 2, and 4, no activities are proposed within 220 feet of the known colony. Proposed treatments may affect individuals of this species if unknown colonies occur within treatment areas. Unoccupied suitable habitats that occur within the treatment units may be altered by soil compaction, increased insolation, and alterations to the detrital layer. Exclusion of damp sites and deciduous forest from most treatments reduces the area of potential direct effects. Any colonies discovered during implementation would be protected with disturbance-free buffer zones.

Cumulative: Past actions across the landscape, including cattle grazing and timber harvest, were identified by Frest and Johannes (2002) as factors in restricting habitat available to this and several other land mollusk species. Because known and high-probability sites would not be disturbed under any alternative, habitat would be maintained or enhanced (objective 221).

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that these species are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Striate Disc

This discussion of striate disc snails is tiered to the Phase II Amendment FEIS, pages III-168 through III-174.

This snail is found in moist environments, especially spruce and spruce/pine mix, in lowland wooded areas, riparian toe slopes or talus slopes, generally with north to east exposure. It is closely tied to calcareous soils, limestone outcrops and soil conditions (Frest and Johannes 1993, 2000). This species forages on decayed deciduous tree leaves and degraded herbaceous vegetation. In suitable habitat, it snail can be found crawling on decaying woody debris.

Distribution data for the United States and Canadian provinces are incomplete. Current identified distribution is in nine states and two Canadian provinces. Populations are known to exist at 13 sites in the northern and central Black Hills. Threats include drying of sites through extensive logging and overgrazing of riparian areas, especially around seeps and springs. Population and habitat trends appear to be stable (USFS 2004b). Frest and Johannes (1999) found live striate disc snails at two sites in the Burner project area. These sites are close together on a steep north-facing slope near the bottom of Ogden Canyon.

Analysis of Effects

Direct and Indirect: There would be no direct impacts under Alternative 0 because no new activities would occur. If the beetle infestation continues, known snail colonies and potential habitat could be negatively affected by site drying and possible wildfire. Under Alternatives 1, 2, and 4, no activities are proposed within 250 feet of the known colonies. Proposed treatments may affect individuals of this species if unknown colonies occur within treatment areas. Unoccupied suitable habitats that occur within the treatment units may be altered by soil compaction, increased insolation, and alterations to the detrital layer. Exclusion of damp sites and deciduous forest from most treatments reduces the area of potential direct effects. Any colonies discovered during implementation would be protected with disturbance-free buffer zones.

Cumulative: Past actions across the landscape, including cattle grazing and timber harvest, were identified by Frest and Johannes (2002) as factors in restricting habitat available to this and several other land mollusk species. Because known and high-probability sites would not be disturbed under any alternative, habitat would be maintained or enhanced (objective 221).

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that striate disc is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Sharp-shinned Hawk

This discussion of sharp-shinned hawk is tiered to the Phase 2 Amendment FEIS, pages III-194 through III-197.

The sharp-shinned hawk breeds in dense forests from Alaska through Canada and throughout the United States (Udvardy and Ferrand 1994). During migration and winter, this species can be found in a variety of habitats in the continental United States (Udvardy and Ferrand 1994). In the Black Hills they were suggested to be "probably fairly common" (Pettingill and Whitney 1965), although currently they seem to occur in very low densities (Panjabi 2003). They have been documented using spruce, pine and aspen cover types (Panjabi 2003). An association between nesting and young seral stages with dense canopies

has been noted (Stephens and Anderson 2003). They have been documented on the Bearlodge District but not in the Burner project area. This bird preys on small birds and mammals.

Analysis of Effects

Direct and Indirect: There would be no direct impacts under Alternative 0 because no new activities would occur. Potential nesting habitat (dense, young forest, structural stages 3B and 3C) would gradually decrease as stands mature unless infested by beetles. Potential severity and spread of wildfire would gradually increase. Wildfire would have negative impacts for 5-10 years, but ultimately beneficial impacts by resulting in young, dense stands. The ongoing beetle infestation is likely to improve sharp-shinned hawk foraging habitat by removing pine and increasing diversity.

Alternatives 1, 2, and 4 could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Forest Plan standard 3204 (Appendix A) would reduce this risk by protecting raptor nests. All action alternatives would decrease potential nesting habitat through thinning. Foraging habitat would likely increase, with logging, prescribed burning, and continuing infestation providing a variety of structural stages and cover types for a diversity of prey species.

Cumulative: Forest succession, fire suppression, pine encroachment, and timber harvest have increased pine regeneration, creating potential nesting habitat. Management actions and beetle infestations that have reduced stand density have decreased potential nesting habitat but created foraging habitat. With application of design criteria to avoid raptor nests, proposed activities may add to negative cumulative effects of reduced stand density but would act against the cumulative effects of pine encroachment and reduction of cover type diversity in foraging habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that sharp-shinned hawk is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Cooper's Hawk and Broad-winged Hawk

This discussion of Cooper's hawk and broad-winged hawk is tiered to the Phase 2 Amendment FEIS, pages III-181 through III-186.

The following information is derived from Udvardy and Ferrand (1994) and Stephens and Anderson (2003). Cooper's hawks breed in forested habitat across southern Canada and throughout the continental United States. They winter throughout the same range and south into Central America. This bird is known to nest in riparian, conifer and aspen forests. Ponderosa pine with moderate to high canopy closure (structural stages 3B, 3C, 4B, and 4C) adjacent to openings is used for nesting. The Cooper's hawk forages across diverse habitats and preys on a variety of birds and mammals.

Broad-winged hawks breed in deciduous and coniferous forests from southern Canada south throughout the eastern United States (Bull and Ferrand 1977). They winter in tropical South America (Bull and Ferrand 1977). These hawks forage primarily in mature to old-growth forests, along forest streams, roads, and openings (Stephens and Anderson 2003a). They feed on a variety of prey, including amphibians, reptiles, insects, birds, and small mammals (Stephens and Anderson 2003a). Panjabi (2003) suggested late-successional pine stands might also be important nesting habitat. These species have been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Nesting habitat for both species is likely to continue to decrease due to beetle infestation. Foraging habitat would increase as infestation produces open patches, though pine mortality across large areas would decrease habitat suitability.

Alternatives 1, 2, and 4 could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Application of Forest Plan standard 3204 (Appendix A) would reduce this risk by protecting raptor nests.

All alternatives would decrease potential nesting habitat through treatment and probable beetle infestation. Much of this habitat would be thinned, meaning its potential for use as nesting habitat would again increase as the stands grow. Broad-winged hawk preferred foraging and nesting habitat would decrease. Foraging habitat for Cooper's hawk would remain stable or increase with logging, thinning, prescribed burning, and patchy beetle infestation, which would provide a variety of prey in diverse habitats.

Cumulative: Past and ongoing management actions have affected potential habitat for these species by reducing stand density, which has both decreased nesting habitat and reduced risk of stand loss to wildfire. Fire suppression has minimized loss of dense stands but also caused loss of openings and diverse habitats necessary for prey species. Proposed activities would add to the reduction of density in mature stands but would also reduce the risk of loss of the stands to beetle infestation. Proposed burning would act against the loss of open and diverse habitats for prey species.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that these species are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Saw-whet Owl

This discussion of northern saw-whet owl is tiered to the Phase 2 Amendment FEIS, pages III-186 through III-190.

The following information is derived from Johnson and Anderson (2003). Saw-whet owls occur from the southern boundary of Alaska across most of Canada and into the northern tier of states from Maine to Minnesota. The Rocky Mountains, the Cascade Range, Coastal Range, and the Sierra Mountains all support year-round populations. In the Black Hills, seasonal migration between high and low elevation habitat is likely. Saw-whet owls can be found in more dense coniferous forests and dense riparian woodlands. This owl nests in cavities excavated by flickers or other large woodpeckers. Nests tend to be in mature forests (structural stages 4C and 5), while dense sapling-pole sized stands (3B and 3C) are preferred for roosting. This species preys on small mammals, particularly deer mice, and birds. This species has not been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Nesting habitat is likely to continue to decrease due to beetle infestation. Foraging habitat may increase due to expansion of openings and enhanced diversity of vegetation. Stand-replacing fire could reduce

habitat.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and large, severe fires compared with Alternative 0. All alternatives, including no action, would also reduce dense, mature pine stands. These stands would decrease by about 47 percent under Alternative 1, 30 percent under Alternative 2, and 17 percent under Alternative 4. Because the course of the infestation cannot be predicted, these figures are approximate, and the potential decrease under the no action alternative is not known. Inadvertent loss of some individual birds or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nesting trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety and during salvage and fuelwood harvest. Snags over 20 inches DBH and those with cavities would be retained. For further discussion of effects on snags, see page 3-15.

Foraging habitat would likely remain stable or increase under all alternatives, with thinning, prescribed burning, and continued infestation providing habitat for a variety of prey.

Cumulative: Past timber harvest and thinning have reduced stand density. These same activities, along with fire suppression, have expanded pine cover and promoted tree growth. Firewood cutting and other activities have decreased availability of large snags. Foraging habitat has probably remained fairly stable, as these birds forage in a variety of habitats. Proposed activities would add to cumulative effects of timber harvest. In other respects, all action alternatives would counteract cumulative effects through enhancement of habitat diversity.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that saw-whet owl is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Pygmy Nuthatch

This discussion of pygmy nuthatch is tiered to the Phase 2 Amendment FEIS, pages III-190 through III-194.

This species ranges from southern interior British Columbia, northern Idaho, western Montana, central Wyoming, and southwestern South Dakota south to Baja California, Mexico, and western Texas. Pygmy nuthatches are cavity nesters generally associated with open, mature ponderosa pine forests (structural stages 4A, 4B, and open-canopy 5) (Ghalambor 2003, Scott 1979, Clark et al. 1989). Degraff (1991) also noted that this species prefers more open, park-like stands in lower and middle elevations. Keller (1992) demonstrated a dependence on snags and relatively large trees. This species is sensitive to forest alteration, and has shown declines when timber harvest removes snags (Ghalambor 2003).

Based on the literature for this species in the West, larger snags are preferred for nesting, and Clark et al. (1989) recommend providing three to five snags at least 19 inches in diameter per acre. This species has been known to use cavities created by woodpeckers. Pygmy nuthatch feeds on insects, ant, wasps, moths, beetles, grasshoppers, spiders, and pine seeds. It is an uncommon resident in the Black Hills with a population that fluctuates annually; it has been sighted more frequently in recent years, but is of uncertain status in the northern Black Hills (Tallman et al. 2002). This species has not been recorded in the Burner

project area or in the Bear Lodge Mountains.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Nesting and foraging habitat (open, mature forest) may decrease if the beetle infestation continues to expand or increase if infestation levels are moderate. Snag habitat would increase over time, although stands may be too open to provide suitable nesting habitat. Potential fire severity would increase over time. Stand-replacing fire would reduce habitat.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and potential fire severity compared with Alternative 0. Open, mature pine stands (structural stage 4A) would increase by about 95 percent under Alternative 1, 52 percent under Alternative 2, and 73 percent under Alternative 4. Because the course of the infestation cannot be predicted, these figures are approximate, and the potential increase under the no action alternative is not known. Inadvertent loss of some individual birds or nests is unlikely but possible under Alternatives 1, 2, and 4 if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nesting trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety, except during salvage harvest. Snags over 20 inches DBH and those with cavities would be retained. For further discussion of effects on snags, see page 3-15.

Cumulative: Past and ongoing timber harvest and thinning have increased mature, open structural stages favored by this species. These actions have probably contributed to a decrease in occurrence of large snags, but this may have been offset by beetle infestation. With application of design criteria to minimize cutting of snags, proposed activities are unlikely to add to negative cumulative effects and would act against the cumulative effects of fire suppression by using timber harvest and prescribed fire to reduce density of small-diameter trees.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that pygmy nuthatch is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black-and-white Warbler

This discussion of black-and-white warbler is tiered to the Phase 2 Amendment FEIS, pages III-179 through III-180.

The black-and-white warbler breeds in mature deciduous forests of the eastern United States and throughout Canada. Overall, its populations are stable throughout North America (Sauer et al. 2003). Habitat fragmentation is probably the main threat to this species. The Black Hills are at the edge of this bird's range. In the Black Hills, the black-and white warbler uses mature aspen stands, bur oak woodlands, and forested riparian areas (Panjabi 2005, Tallman et al. 2002). This species forages on insects and spiders. It has been observed in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Warbler habitat may increase over time along as beetle infestation increases aspen and oak woodland

habitat. Potential fire severity would increase over time. The impacts of wildfire would be negative in the short term (about five years) and then mostly positive as aspen and oak habitat benefit from decrease of pine cover.

Alternatives 1, 2, and 4 include the potential for individual mortality due to management activities. Indirect impacts include potential habitat loss or disturbance that may occur from logging, thinning, prescribed burning and road work in mixed pine and aspen or oak habitat. Proposed treatments would have mostly beneficial impacts by decreasing pine cover and encouraging the growth and expansion of hardwood habitats. Prescribed burning may have negative impacts for one to two years but overall benefits to foraging habitat (Cerovski 2002).

Cumulative: The greatest impact to this species has been loss of healthy riparian areas and aspen stands due to fire suppression and forest succession, which have increased pine cover and decreased riparian habitat and aspen extent and vigor. Past and ongoing timber harvest, thinning, and small-scale beetle infestation have probably positively impacted nesting and foraging habitat by encouraging hardwood development. Past livestock overgrazing has decreased riparian shrubs in some localized areas, reducing habitat. Proposed activities would act against cumulative effects by decreasing pine cover.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Myotis, Small-footed Myotis, Long-eared Myotis, and Long-legged Myotis

Discussion of these bats is tiered to the Phase 2 Amendment FEIS, pages III-198 through III-205, III-214 through III-217, and III-220 through III-223. Similarities in effects allow them to be addressed together.

The northern myotis ranges across most of eastern North America. It has been documented across the Black Hills region (Higgins et al. 2000, Cerovski et al. 2004). The northern myotis is found in wooded riparian zones in badlands and prairies to higher elevation coniferous and deciduous woodlands (Schmidt 2003b). Hibernacula for this species include mines and caves. Day roosts have been reported in buildings, under shingles, underneath bark, inside tree cavities, and in caves, mines, and quarries. Northern myotis bats have been documented using ponderosa pine snags as summer/maternity roosts in the Black Hills (Tigner and Dowd Stukel 2003). Moths and beetles make up most of this bat's diet (Schmidt 2003b). This species has been documented in the project area.

The small-footed myotis ranges across much of western North America, from central Canada south to the central states of Mexico (Schmidt 2003c). The species is widespread but not abundant throughout the Black Hills region. It is found in a wide range of habitat types and is usually associated with rocky outcroppings within this broad range of habitat types (Schmidt 2003c). Hibernacula for this species include mines and caves. Maternity and summer roosts are usually associated with rock features. This species may use snags with loose bark as day roosts. Moths and beetles are primary prey items. Small-footed myotis has not been documented in the project area.

The long-eared myotis ranges across much of montane western North America, from west central Canada south to Baja California along the Pacific coast, along the western edges of the Dakotas, and most of Wyoming and Colorado to northwestern New Mexico and northeastern Arizona (Schmidt 2003d). This

species is associated with coniferous montane habitats and has been reported foraging among trees and over woodland ponds. Hibernacula for this species include mines and caves, although they have not been documented hibernating in the Black Hills (Schmidt 2003d). Day and maternity roosts in the Hills are found in buildings, rock crevices, snags, under loose bark, and caves and mines. Limited data suggest they use ponderosa pine snags as day and maternity roosts in other regions. Moths and beetles are believed to be important prey items (Schmidt 2003d). This species has been documented in the Burner project area.

The long-legged myotis is common across the western United States. Its range extends across much of western North America from southeastern Alaska into central Mexico (Schmidt 2003e). This species is considered to be the most common and widely distributed member of the genus *Myotis* and has been documented across the Black Hills Region (Schmidt 2003e). It is primarily associated with montane forest, and forages over meadows, ponds, streams, and open mesic habitats of the Black Hills. Hibernacula include mines and caves. Day and maternity roosts have been documented rock crevices, buildings, under the bark of trees and in snags (Schmidt 2003e). Ponderosa pine snags are used as summer/maternity roosts in the Hills. Moths appear to comprise the majority of this species' diet, and it is known to feed on the spruce budworm moth (Schmidt 2003e). This species has been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Continued beetle infestation may create large numbers of snags and improve foraging habitat due to reduction in pine cover, but could have negative effects if pine stands are killed across large areas.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and potential fire severity and rate of spread compared with Alternative 0. Inadvertent loss of some individual bats is unlikely but possible under Alternatives 1, 2, and 4 if undetected roosts are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of roosting trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety, except during salvage harvest. Snags over 20 inches DBH and those with cavities would be retained. For further discussion of effects on snags, see page 3-15. Foraging habitat would increase as a result of thinning and burning. Insect prey numbers are expected to increase after prescribed burns (Cerovski 2002).

Cumulative: Past and ongoing timber harvest and other actions have probably contributed to a decrease in occurrence of large snags. With application of design criteria to minimize cutting of snags, proposed activities are unlikely to add to negative cumulative effects.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that these species are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Flying Squirrel

This discussion of northern flying squirrel is tiered to the Phase 2 Amendment FEIS, pages III-210 through III-213.

The northern flying squirrel occupies forested areas in much of Canada and parts of the western United States, with a separate population in the Black Hills of South Dakota and Wyoming (Higgins et al. 2000). They inhabit mature, dense woodland habitats dominated by conifers or mixed conifer and deciduous forest. Anecdotal evidence suggests that, in the Black Hills, flying squirrels are habitat generalists and can be found in open pine habitat adjacent to more densely vegetated hardwood habitats. They are likely benefit from any hardwood enhancement, as they have been documented in aspen stands and riparian hardwood stands. This squirrel nests in a leaf nest or tree cavity and is considered uncommon in Wyoming (Cerovski et al. 2004). It feeds on lichens, fungi, conifer cones, fruit, buds, arthropods, bird eggs, and nestling birds (Cerovski et al. 2004). It has not been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Depending on the course of the beetle infestation, dense forests may remain stable or decrease due to beetle-caused mortality. Snag availability is likely to increase in infested areas. Potential fire severity and rate of spread would also increase. Impacts of wildfire may include loss of snags and dense forests, but localized fire and beetle infestation would also create snags and allow aspen stands to expand.

Under Alternatives 1, 2, and 4, proposed treatments would reduce the risk for further infestation and potential fire severity and rate of spread compared with Alternative 0. Inadvertent loss of some individual squirrels is unlikely but possible under these alternatives if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nest trees. This effect is most likely to occur under Alternative 1, which proposes these actions on the largest area. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety, except during salvage harvest. Snags over 20 inches DBH and those with cavities would be retained. For further discussion of effects on snags, see page 3-15. Preferred pine habitat would decrease as a result of logging, thinning, prescribed burning, and beetle infestation. Much of this habitat would be thinned, meaning its potential for use as flying squirrel habitat may again increase as the stands grow. Aspen would benefit from prescribed fire and infestation of pine stands.

Cumulative: Past and ongoing management actions have affected potential habitat for flying squirrels by reducing stand density, which may have decreased preferred habitat while also reducing risk of stand loss to intense wildfire. Fire suppression has minimized widespread loss of dense stands. Proposed thinning as well as beetle infestation would add to the loss of dense, mature stands. Proposed burning and continued infestation would act against the loss of diverse foraging habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Meadow Jumping Mouse

This discussion of meadow jumping mouse is tiered to the Phase 2 Amendment FEIS, pages III-206 through III-208.

Meadow jumping mice occur across portions of Alaska east through much of Canada and in the eastern United States as far south as Georgia and Alabama (Higgins et al. 2000). Within the United States its range extends west to the eastern foothills of the Rocky Mountains (Higgins et al. 2000). The Bearlodge jumping mouse is a separate subspecies that occurs in the Black Hills of northeastern Wyoming and is

considered rare in the state (Cerovski et al. 2004). This species is associated with marshy areas and moist grasslands near streams, coniferous and deciduous forests, mixed shrublands and riparian shrublands (Cerovski et al. 2004). It feeds on buds, grasses, seeds, fungi, leaves, fruit, and insects. Meadow jumping mice have not been documented in the project area.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct impacts because no new activities would occur. Continued beetle infestation would enhance understory vegetation and hardwood communities and may result in a temporary increase in water delivery to riparian areas. These changes would benefit meadow jumping mouse habitat. Stand-replacing fire following the infestation could lead to short-term (less than 5-year) negative impacts and ultimately beneficial effects on riparian habitat.

Alternatives 1, 2, and 4 have the potential to cause mortality of individual mice. Proposed activities may have beneficial impacts by enhancing hardwood habitat through thinning of pine and continued infestation. Prescribed burning and logging may have one- to two-year negative impacts on habitat by reducing hiding cover.

Cumulative: Expansion of pine forest, fire suppression, reduction of beaver populations, and other actions have decreased available water to riparian habitat and negatively impacted riparian habitat. Riparian habitat has been and is negatively impacted in some areas due to periodic overutilization and trampling by livestock. Conversely, beneficial impacts have resulted or will result from past, current and future removal of commercial timber, thinning of pine and oak brush, prescribed burns, wildfires, and beetle infestation by creating more meadow openings and setting back forest succession. With application of design criteria to minimize effects on riparian habitat, proposed activities are unlikely to add to negative cumulative effects.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Emphasis Species – Game Species

Rocky Mountain Elk

This discussion of elk is tiered to the Phase 2 Amendment FEIS, pages III-303 through III-307.

Elk are adaptable animals and occupy a wide variety of habitats, ranging from semi-desert to coniferous forests. Although they may use coniferous forests for cover, elk are commonly found in open areas, meadows, and along forest edges. Summer range typically provides a mixture of open brushy and grassy areas, water sources, and areas of dense forest cover. Grasses and forbs dominate the summer diet. During winter, most elk move to winter ranges. Some mature bulls stay on summer ranges, where snow depths can reach four feet. Fall diet is primarily grass, forbs and some browse, and in winter diet shifts to mostly browse and some grass (Higgins et al. 2000).

The Wyoming Game and Fish Department does not have a rigorous Black Hills elk population estimate or population model. The best estimate is that 1,500 to 2,000 elk occur in the Bear Lodge Mountains and the Wyoming part of the Black Hills; it is apparent that the population is increasing, but the rate of expansion is unknown (Sandrini 2006a). Elk have been observed in the Burner project area. There is a

fall hunting season.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effects on elk because no new activities would occur. Continued beetle infestation would enhance forage but may remove escape cover; however, this may be offset by reduction of motorized vehicle access due to large numbers of fallen trees.

Under Alternatives 1, 2, and 4, implementation of proposed treatments would alter suitable habitat. New roads would be constructed under Alternatives 1 and 2, though not in big game winter range. Besides removal of potential elk cover, the use of these roads could displace elk from otherwise suitable habitats. Potential displacement would be limited to the life of the project if closure of newly constructed roads after completion of the project is successful. Treatments proposed under Alternatives 1, 2, and 4 would affect elk foraging and security habitats. Initially, cover would decrease in proposed treatment areas, though the reduction may be less than if beetle infestation continued unchecked. Timber harvest, thinning, and burning would benefit elk by providing high-quality, low-growing forage. Timber harvest has been shown to increase forage and browse production (Pase and Hurd 1957, Alexander 1987, Uresk and Severson 1989). Any new roads that are not effectively closed after use would decrease adequate escape and security cover. Proposed treatments would reduce cover temporarily, but understory species and pine or hardwood regeneration are likely to respond rapidly so that horizontal screening cover would be restored and increased within about five years. Elk would be more vulnerable to hunters and other predators over the short term. Decommissioning of non-system roads would improve habitat by reducing disturbance. Closure of MA 5.4 (big game winter range) to off-road and off-trail motorized use in winter would increase habitat security. Under Alternative 4, closure of MA 5.4 to off-road motorized use all year may benefit elk by reducing disturbance of calving habitat.

Cumulative: Fire suppression, livestock grazing, and management favoring pine have decreased forage available for elk in the Black Hills. Nevertheless, the Black Hills elk population has increased in recent years (USFS 2004b). Proposed activities would generally act against cumulative effects by reintroducing fire and enhancing non-pine vegetation communities. All alternatives would conserve elk habitat in accordance with Forest Plan objective 217.

Mule Deer

This discussion of mule deer is tiered to the Phase 2 Amendment FEIS, pages III-307 through III-308.

Mule deer are widely distributed in western North America. They occur in many habitat types, including semiarid deserts, riparian areas, grasslands broken by river breaks, shrub and forested areas, mountain foothills, and tundra (Higgins et al. 2000). Important food and cover plants for mule deer include sagebrush, rabbitbrush, sumac, snowberry, chokecherry, buffaloberry, willow, ponderosa pine, cottonwood, Rocky Mountain juniper, green ash, and boxelder. Habitat suitability depends on both the presence of food and cover plant species and their arrangement across the landscape (Higgins et al. 2000). Mule deer use the lower elevations and open sections of the project area.

Mule deer population across the Wyoming portion of the Black Hills grew rapidly between 1997 and 2000. It then decreased in 2001 due to poor reproduction and recruitment brought on by climatic conditions and disease. From 2002 to the present, mule deer numbers have increased. The 2005 post-hunting season population estimate was 28,282 animals (Sandrini 2006b). There is a fall hunting season.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effects on mule deer because no new activities would occur. Continued beetle infestation may improve habitat suitability for mule deer as stand density decreases. Most of the beetle infestation is not, however, in the parts of the project area most frequently used by mule deer.

Under Alternatives 1, 2, and 4, implementation of the proposed treatments would alter suitable habitat. New roads would be constructed under Alternatives 1 and 2, though not in the most suitable mule deer habitat or big game winter range. The use of these roads may displace deer from otherwise suitable habitats. Potential displacement would be limited to the life of the project if closure of newly constructed roads after use is effective. Treatments proposed under these alternatives would affect mule deer foraging and security habitats. Within a few years of treatment, near-ground cover would increase in treated stands as pine regeneration and hardwood brush grow. Forage quality is likely to increase following prescribed burns. Closure of MA 5.4 (big game winter range) to off-road and off-trail motorized use in winter would increase habitat security. Under Alternative 4, closure of MA 5.4 to off-road motorized use all year may benefit deer by reducing disturbance of fawning habitat.

Cumulative: Mule deer numbers across the Forest have fluctuated somewhat over the last five years (USFS 2004b). Fire suppression, livestock grazing, and management favoring pine have decreased forage available for mule deer in the Black Hills. Ongoing and foreseeable modifications to allotment management plans are expected to alleviate existing riparian overuse problems. Proposed activities would generally act against cumulative effects by reintroducing fire and enhancing non-pine vegetation communities. All alternatives would conserve mule deer habitat in accordance with Forest Plan objective 217.

Merriam's Turkey

This discussion of turkey is tiered to the Phase 2 Amendment FEIS, pages III-311 through III-314.

Across its western range, Merriam's turkey is associated with ponderosa pine and montane forests, scrub oak, and juniper at elevations of 6,000 to 12,000 feet (DeGraaf et al. 1991, Latham 1976). This bird inhabits a wide range of forest types in and around the Black Hills. It occurs year-round in the project area. Turkeys nest in shallow depressions on the ground, usually beneath a bush or log, and at the base of trees (SDOU 1991). Their diet includes mast of oaks and pines, fruits, seeds, grains, grasses, forbs, roots, tubers, and insects. They require large trees for roost sites (DeGraaf et al. 1991).

Turkey populations have been increasing across the Forest (USFS 2004b). There are no population estimates for turkey in the Wyoming part of the Black Hills. However, the Wyoming Game and Fish Department has used winter counts and harvest statistics to determine trend as an index of population size. High winter counts, high harvest statistics, and favorable weather conditions during nesting all indicate that the turkey population has increased since 1996. Poult production fell in 2005 due to a cool, wet June, but the population remains robust (Sandrini 2006c). This species is common in the project area. There are spring and often fall hunting seasons.

Analysis of Effects

Direct and Indirect: Alternative 0 would have no direct effect on turkeys because no new activities would occur. Continued beetle infestation would enhance foraging habitat but may reduce roost tree availability. Alternatives 1, 2, and 4 would alter areas of suitable turkey habitats, including roost trees, thermal cover, and foraging habitats. Increased human presence associated with treatment activities may

temporarily displace turkeys from otherwise suitable habitats. Fast-moving fire may impact newly hatched poults, but losses are negligible once poults can fly (Hurst 1978).

Alternative 1 would alter the most roosting habitat and Alternative 4 the least, but roost trees would not be a limiting factor under any action alternative due to the extent of mature pine forest across the project area. Following implementation of treatments, turkey foraging habitats may improve over existing conditions because treatments such as prescribed fire are likely to cause an increase in the diversity of understory vegetation. Small pockets of beetle infestation would provide transitory foraging habitat in a matrix of denser forest. All alternatives would conserve turkey habitat in accordance with Forest Plan objective 217.

Cumulative: Previous management activities in the project area have had a mixed effect on turkey habitat. Timber harvest has set back succession, providing foraging habitat, but has also removed potential roost trees. Fire suppression has decreased diversity of forest vegetation and structure to the detriment of turkey habitat. Proposed activities would generally act against cumulative effects by enhancing non-pine habitats and reintroducing fire.

Migratory Birds

Many species of migratory birds are of international concern due to naturally small ranges, loss of habitat, observed population declines and other factors. The Black Hills National Forest recognizes the ecological and economic importance of birds, and approaches bird conservation at several levels by implementing 1) Forest Plan objectives, standards and guidelines, 2) a Forest-wide bird monitoring program, and 3) site-specific mitigation and effects analyses for identified species of concern.

The highest priority (Level 1) bird species listed in the Wyoming Partners in Flight (PIF) Bird Conservation Plan for forest, montane riparian, and aspen habitat groups include northern goshawk and bald eagle. These species are discussed in previous sections. The US Fish and Wildlife Service's Birds of Conservation Concern (BCC) publication (USFWS 2002) partitions North America into 37 bird conservation regions (BCRs). The Black Hills is included in BCR 17 (Badlands and Prairies). Of the 24 bird species found in BCR 17, eleven are duplicated on the Regional Forester's sensitive species list and are evaluated above if they have potential to occur in the Black Hills. Eight species are not expected to occur in the Black Hills due to lack of habitat. A summary of all 19 species can be found in the project record. The five remaining species (golden eagle, prairie falcon, black-billed cuckoo, red-naped sapsucker, and dickcissel) or their habitats have potential to occur in the Burner project area and are evaluated below.

Golden Eagle *(Aquila chrysaetos)* – Golden eagles occur throughout North America. The species is fairly common in the plains of the western US, Alaska and western Canada. It is a year-round resident of Wyoming and western South Dakota, inhabiting open country primarily in hilly or mountainous regions but also in deserts and grasslands. It prefers to nest on cliff ledges, but will occasionally use trees for nesting (DeGraff et al. 1991).

The project area includes numerous areas of rimrock, but no large cliffs or rock faces that would provide typical nesting substrates. Contiguously forested habitats, such as those found within most of the proposed treatment areas, are not preferred by golden eagles, but they may be included in a home range if suitable nesting or foraging habitat is intermixed. Golden eagles have been recorded a number of times on Bearlodge District (district files) and by RMBO (Panjabi 2003). This species has been documented in the Burner project area in the fall but is not known to nest there.

Beetle infestation may temporarily increase potential foraging habitat by reducing forest cover. Proposed prescribed fire could also have a small positive effect by enhancing prey habitat. No other vegetation treatments or access proposals would have any effect on the eagle or its habitat. Any golden eagle nests found during project implementation would be protected under standard 3204.

Prairie Falcon *(Falco mexicanus)* – The prairie falcon occurs throughout southwestern Canada and the western US. It is locally common throughout the plains, deserts, canyons, foothills and mountains in relatively arid regions (DeGraff et al. 1991). It is a year-round resident of Wyoming and far western South Dakota. This bird nests on cliffs, from low outcrops (Tallman et al. 2002) to tall vertical cliffs over 400 feet in height (Degraff et al. 1991). The prairie falcon feeds on a variety of prey, including ducks, prairie chickens, quail, pigeons, doves, small birds, prairie dogs, mice, ground squirrels, rabbits, grasshoppers, and lizards (Degraff et al. 1991). Hunting occurs in open areas.

Observations of prairie falcons in the Black Hills are primarily along the perimeter of the forest, where high cliffs provide nest sites adjacent to open grasslands for hunting (Panjabi 2003). This species has been observed on the Bearlodge District (district files), including a possible nest along the Forest boundary in the Burner project area. Nesting was not confirmed. The possible nest area would not be affected by any proposed activities.

Beetle infestation may temporarily increase potential foraging habitat by reducing forest cover. Proposed prescribed fire could also have a small positive effect by enhancing prey habitat. No other vegetation treatments or access proposals would have any effect on the prairie falcon or its habitat. Any falcon nests found during project implementation would be protected under standard 3204.

Red-naped Sapsucker *(Sphyrapicus nuchalis)* – This species occurs from southern British Columbia and Saskatchewan south throughout the western US. It is a common woodpecker found in deciduous and mixed deciduous-coniferous forests. In the Rocky Mountains, it occurs in aspen stands, or in mixed pine-aspen stands (DeGraff et al. 1991). It prefers to excavate cavities in aspen, but will also use birch, cottonwood, or ponderosa pine. It may use the same nest tree year after year, but excavates a new cavity each year (DeGraff et al. 1991). In addition to foraging on cambium and sap, it will also consume insects, fruits, mast, and other seeds.

This sapsucker occurs throughout much of the Black Hills, typically in low to moderate abundance, although it is most abundant in the northern Black Hills. The abundance and distribution of this species is tied to the availability of hardwood stands, particularly aspen and birch (Panjabi 2003). It occurs in greatest density in aspen stands (D=13.8 birds/km^2 in Panjabi 2001, and D=10.4 birds/km^2 in Panjabi 2003). It has been observed in hardwood stands of aspen and birch and mixed pine-aspen stands in the project area and across the Bearlodge District.

No treatments are proposed in mature aspen or birch stands under any alternative. Treatments that remove pine could have a negligible negative effect on potential nesting habitat since sapsuckers may excavate cavities in pine but are more likely to use aspen. No other vegetation treatments or travel management proposals would affect red-naped sapsucker or its habitat.

Black-billed Cuckoo *(Coccyzus erythropthalmus)* – The black-billed cuckoo breeds from Alberta and Montana east to the maritime provinces and south to northern Texas, Arkansas, and South Carolina. It winters in South America. This species favors a variety of wooded or brushy habitat, avoiding extremely dense woods (DeGraff et al. 1991). It forages among leaves for caterpillars, insects, spiders, and fruit. Nests are usually in groves of trees, forest edges, moist thickets, or overgrown pastures (Peterjohn et al.

1995).

This species has been considered an uncommon migrant and summer resident (Tallman et al. 2002). In 2001, Rocky Mountain Bird Observatory technicians observed a black-billed cuckoo near Galena in the northeastern Black Hills and another near Hop Creek in the north-central Hills (Panjabi 2003). Black-billed cuckoos have not been documented on the Bearlodge District, although suitable habitat exists.

The Burner project area may provide suitable habitat in drainages forested with hardwoods, meadow edges, and open pine stands. Beetle infestation, thinning, and prescribed fire could have a small positive effect on black-billed cuckoo habitat by increasing understory production and diversity.

Dickcissel *(Spiza americana)* – This species inhabits grasslands with tall grasses, forbs, or shrubs, as well as fields planted to agriculture grasses and forbs (DeGraaf et al. 1991). Panjabi (2003) reported this species occurring in the southern Black Hills. It has not been reported in the project area or on Bearlodge District. While most of the Burner project area does not provide suitable habitat for dickcissels due to forest cover, grassy openings at low elevations may provide potential habitat.

Beetle infestation may have a small positive effect on potential dickcissel habitat by increasing the number and size of forest openings, but most of the infestation is away from potential areas of dickcissel occurrence. Proposed burning may have a slight positive effect on habitat by removing woody plants from open areas and rejuvenating grasses and forbs. Forest Plan standard 4107 would be applied to prevent potential negative effects from grazing in combination with burning (Zimmerman 1997).

3.2.3 Rare Plants

Botanical surveys of the project area were conducted in 2002. Additional surveys for other projects within the Burner project area were conducted during the 1996, 2003, 2004, and 2006 field seasons. Surveys focused on the types of habitat where sensitive plants are generally found. In the project area, this habitat consists of paper birch and paper birch/quaking aspen stands with moist soils and areas where surface water is present. High-quality sites are those with little to no disturbance from logging or livestock and few noxious weeds. A high percentage of canopy cover is typical, as is greater than average microsite moisture.

Pre-field reviews and field surveys confirmed that no federally listed or proposed plant species occur in the project area. One R2 sensitive plant species, *Botrychium campestre*, has been recorded at a single site in the project area. Habitat for this and six other sensitive plant species exists in the project area (**Table 3-19**) and is mapped in the analysis file. All sensitive species are addressed in the Burner Project Area Botany Biological Evaluation (located in the analysis file).

Table 3-17. Sensitive Plant Species with Suitable Habitat in the Burner Project Area

Common Name	Scientific Name	Species Recorded in Project Area	Habitat Category
Narrowleaf grapefern	*Botrychium lineare*	No	Open areas of natural and human disturbance
Prairie moonwort (Iowa moonwort)	*Botrychium campestre*	Yes	Open areas of natural and human disturbance
Leathery grapefern	*Botrychium multifidum*	No	Riparian meadow
Foxtail sedge	*Carex alopecoidea*	No	Riparian meadow
Yellow lady's slipper	*Cypripedium parviflorum*	No	Moist forest and cliffs
Large round-leaved orchid	*Platanthera orbiculata*	No	Moist forest
Highbush cranberry	*Viburnum opulus var. americanum*	No	Moist forest and riparian meadow

Effects on R2 Sensitive Plant Species with Suitable Habitat in the Project Area – Leathery Grapefern, Foxtail Sedge, Yellow Lady's Slipper, Large Round-leaved Orchid, and Highbush Cranberry

In the Black Hills, the primary habitat for leathery grapefern, foxtail sedge, yellow lady's slipper, large round-leaved orchid, and highbush cranberry is riparian communities and/or moist forest communities, usually with a birch or spruce component. Although the Burner project area has suitable habitat for these five species, they were not found during surveys. The following analysis discusses effects on suitable habitat for these species.

Direct and Indirect Effects: Under the no action alternative, ongoing activities such as recreation, fire suppression, and road maintenance would continue. If the mountain pine beetle infestation continues to spread, additional habitat for species associated with natural disturbances could be created. Aspen and birch forest could expand where heavy infestation has cleared pine on north aspects. The no action

alternative would maintain existing sensitive plant habitat and protect botanical diversity, although over time there may be an indirect effect of increased risk of stand-replacing fire or changes in suitable habitat from increased pine forest cover. Neither the negative effects from road construction or improvement nor the beneficial effects from road decommissioning and off-road motorized travel restrictions would occur.

The action alternatives differ in objectives, emphasis areas, and acres to be treated, and would result in different magnitudes of potential effects. The types of effects would be similar, however. For this reason all three action alternatives are analyzed together, followed by discussion of the differences in magnitude of effects among alternatives.

The possibility exists for a small amount of overlap between suitable habitat and mechanical treatments proposed under each alternative. Risk is considered low due to the purpose of the mechanical treatments (management of pine). In general, pine is either absent from suitable habitat or present in very limited amounts. Nevertheless, these treatments may result in impacts to habitat and individual plants if there are unknown occurrences. Ground disturbance is likely to occur in mechanical treatment units due to use of heavy machinery. While direct and indirect impacts to habitat are possible in areas where treatments overlap suitable habitat, proposals include design criteria to limit the extent of overlap and disturbance (see Chapter 2).

A beneficial indirect effect of implementing Alternative 1, 2, or 4 would be a reduction in the risk of high-intensity wildfire through mechanical treatments and prescribed fire. Ecotones between suitable plant habitat and pine stands, as well as the adjacent pine stands themselves, may have a strong influence on the health of suitable habitat, particularly relative to fuel loads and potential severity of wildfire effects. Heavy fuel loading may increase severity of fire effects, which could negatively affect moist forest and riparian communities that would otherwise act as fuelbreaks. Reducing fuels in the project area now could influence and moderate future wildfire behavior. This may reduce the likelihood of severe wildfire effects in moist forest communities. Management that includes prescribed burning and selective thinning of conifer stands adjacent to suitable sensitive plant habitat could help maintain a mosaic of seral stages and decrease the potential for widespread crown fires (Hornbeck et al. 2003). Patches of paper birch and other moist communities may act as natural fuelbreaks. As a forest type, paper birch stands are one of the least flammable. The canopy often has high moisture content and lush understory. Crown fires in coniferous stands often stop at the boundary of large paper birch stands or become slow-moving ground fires (Uchytil 1991).

Another possible beneficial effect of the action alternatives could result from decommissioning of roads. Reducing or eliminating motorized travel may improve plant habitat by allowing vegetation to become re-established and shade and moisture levels to increase as a result of increased canopy cover. Decommissioning roads would be expected to benefit all plant communities, and “eventually, obliterated roads would be expected to function like undisturbed areas” (USFS 1997).

A possible negative indirect effect could be spread of noxious weeds or creation of new weed infestations as a result of soil disturbance. Noxious weeds may out-compete desired plant species, and herbicides used to control weeds can have negative effects on desirable plants. Adherence to standards and guidelines present in the Phase 2 Amendment and the Black Hills National Forest Noxious Weed Management Plan (see Appendix A) would help reduce indirect effects on habitat due to spread and treatment of noxious weeds.

There is no overlap of suitable habitat with new road construction or road reconstruction proposed under any alternative. Therefore, direct effects to suitable habitat from road construction or reconstruction are not anticipated. Indirect effects are unlikely but possible due to the proximity (in some cases less than

100 meters) of road construction to areas of suitable habitat. Roads act as corridors for the dispersal of invasive weeds. Weeds are one of the greatest risks to R2 sensitive plant species, particularly for those found in riparian areas and wetlands. Since no new road construction or reconstruction would take place in suitable R2 sensitive plant habitat under any alternative, the risk to suitable habitat due to road construction and reconstruction is low.

Under Alternative 1, portions of two proposed broadcast burns overlap suitable sensitive plant habitat. These treatments may result in direct impacts such as crushing or burning or individual plants or habitat if unknown occurrences are present. Light ground disturbance may occur due to fire and foot traffic. While direct impacts to habitat are possible in areas where burns overlap suitable habitat, proposals include design criteria to limit the extent of overlap and disturbance (see Chapter 2).

Cumulative Effects: The cumulative effects area for the five R2 sensitive plant species analyzed in this section is moist forest and riparian meadow communities within the project area (mapped in analysis file). Soil disturbance, introduction of invasive species, and changes in microsite moisture and hydrologic regimes can negatively affect sensitive plant species and their habitats. Moist forest and riparian areas have changed as a result of livestock grazing, road building, fire suppression, recreation, mining activities, water diversion, and near-extirpation of beaver. These activities have decreased suitability of many of these habitats for sensitive plant species.

Under Alternative 0, continued fire suppression in the absence of vegetation treatment would likely result in higher fuel loading and may increase the risk of intense wildfires in stands adjacent to sensitive plant habitat. Because Alternatives 1, 2, and 4 would be expected to decrease hazard of high-intensity wildfire, implementation of these alternatives would act against the cumulative effects of fire suppression on suitable sensitive plant habitat. Proposed road decommissioning may act against cumulative effects of roading by reducing soil disturbance, promoting revegetation, and decreasing dispersal routes for noxious weeds. These alternatives may also, however, add to cumulative effects of noxious weed infestation through ground disturbance caused by timber harvest, fuel treatments, and road improvements.

Magnitude of Effects: Alternatives 1 and 2 would conduct treatments on nearly the same number of acres. Potential overlap with suitable sensitive plant habitat under Alternative 1 includes approximately 120 acres. Potential overlap is 95 acres under Alternative 2 and 68 acres under Alternative 4. The magnitude of potential effects, both positive and negative, from mechanical vegetation management treatments would be expected to be greatest under Alternative 1, followed by Alternatives 2 and 4.

Alternatives 1 and 2 proposed broadcast burning of the same number of acres. The magnitude of effects, both positive and negative, are expected to be similar under Alternatives 1 and 2. Alternative 4 includes no broadcast burning and would have effects similar to those described for the no action alternative.

Of the three action alternatives, Alternative 1 proposes the most road construction and reconstruction. Alternative 2 proposes slightly less of both, and Alternative 4 proposes no construction and less reconstruction than either Alternative 1 or 2. The magnitude of negative indirect effects due to building new roads and reconstructing existing roads would be expected to be somewhat greater for Alternative 1, followed by Alternative 2, and least for Alternative 4. Beneficial indirect effects from road decommissioning would be expected to be the same for Alternatives 1 and 2, with a slightly greater level of effect under Alternative 4.

Risks: The risk of implementing Alternative 1, 2 or 4 is low because areas of suitable habitat were identified and surveyed within the project area and no Sensitive plants were found during surveys. Risk is further reduced because protective measures associated with Forest Service Manual 2509.25 - Watershed Conservation Practices Handbook apply.

Determination for Leathery Grapefern, Foxtail Sedge, Yellow Lady's Slipper, Large Round-leaved Orchid, and Highbush Cranberry: Implementation of Alternative 0 would result in minimal direct or indirect effects on these sensitive plant species or their habitats in the next three to five years. Beyond that time frame, there are risks associated with the indirect and cumulative effects noted above, especially considering the level of mountain pine beetle infestation in the project area. Therefore, implementation of Alternative 0 may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing for these species.

Although Alternatives 1, 2, and 4 may have negative impacts, they are expected to be balanced or outweighed by beneficial effects such as the reduction in the risk of intense wildfires and mountain pine beetle infestation. This approach of managing to restore and preserve habitat despite potential three- to five-year negative effects (increased weed infestation, loss of plant or wildlife individuals, or initial changes to habitat) is supported by the US Fish and Wildlife Service and the National Oceanic and Atmospheric Administration (USFWS/NOAA, December 2002). Considering the risk and the potential for indirect and cumulative effects, implementation of Alternative 1, 2, or 4 may adversely impact individuals of these R2 sensitive species, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.

Effects on R2 Sensitive Plant Species with Suitable Habitat in the Project Area – Prairie Moonwort and Narrowleaf Grapefern

Suitable habitat exists in the Burner project area for prairie moonwort *(Botrychium campestre)* and narrowleaf grapefern *(Botrychium lineare)*. Prairie moonwort has been documented at a single site in the project area.

Prairie Moonwort

Species Distribution: Prairie moonwort is a North American endemic that ranges from the Canadian provinces of Alberta, Ontario, and Saskatchewan to Colorado, Iowa, Michigan, Minnesota, Montana, Nebraska, New York, North Dakota, South Dakota, Wisconsin, and Wyoming. It is considered an uncommon species with a very patchy, widespread distribution. Prairie moonwort is a grassland species originally described from the loess prairies of Iowa and dune habitats around the Great Lakes. It reaches the southern edge of its range in Region 2 and is known from only a few scattered sites within the region (USFS 2006b).

In the Black Hills, there are currently five confirmed prairie moonwort sites on National Forest System lands. Additional sites exist on private lands and at Wind Cave National Park. The known site in the project area is outside any proposed treatment units under all alternatives, but is adjacent to a non-commercial thin followed by prescribed burning proposed under Alternatives 1 and 2.

Members of the genus *Botrychium* (moonworts) can be difficult to identify to species level. Morphology is variable within species, and differences between species can be subtle. Recent research being completed by Dr. Donald Farrar is revealing genetic similarity between prairie moonwort and narrowleaf grapefern. Dr. Farrar plans to continue analysis to resolve whether the taxa warrant taxonomic separation.

Habitat: Rangewide, prairie moonwort is extremely inconspicuous. It is considered a grassland species

associated with sandy grassland habitats in prairies, dunes, railroad sidings, and fields over limestone (USFS 2006b). Black Hills sites are found on limestone in open grassland habitats, usually with high forb diversity and often with a high percentage of bare and rocky soils. Little bluestem (*Schizachyrium scoparium*) and western snowberry (*Symphoricarpos occidentalis*) occur at the majority of known sites.

Narrowleaf Grapefern

Species Distribution: Narrowleaf grapefern has historically been documented in Idaho, Oregon, Montana, California, Washington and Colorado, and in Quebec and New Brunswick, Canada. The species is also now documented in Utah, Wyoming, Alaska, and the Yukon Territory, and additional occurrences have been found in Glacier National Park, Montana (USFS 2006b).

Habitat: Typically, moonworts are long-lived (i.e. 10-15 years), colonizing plants that may require disturbance to become established. This is consistent with narrowleaf grapefern occurrence conditions in the Black Hills, since individuals are documented to occur on an old native surface roadbed with low levels of ongoing disturbance (USFS 2006b).

Typical habitat descriptions for narrowleaf grapefern are problematic because known sites are so different across its currently known range (Beatty et al. 2003). This species may be a habitat generalist since habitat across the range is quite variable and its range stretches from sea level in Quebec to approximately 10,000 feet in Colorado. Narrowleaf grapefern has been observed growing in primarily open habitats and often in areas with documented disturbances, both human-caused and natural (USFS 2006b).

Baseline inventory documentation of the narrowleaf grapefern occurrences on the Black Hills shows habitat similarities to occurrences elsewhere as well as differences. In the Black Hills, confirmed occurrences on National Forest lands are located on the Bearlodge and the Hell Canyon Ranger Districts. All sites occur in open conditions on limestone geologic material. Two sites have been confirmed on older, native-surface roadbeds. A third site is located adjacent to a gravel roadbed in open grassland. The fourth site, located on a north-facing slope, is not associated with a road.

Botrychium species depend on mycorrhizal fungi in the soil for water and nutrient uptake. Because mycorrhizal function is dependent on adequate soil moisture, mycorrhizae are probably the most important limiting factor for *Botrychium* establishment (Anderson and Cariveau 2003).

Risks: There is much uncertainty regarding risks to *Botrychium* species in the Black Hills, including prairie moonwort and narrowleaf grapefern. Disturbances and land management activities may create and maintain suitable habitat or may negatively impact existing populations, depending on the disturbance intensity and frequency (Beatty et al. 2003).

Determination: The following determination is assigned to prairie moonwort and narrowleaf grapefern. The rationale following the determination applies to both species.

Because there is limited information available for either species in the Black Hills and the Rocky Mountain Region, it is difficult to assess whether the activities associated with the Burner project would have no effect, a potential adverse effect, or a potential beneficial effect on prairie moonwort and narrowleaf grapefern. Based on the information that is available, a determination of "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing" is made for all alternatives for prairie moonwort and narrowleaf grapefern. The rationale for this determination is based upon the following:

1. Other verified occurrences of these species are located more than 50 miles from the Burner project

area. The closest occurrences are located approximately 15 miles from the Burner project boundary. None of these occurrences would be disturbed by the activities associated with the Burner project. While the full extent of the distribution of these species in the Black Hills is currently unknown, the appearance of above-ground sporophytes at the known sites is indicative of viable populations with extensive supporting underground biomass (including mycorrhizae). Therefore, while loss of individuals may occur in any currently unknown sites in the Burner project area, the viable populations at the known occurrence sites outside of the Burner project area would not be affected by the project.

2. Baseline monitoring data for known Black Hills occurrences of these species documents that they are able to colonize areas disturbed in the past and that the species are currently persisting at the known monitored sites with limited ongoing disturbances (USFS 2006b).

3. Under Alternatives 1, 2, and 4, canopy cover would be reduced in some portions of the project area, which could benefit prairie moonwort and narrowleaf grapefern. Although specific data are lacking on the Black Hills National Forest, the earlier successional conditions that occur with opening the overstory canopy could produce conditions that may be beneficial to site colonization by these wind-dispersed, spore-producing species, if the associated mycorrhizal species and other microsite conditions are present (USFS 2006b).

4. If there are unknown occurrences of these species in the Burner project area, and in the case of the single known prairie moonwort site, it is possible that actions proposed under Alternatives 1, 2, and 4 could expand or alter site conditions as a result of some level of disturbance caused either by mechanical treatments or prescribed burning (i.e., earlier successional conditions including shrub shade reduction, disturbed site conditions, and changes in plant competition patterns); these may be favorable for expansion and/or colonization by spores of *Botrychium* species, as long as associated mycorrhizae and other microsite conditions are present.

5. For Alternatives 1, 2, and 4, log-skidding when ground is not frozen could result in belowground disturbance that may impact unknown individuals. Conversely, skidding may create conditions suitable for colonization by these species (USFS 2006b).

6. Although uncertainty exists, weed competition as well as herbicide application are considered to be potential risks to *Botrychium* species. If herbicide spraying occurred at a site while aboveground portions of prairie moonwort or narrowleaf grapefern are present, the individuals could be negatively affected by the herbicide. Dr. Farrar believes that there would probably be enough belowground spores, gametes, juveniles, etc., so that not all of any one occurrence would be affected by herbicide treatment. In addition, if a prairie moonwort or narrowleaf grapefern occurrence does exist at a herbicide application site, the individuals would likely benefit from reducing weed competitors (USFS 2006b).

7. Despite possible negative effects on aboveground stems, overall beneficial effects may be realized by broadcast burning proposed under Alternatives 1 and 2. When an occurrence has aboveground growth, a fast-moving fire may remove above-ground stem portions but would not be expected to affect below-ground individuals or parts. Burning may release more nutrients to the soil that may immediately benefit the mycorrhizae and *Botrychium* species, and prescribed fire may provide the disturbance needed for site colonization. An intense fire (wild or prescribed) with severe effects such as deep soil heating could potentially negatively affect both the below-ground and above-ground portions of individuals of these species. Treatments reducing fuels in adjacent upland conifer stands

would be expected to decrease the likelihood of a crown fire reaching R2 sensitive plant species such as prairie moonwort and narrowleaf grapefern (USFS 2006b).

8. Complete information on distribution, abundance, microhabitat needs, and disturbance regimes optimal for persistence of prairie moonwort and narrowleaf grapefern is unknown. This lack of information makes it difficult to predict cumulative effects on these species under any of the Burner alternatives. Past, present, and foreseeable actions (as well as natural disturbances) likely have and could be expected to continue to have both beneficial or negative effects on some of these individuals or entire occurrences, but at the same time could contribute to site conditions suitable for colonization by prairie moonwort and/or narrowleaf grapefern or help conserve or maintain existing habitat (USFS 2006b).

For further information, refer to Appendix C of the Phase 2 Amendment FEIS and to the Supplemental Information on *Botrychium campestre* Based on Recently Received Preliminary Information (USFS 2005a).

Species of Local Concern

Habitat exists in the project area for four plant species of local concern (SOLC): northern hollyfern *(Polystichum lonchitis)*, arrowleaf sweet coltsfoot *(Petasites sagittatus)*, pleated gentian *(Gentiana affinis)*, and shining willow *(Salix lucida)*. The Burner Project Botany Specialist's Report (in the analysis file) discusses the full list of SOLC plants. Northern hollyfern is associated with rock crevices and birch/hazel forest on moist, north-facing slopes. Arrowleaf sweet coltsfoot, pleated gentian, and shining willow are associated with riparian meadows. These species have not been documented in the project area. Effects on these habitats are discussed above in the sensitive species section. Conclusions of that section apply to these species.

3.2.4 Rangeland

The Burner project area includes all of Cole, Ogden, and Warren grazing allotments and parts of Divide and Redwater allotments. Cattle numbers and season of use are described in Section 3.1. Range improvements in the project area include 39 water developments (springs, tanks, stock dams) one-quarter mile of water pipeline, and 40 miles of fence.

Direct and Indirect Effects

Depending on the course of the mountain pine beetle infestation, Alternative 0 may increase forage or allow continued encroachment of ponderosa pine communities into primary range. Any additional forage range created through infestation may be of limited use to cattle due to the many fallen trees that could restrict movement. Encroachment of ponderosa pine into grassland communities, meadows, and riparian areas would increase the grazing pressure on these areas as they shrink in size. This would ultimately reduce their capability under the current permitted livestock numbers. Utilization standards described in Forest Plan standard 2505 may eventually be exceeded, making it difficult to maintain satisfactory condition in some areas.

No changes to livestock management are proposed under Alternative 1, 2, or 4. Commercial and noncommercial treatments would result in additional forage on transitory (temporarily improved) range. Livestock distribution throughout the project area may improve as treatment areas are opened up and

roads are improved or new ones are built. Better livestock distribution would decrease effects on primary range, such as meadows, upland grasslands, and riparian areas. This would aid in maintaining or moving these communities towards desired condition.

Alternative 1 would treat the most acres and would have the highest potential for increased forage availability. Prescribed fire proposed under Alternatives 1 and 2 would aid in maintaining or moving primary range towards satisfactory condition. It would also help maintain or restore upland grasslands and meadows and set back pine encroachment while increasing available forage. These effects could improve cattle distribution and relieve pressure on primary range. Prescribed fire would also have a direct short-term impact on permittees and livestock grazing. Pasture rotations, season of use, or livestock numbers may need adjusted in order to allow sufficient recovery time in burned areas according to Forest Plan standard 4107 (Appendix A). New vegetation in burned areas often becomes very desirable to livestock and wildlife because of palatability and access. Close coordination would be needed between the district fire/fuels and range staffs to ensure adequate time for the vegetation to recover before it is grazed and to minimize impacts on the permittee's operations.

Cumulative Effects

The cumulative effects area for the range resource is the total area of the Cole, Divide, Ogden, Redwater, and Warren allotments.

Past and future timber harvest and prescribed fire have created and would continue to create transitory range, increasing livestock distribution and available forage. This would reduce the time livestock spend on primary range, contributing towards achievement of Forest Plan objectives 301 and 302 as well as standard 2505.

Fire suppression has reduced available forage. Treatments proposed under all action alternatives, along with continued beetle infestation, would work against this trend. Road construction proposed under Alternatives 1 and 2 would contribute to the cumulative effect of increased cattle access to secondary range.

Both effects would be likely to last until forage in treated stands has decreased due to regrowth of forest canopy cover.

3.2.5 Noxious Weeds

Noxious weed surveys took place in the project area in 2004. Approximately 1,370 acres were found to be infested with noxious weeds. The most common weeds are musk thistle *(Carduus nutans)*, yellow toadflax *(Linarea vulgaris)*, Canada thistle *(Cirsium arvense)*, houndstongue *(Cynoglossum officinale)*, and common mullein *(Verbascum thapsus)*. Common tansy *(Tanacetum vulgare)*, St. Johnswort *(Hypericum perforatum)*, and spotted knapweed *(Centaurea maculosa)* are present in very limited numbers. About 400 acres of weeds were treated with herbicide in the project area in 2006.

Direct and Indirect Effects

Alternative 0 could facilitate noxious weed spread if beetle infestation continues. As pine canopy decreases, an abrupt increase in the forest floor's exposure to light would improve conditions for weed growth. Under Alternative 0, potential wildfire severity and rate of spread are likely to remain high and continue to increase. A severe fire could expose large areas of bare soil and invite infestation by weeds;

this may delay or prevent reestablishment of desirable species.

Inventory and treatment of noxious weeds would continue under all alternatives. Roads and trails would continue to provide avenues for noxious weed spread. Any time there is ground disturbance, noxious weeds have the potential to spread from existing infestations, and new species may colonize the area. Noxious weeds play a negative role in the health of vegetation communities, decreasing plant species diversity and availability of forage for grazing animals.

Activities such as those proposed under the action alternatives, including timber harvest, slash disposal, road construction, and prescribed fire, can facilitate noxious weed infestation. Prescribed fire can benefit forest health but can also aid the spread of noxious weeds. Treatment of weed infestations prior to prescribed fire implementation is important in reducing the risk of spread. Some fire containment practices, such as construction of dozer lines, result in soil disturbance that provide opportunities for establishment and spread of noxious weeds. Movement of equipment needed during fire operations can contribute to the spread of weeds. New species may be introduced when equipment is brought in from out of the local area.

The potential for additional infestation is greater under the action alternatives than the no action alternative unless widespread, severe wildfire followed the unchecked beetle infestation. Alternative 1 has the greatest potential to increase noxious weed infestation due to the large area proposed for treatment and the inclusion of prescribed fire. Alternatives 2 and 4 could also result in additional infestation, though the risk under Alternative 4 would be somewhat less due to the lack of road construction and prescribed fire and the dispersed nature of treatments.

To counteract this risk, all action alternatives would incorporate design criteria and mitigation measures listed in Chapter 2 and Appendix A. These measures would reduce the chance and extent of negative effects by minimizing soil disturbance and duration of soil exposure, addressing new infestations, and designing operations to minimize spread of seeds and plant parts.

Cumulative Effects

The cumulative effects analysis area for noxious weeds is the project area, including non-NFS lands.

Past activities, including actions similar to those proposed, resulted in the analysis area's existing noxious weed infestations. Alternatives 0, 1, 2, and 4 could add to the cumulative effect of weed infestation. Noxious weeds are not known to have caused substantial changes in plant community composition or measurable losses of forage in the analysis area. Application of design criteria, mitigation measures, and monitoring listed in Chapter 2, and prompt weed control if needed, is likely to minimize the additive effect of this project. Under these circumstances, effects of this project on weed infestation should be unnoticeable by the next entry.

3.3 PHYSICAL CONSEQUENCES

This section discusses resources that are primarily physical in nature, including soils, water, transportation, fire hazard, and fuel loading. The existing conditions of these resources in the project area are described and the potential direct, indirect, and cumulative effects of each alternative are discussed.

3.3.1 Soils

The objective of soil resource management is to improve or maintain long-term soil productivity. Soil productivity is the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. In order to improve or maintain long-term soil productivity, soil disturbance should be kept to a minimum and adequate measures need to be implemented to protect the surface soil, keep the soil in place, reduce compaction, and maintain nutrient and organic matter levels (USFS 1997).

Twenty-five soil map units are located in the project area **(Figure 3-2)**. Three of these soils cover 75 percent of the project area, with 15 soil map units each occurring on less than one percent of the area. **Table 3-18** lists characteristics of soils dominating the areas where activities are proposed.

Table 3-18. Characteristics of Major Soil Map Units

Soil Map Unit Name	Percent Slope	Erosion Hazard	Landslides/Soil Failures	Percent of Project Area
Grizzly-Virkula Complex	15-60	High	n/a	33.7
Rock Outcrop-Vanocker Complex	50-75	High	Throughout unit	27.6
Peso-Paunsaugunt Complex	10-60	High	On slopes over 40%	13.3
Larkson-Lakoa Loams	10-60	High	On slopes over 40%	5.9
Peso-Paunsaugunt Complex	6-10	High	n/a	4.8
Rock Outcrop-Limestone	n/a	n/a	n/a	4.8
Grizzly-Virkula Complex	6-15	High	n/a	3.4

Source: SCS Soil Survey of Crook County, Wyoming, 1983

Soil health monitoring assessments were conducted in 17 stands in the project area in 2006. Survey sites were selected based on recent activities or disturbances. Observations focused on characteristics relevant to Forest Plan standard 1103 (e.g., soil compaction, displacement, erosion, and severely burned soil). The majority of the sites were rated as “properly functioning”. Exceptions were in stands 0108030095 and 0108030101, both of which were rated as “at risk” due to loss of soil productivity due to trenches dug for mineral exploration conducted in the 1980s. Proposals for adaptive management treatment in these stands were dropped as a result. Also, a meadow area of stand 0108030109 was rated as “properly functioning” overall, but appeared to have a high water table, leading to soils being saturated more often than in the adjacent uplands. Preliminary proposals were modified to keep timber harvest and heavy equipment out of this meadow. All stands surveyed were observed to have the minimum percent

Figure 3-2. Project Area Soils

effective ground cover needed to keep erosion within tolerance limits based on the soil health assessment monitoring protocol.

On-site slope-stability examinations were also conducted in 2006 in eight stands where soils and proposed treatments met criteria specified in Forest Plan standard 1108. Observed evidence of past mass movement included scattered leaning trees and hummocky terrain.

Direct and Indirect Effects

Soil Erosion

Under the no action alternative, there would be no new activities that would contribute to soil erosion. Fuel buildup due to beetle infestation could increase potential wildfire severity and rate of spread. In the project area, less flammable hardwoods and grasslands are intermixed with pine, so fires may burn in a mosaic pattern. Where surface vegetation and litter layers are consumed by fire and soil heating occurs, it would be expected that soil productivity would be adversely affected. Soil erosion could be higher at these sites until vegetation and litter recover. Vegetation recovery time depends on a variety of factors, including the inherent productivity of a soil, severity of impacts to the soil and vegetation components, and the climatic conditions experienced during the years following the fire.

Under all action alternatives, potential for soil erosion through gullying and displacement would be expected to increase where vegetation is removed and soil exposed to erosive elements. Soil surface layers may be displaced by heavy equipment and log skidding. New road cuts would leave bare soil exposed and susceptible to movement by wind and water. Soil erosion would include loss of soil nutrients. After a gravel surface has been placed on new roads and road cuts have revegetated, there would be expected to be few adverse effects unless the roads are damaged by severe weather or landslides (USFS 1997).

Sixteen soil map units in the project area are classified as having high erosion hazard (SCS 1983). These units cover 92 percent of the project area. This may indicate that proposed activities present an elevated risk of soil erosion in some areas. Soil health assessments conducted in the project area, however, generally did not document that soils were impaired or at risk due to erosion. These assessments occurred in 2006 in proposed treatment areas where timber harvest, fuel treatment, or prescribed fire took place within the last 10 to 15 years.

Slope is a factor in erosion hazard ratings for the three soil units that make up the majority of the project area. Slope-related design criteria included for this project specify avoidance of 1) log skidding on sustained slopes over 40 percent and on moderately to severely burned slopes greater than 30 percent, and 2) road construction on slopes over 70 percent (see Chapter 2). Implementation of these design criteria and other Forest Plan standards and Regional Watershed Conservation Practices (Chapter 2 and Appendix A) would be expected to keep erosion within acceptable levels.

Road decommissioning conducted in accordance with Forest Plan standards and Regional Watershed Conservation Practices would be expected to decrease the effects of road-related runoff and associated soil erosion. Decommissioning of several unclassified roads that run along or cross water influence zones would be expected to reduce negative effects on riparian areas and soil. The extent to which these benefits would be realized would depend on various factors, including the location and initial condition of the road and specific measures implemented.

Type of effects would be similar under all action alternatives. Alternatives 2 and 4 propose treatment on

fewer acres than Alternative 1. Alternative 4 does not include construction of new roads or prescribed fire.

Soil Compaction

Soil compaction can reduce soil aeration and infiltration, which can contribute to reduction in long-term tree growth. To the degree that compaction reduces growth of vegetation, there may be increases in soil erosion and runoff. Increased compaction can lead or contribute to site-specific reduction in soil productivity (USFS 1997).

Under the no action alternative, soil compaction would not generally be expected to increase. Soil compaction that does occur may decrease over time. The action alternatives could cause compaction through use of heavy equipment. Compaction is most likely to occur on roads, major skid trails, and log landings; it could be expected to decrease over time after the activity ends. Indirect effects include a potential increase in soil erosion and runoff. Implementation of Forest Plan and specific Regional Watershed Conservation Practices (Appendix A) would be expected to keep soil compaction within acceptable limits.

Intensity of effects would be expected to be similar under all action alternatives. Extent would be expected to vary in proportion to number of acres treated and amount of road work. Alternatives 2 and 4 propose treatment on fewer acres than Alternative 1. Alternative 4 does not include construction of new roads or prescribed fire. Heavy equipment associated with these activities would therefore operate in fewer areas, and compaction may therefore be less likely to occur.

Soil Nutrients

Loss of soil nutrients lowers site productivity. Varying levels of nutrient loss generally occur when there is removal of surface soil, organic matter on the ground, or standing vegetation.

The no action alternative would have no direct effects on soil nutrients. If a high-intensity wildfire occurred, it would be expected that the consumption of vegetation and surface litter would result in nutrient loss, depending on site-specific severity of effects. High-intensity fires may occur under any of the alternatives, but fuel loadings are expected to be greatest under the no action alternative;depending on intensity of fires, severity of effects may be expected to be greatest under that alternative. Timber harvest proposed under the action alternatives would result in loss of some of the nutrients contained in trees. The majority of nutrients are concentrated in tree foliage, branches, and roots. Foliage and branches would remain on site except where whole-tree yarding takes place. All action alternatives are likely to use whole-tree yarding in most stands except those where cable yarding is necessary due to steep slopes. Because Alternatives 1 and 2 would harvest roughly the same area, the extent of nutrient loss would be expected to be similar under these two alternatives, and greater than under Alternative 4. Available literature suggests that the degree of nutrient loss due to one entry using whole-tree yarding may be negligible (McLaughlin and Phillips 2006, Sanchez et al. 2006). Whole-tree yarding has not previously been used in sites proposed for treatment as part of this project. Prescribed burning could reduce organic material in soil, though this effect would occur only in isolated spots where fire intensity is high.

Soil Heating

Generally, low-intensity fire increases availability of nutrients to plants without increasing soil erosion. High-intensity fires can cause areas of severe effects, such as detrimentally burned soils where most of the woody debris is consumed along with the litter, duff, and humus, leaving only bare mineral soil. Low-intensity prescribed fire increases availability of nitrogen for plant use while maintaining ground cover, which prevents accelerated erosion. Prescribed fire can also reduce the potential for high-intensity

wildfire and resulting adverse effects on soils (USFS 2006b).

The no action alternative would not result directly in soil heating, but potential wildfire intensity in areas heavily infested by mountain pine beetles would remain elevated above conditions generally associated with endemic beetle infestation levels. Soil heating could occur during prescribed fire under Alternatives 1 and 2. At the same time, these alternatives could be expected to severity of effects associated with wildfires. Alternative 4 includes no prescribed fire. It would be expected to decrease potential wildfire intensity in mechanically treated areas, but this effect would occur on fewer acres than under Alternatives 1 and 2.

Regeneration Hazard

Survival of tree seedlings can be affected by a variety of contributing factors, including soil features such as depth to water table, salinity, available water capacity, aspect, and soil temperature regime. The Bone soil map unit, which occurs on 0.2 percent of the project area, is the only soil unit with high potential for seedling mortality. This soil unit is located in the isolated block of NFS land located in section 31, Township 52 North, Range 63 West. Alternative 1 proposes adaptive management treatment on this soil unit and Alternative 4 proposes wildland-urban interface thinning. None of the alternatives propose regeneration harvest, and the soil unit would remain forested with mature trees. Seedling survival would not be affected.

Landslides and Slope Failures

See discussion of Forest Plan standard 1108, below.

Compliance with Forest Plan Direction

Standard 1101 (soil productivity): The cumulative effects analysis discusses cumulative effects of disturbances on long-term soil productivity.

Standard 1103 (soil disturbance): Soil erosion, displacement, and heating are all types of soil disturbance that may occur in the project area as a result of proposed activities. Soil health assessments conducted in the project area rated the majority of the sites surveyed as “properly functioning”. This rating meets the intent of standard 1103 (no more than 15 percent of any land unit should be severely burned or detrimentally compacted, eroded, or displaced). Exceptions were stands 0108030095 and 0108030101, which were rated as “at risk” due to loss of productivity resulting from historic mineral exploration. Preliminary treatment proposals in these stands were dropped. Unit 0108030109 was rated as “properly functioning” overall, but exhibited deep rutting from past activities in the riparian meadow adjacent to Whitetail Creek. This part of the stand appears to have a high water table, resulting in soils that are saturated more frequently than soils in the upland parts of the stand. All sites had the minimum percent effective ground cover needed to keep erosion within tolerance limits based on the soil health assessment protocol. Avoidance of these sites (page 2-13) and adherence to Forest Plan standards and Regional Watershed Conservation Practices would meet the intent of standard 1103.

Standard 1108 (slope stability): Landslide and slope failure hazards exist in the project area on three soil map units when slopes are generally over 40 percent (Lakoa-Butche, Larkson-Lakoa, Peso-Paunsaugunt) and on Rock Outcrop-Vanocker regardless of slope. Together these soil units cover about 50 percent of the project area. Road construction on unstable slopes and vegetation removal leading to reduction in root strength can increase the potential for landslides and slope failures.

On-site slope stability examinations were conducted in 2006 in eight stands meeting the criteria of standard 1108. No actions are proposed in other areas meeting the criteria. Evidence of past mass

movement included scattered leaning trees and hummocky terrain characteristic of soil creep. Relevant literature (Sidle et al. 1985) and consultation with Regional soil experts indicates that retention of 25 to 33 percent pine crown cover could limit the likelihood of increased potential for mass movement effects. Alternative 1 proposes adaptive management treatment in six of the surveyed stands. Alternative 2 proposes various treatments in four of the stands, and Alternative 4 proposes interface thinning in six of the stands. Site-specific design criteria require retention of at least a third of the existing crown cover in these sites (pages 2-14, 2-20, and 2-25).

Cumulative Effects

Past timber harvest activities in the project area are likely to have caused short-term soil erosion and compaction due to use of mechanized equipment. Road construction, maintenance, reconstruction, and decommissioning have caused and would be expected to continue to cause short-term effects on soils through compaction from road maintenance and construction equipment or by exposing soils that are vulnerable to erosion until vegetation is reestablished. Persistent effects of these activities appear to be limited in magnitude.

Mineral exploration occurred in the Warren Peak area in the 1980s and from 2004 to the present. Drilling of additional exploration holes in the same vicinity is planned. Past exploration resulted in “at risk” soil health conditions in two sites as described above, largely due to lack of reclamation. Soil erosion from future exploration should not be elevated over the long term if the activities are conducted in accordance with Minerals Best Management Practices and Watershed Conservation Practices, which include measures to stabilize soils and restore some measure of productivity in locations disturbed by mining.

Livestock grazing, water source development, and utility maintenance have occurred and will continue to occur in the project area. These activities can disturb soils and have likely caused erosion, compaction, and sedimentation in parts of the project area. The North Zone Range EIS (USFS 2006e) identified no livestock-related soils effects identified in the Cole, Redwater and Ogden allotments, which overlap the project area, and concluded that detrimental compaction due to livestock grazing could be expected only in small areas around tanks and trails.

The no action alternative would have little additive effect on soil resources unless a high-intensity wildfire occurs. Severe fire effects, such as widespread soil heating and loss of soil nutrients, could result. Soil productivity could decrease as a result until soil structure and function recover.

The action alternatives would not be expected to contribute substantially to cumulative effects on soil resources. Regular road maintenance and the activities proposed under these alternatives would add to cumulative effects by exposing soils, which would be vulnerable to erosion until revegetated. The additive effect would be minimized through application of measures to ensure timely revegetation (page 2-13; see also Appendix A). Long-term beneficial effects would be expected from road closure and decommissioning. Proposed road construction (Alternatives 1 and 2) is unlikely to add to cumulative effects of roads on soil erosion due to the location of these roads on gently sloping ridgetops. Proposed road construction would add to the effects of existing roads by causing a loss of productive soil along the new roads; the area returned to various levels of production through road decommissioning should, however, exceed the area affected by new roads.

Off-road motorized vehicle use has not been observed to be noticeably higher in the project area than elsewhere on the National Forest. Soil and water damage due to this use has been documented occasionally in a few specific areas mainly in the southeast part of the project area. Continued use of off-road motorized vehicles may contribute to a cumulative increase in the level of soil disturbance in the

project area by compacting or displacing soil and exposing soil to erosive elements. Forest-wide travel management planning currently under way may affect this contribution. Proposed area closures would, if effective, reduce the contribution of off-road vehicle use to cumulative effects. This effect would be greatest under Alternative 4, which would close the largest area year-round (74 percent of the project area). Vehicles that conduct mechanical treatment of fuels usually drive over the slash they create, resulting in minimal soil disturbance. Livestock have contributed to cumulative effects on some riparian areas, springs, and small areas of soil where concentrated use occurs. These effects would be expected to decrease with implementation of adaptive Allotment Management Plans in the Cole, Ogden, and Redwater grazing allotments. Other than repair of Connected Disturbed Areas, activities proposed under the Burner project would not affect these locations. Proposed activities are therefore unlikely to add to cumulative effects of livestock grazing.

The action alternatives could add to cumulative effects on long-term soil productivity on a limited basis, such as where roads are constructed. Other soil disturbance or alteration is likely to last only until revegetation takes place (one to three years). The low- to moderate-intensity broadcast burning proposed under Alternatives 1 and 2 is unlikely to have lasting effects on soils due to relatively low heat yield and short residence time.

Under all action alternatives, the only activities proposed on soils prone to mass movement include design features to target the conservatin of slope stability (pages 2-14, 2-20, 2-25). None of the alternatives would be expected to add to cumulative effects on slope stability.

3.3.2 Water Resources

The project area lies within portions of ten 7th-level watersheds, listed in **Table 3-19** and displayed in **Figure 3-3**. The total watershed area (74,873 acres) is greater than the project area because portions of the watersheds are located outside the Forest and project area boundaries. For the cumulative effects analysis, the entire watershed area was considered.

Table 3-19. 7th Level Watersheds

Watershed	Named Drainages	Watershed Acres in Project Area	Total Watershed Acres
101-202-0107-0501	Miller Creek	119	9,958
101-202-0107-0701	Lytle Creek	406	8,317
101-202-0108-0602	Oak Creek	63	8,353
101-202-0108-0601	Bear Den Canyon, Houston Creek, Lost Houston Creek	3,252	4,876
101-202-0109-0601	Beaver Creek, Whitelaw Creek	3,169	7,158
101-202-0301-0201	Ogden Creek, Richardson Creek, Rocky Ford Creek, South Fork Ogden Creek, Tent Canyon Creek	5,354	7,489
101-202-0301-0202	Cole Canyon, South Redwater Creek	3,596	9,313
101-202-0301-0203	Rocky Ford Creek	813	6,524
101-202-0301-0301	Sundance Creek	1,496	6,218
101-202-0301-0303	None	1,296	6,667

Water Quantity

Data for water quantity on existing perennial streams within the project area is limited. In general, the area is drained by small streams which are tributaries to the Belle Fourche River. Flow regimes of most streams in the northern Black Hills and Bear Lodge Mountains that have perennial flow are driven by snowmelt and seasonal rains. The majority of streams have a sharp increase in channel flow in April concurrent with melting of accumulated snow. The greatest water yield occurs from the rains in April, May, and June (USFS 1997).

Vegetation affects the amount of precipitation that is evaporated or transpired and consequently affects the amount available for stream flow. In the Black Hills, streamflow decreases are greater than precipitation from July through September mainly due to evapotranspiration (USFS 1997).

Under the no action alternative, streamflow and water yield would continue to be influenced by climate and vegetation. Current trends are likely to continue. Potential wildfire severity and rate of spread would be greatest under the no action alternative due to high density of many pine stands, areas of high fuel loading, and continued beetle infestation. Severe fires have been known to affect water quantity by increasing peak flows and surface runoff.

Any disturbance that reduces the density of live vegetation cover will increase runoff from forested watersheds. In snow-dominated areas, flow increases occur mostly during spring runoff and are not measurable until about 25 percent of the basal area of a forested watershed is affected. The increase in the size of peak flows is proportional to the amount of basal area affected (USFS 2006c).

Under Alternative 1, treated acres would exceed 25 percent of the watershed acres in watersheds 101-202-0301-0201 (28.2 percent) and 101-202-0108-0601 (25.6 percent). Using the treatment assumptions for the maximum infestation scenario (page 2-5), less than 25 percent of the basal area of any given 7th-level watershed would be cut. Measurable flow increases at the 7th-level watershed scale would therefore not be expected under Alternative 1. Measurable flow increases may be possible at a smaller watershed scale on streams such as Richardson Creek, where treatments in the associated 440-acre watershed could potentially remove more than 25 percent of the existing basal area.

Some of the roads proposed for reconstruction under both Alternatives 1 and 2 cross existing drainages or are located within water influence zones, including NFSR 830.1B (upper Richardson Creek), U610112 (unnamed South Redwater Creek tributary), NFSR 838.1E (upper Sundance Creek), and NFSR 899.2 (Sundance Creek tributary). Under Alternative 4, only U610112 would be reconstructed. Reconstruction of drainage crossings would be designed and implemented in conjunction with a qualified hydrologist to maintain water influence zone integrity.

Under Alternatives 2 and 4, treated acres would not exceed 25 percent of the total watershed area in any 7th-level watershed. Measurable flow increases at the 7th-level watershed scale would therefore not be expected.

Water Quality

Water quality refers to the physical, chemical and biological characteristics of water and how these components affect beneficial uses. Water chemistry greatly affects the diversity and quantity of aquatic life present in a stream. Existing water quality is a result of the natural characteristics of watersheds, along with management activities (timber harvest, recreation, grazing, mining, construction), and natural events (wildfire, floods) occurring on both public and private lands (USFS 2006a).

One of the primary purposes of National Forests is the protection of water quality. The principle of anti-degradation, established by the Clean Water Act of 1972 (CWA), means that water of high quality must remain at the same high quality, even if far above standards required for domestic use. Downstream water users often depend on the high quality of Forest System waters to dilute industrial or agricultural pollutants (USFS 2006a). The amended Forest Plan contains directions to ensure all projects comply with the requirements of the CWA (USFS 2006b).

States assign beneficial or designated uses to their streams and set water quality standards for each use. Wyoming has designated all streams on the Black Hills National Forest as being Class 2. Class 2 streams are those surface waters which are determined to be presently supporting game fish, or have the hydrologic and natural water quality potential to support game fish, or include nursery areas or food sources for game fish (USFS 2006a).

Under Section 303(d) of the CWA, states are required to identify and establish a priority ranking of all waterbodies that are not meeting beneficial uses and to develop a Water Quality Limited Segments List (commonly called a 303(d) List). No streams in the project area are listed on Wyoming's 2006 303d list (WDEQ 2006). Monitoring conducted by DEQ shows full support of designated 2AB aquatic life uses in Blacktail Creek within the National Forest (WDEQ 2006).

A reach on Whitelaw Creek has been monitored by DEQ as a long term reference site since 1993. Extrapolation of those data and assessments to the remaining tributaries indicate full aquatic life use support in the Beaver Creek watershed (WDEQ 2006).

Watershed Condition

Watershed assessments form a practical basis for management activity planning. Watersheds in the Black Hills National Forest have been categorized into three classes (USDA 2006a). Class I watersheds are in robust health, Class II are of moderate concern, and Class III are of high concern. The 6th-level watersheds in which Bear Den Canyon and Beaver Creek are located are rated as Class III. Lytle Creek, Blacktail Creek, and South Redwater Creek are in Class II 6th-level watersheds.

Bear Den Canyon is a Class III watershed because of its sensitivity index and impact index. Sediment is the main pollutant of concern because of steep slopes, acres of unbuffered roads, and number of watershed acres with high soil hazards (USFS 2006a).

Water quality concerns in the Beaver Creek watershed are mainly related to sediment and other physical parameters. Elevated water temperatures in Beaver Creek appear to be due primarily to historic channel widening caused by a combination of past grazing practices and changes in flow regime from Cook Lake. The system has since stabilized and supports its designated class 2AB aquatic life uses. Past actions have also resulted in sediment impairment of Beaver Creek and sources of sediment in the watershed include cattle trampling the streambanks of several tributaries, several blown-out beaver dams and instances of streambank destabilization, portions of Beaver Creek (and the headwaters of several tributaries) flowing through high erosion hazard soils prone to landslides, and the location of roads (running parallel to the creek) associated with several landslides that occurred in 1995. These landslides also contribute sediment to the channel (USFS 2006a).

South Redwater Creek watershed is a Class II watershed because of its sensitivity index and impact index. Mountain pine beetle infestations appear to be most concentrated around Ogden Creek and its largest tributary, Richardson Creek, both of which are in 7th-level watershed 101-202-0301-0201. Existing data (Belz 1995) indicate that numerous past activities (prospecting, mining, dam construction, water diversions, wildfire, beaver activity, beaver eradication, and road construction) have occurred in the Ogden Creek drainage. Virtually all of Ogden Creek has been impacted by these activities to some degree. Current conditions in this drainage are variable. Some areas of past impact have stabilized either through natural recovery processes or watershed improvements, while other areas remain unstable. Mining, trails, and roads are the most evident continuing impacts along mainstem Ogden Creek. On three reaches surveyed on mainstem Ogden Creek, mining and/or slide areas of varying stabilities were documented along five to 26 percent of the reach length. Although a Proper Functioning Condition (PFC) assessment site on Ogden Creek (just below its confluence with Richardson Creek) was shown to be at PFC in 2005 (Wignall et al. 2005), streambank alteration and continuing impacts have likely left portions of the Ogden Creek drainage vulnerable to increases in water yield.

Connected Disturbed Areas

Connected Disturbed Areas (CDAs) contribute sediment to streams or wetlands, causing degradation of physical function and water quality and increase peak flows that may alter physical channel processes. CDAs may include bare soil, compacted soils, roads, and severely burned areas that are connected to drainages. CDAs were surveyed in the project area in 2006. Twenty culverts and nine low-water crossings were assessed, and stream surveys were conducted. A total of 20 CDAs were identified, including low water crossings, trail crossings, OHV crossings, and culvert plugging or erosion. CDAs and other drainage concerns that could be corrected during road reconstruction and maintenance include 1) a low water crossing on road 855.2A, where soil is disturbed on the crossing surface and bank cutting has occurred on the downstream side of the crossing; 2) two obsolete culverts causing bank-cutting along Ogden Creek; 3) a plugged culvert outlet on road 899.2; and 4) inadequate drainage on road 851.1B, leading to erosion channeling water down the road surface.

Pollutants of Concern

Sediment affects water quality and the beneficial uses of water, whether for drinking water, fish reproduction and habitat, or recreation. Sediment often reaches stream channels through the process of erosion. The effects of sedimentation can be seen long after the sediment source has revegetated (USFS 2006a).

Ground disturbance increases soil erosion rates by leaving areas of unprotected soil. Increasing the number of acres disturbed by management activity will increase the potential of sediment being delivered to the channel system. The closer a disturbance is to a stream channel, the more likely that sediment will affect water quality. Soil disturbance on the ridges or sidehills may never affect water quality, but disturbance of a channel bank or bed is immediately reflected in downstream sediment levels. Thus, it is imperative that these highly sensitive areas be avoided during logging, road construction, and other operations (USFS 2006a).

The relative stability of even small intermittent and ephemeral channels is important because it can affect areas of transported sediment. Neglecting to leave a buffer zone on any drainage can affect long-term water quality of streams located lower in the watersheds. Unvegetated or unsurfaced roads may undergo a substantial amount of erosion, especially if continually used. Roads are the greatest source and delivery system of sediment to channels. Relocating roads out of drainages, surfacing roads located adjacent to channels, surfacing stream crossings and approaches, and providing proper drainage and adequate vegetative buffer strips greatly reduces the amount of sediment delivered to the drainage network.

Cattle grazing can also affect sediment delivery to streams. Excessive livestock grazing in upland areas can reduce plant cover. This can lead to destabilized hill slopes, increasing erosion and sediment delivery to the stream system. Changes in the grazing system, such as deferred grazing systems, riparian pastures, or creating riparian area exclosures, can mitigate existing problems and prevent other areas from damage.

Even disturbed areas that are far from the drainage system may contribute sediment if they are connected to the stream by roads, skid trails, ditches or cattle trails. Connected disturbed areas effectively increase the drainage network and increase both the volume and velocity at which water and sediment are added to streams.

Water temperature is a critical water quality characteristic of many streams and aquatic habitats. Temperature controls the survival of certain flora and fauna in the water that are sensitive to water temperature. The removal of streambank vegetation by burning, cattle grazing, road construction, and other causes can cause water temperature to rise, causing thermal pollution to occur, which in turn can increase biological activity in a stream (Neary et al. 2005). Increases in biological activity place a greater demand on the dissolved oxygen content of the water, one of the more important water quality characteristics from a biological perspective. Increases in stream water temperatures can have important and often detrimental effects on stream eutrophication. Acceleration of stream eutrophication can adversely affect the color, taste, and smell of drinking water.

Dissolved oxygen concentration influences both the character and productivity of small streams. It is inversely proportional to water temperature and can be reduced through an increase in nutrients. Increased sediments may also lead to increased water temperatures and decreased dissolved oxygen. Forest management activities can alter stream pH by adding bark and other organic debris to the channel. This can lead both to increased oxygen demand and increased carbon dioxide inputs.

Nutrients. The processes of photosynthesis, metabolism, and decomposition of plant and animal tissues

produce organic solutes. These organic compounds can serve as nutrient and energy sources for plants and animals farther downstream. Many streams are limited by either nitrogen or phosphate, so that an increase in one of these nutrients can lead to algae blooms. Algae blooms are a sudden, lush growth of algae. These blooms lead to a loss of water clarity. The death and decay of the algae causes a reduction in available oxygen, and subsequent fish die-off is possible. Sources of increased nitrogen or phosphate include leaking sewage facilities, cattle feces, industrial dumps, and the application of commercial fertilizers near lake or stream shores. Lakes and streams can also be over-supplied with nutrients from natural sources, such as soil erosion.

Analysis of Effects on Water Quality

Under the no action alternative, effects to water quality would continue at present trends. Ongoing activities such as livestock grazing, recreation, and road use would continue. Connected disturbed areas and unclassified roads would continue to contribute sediment to surface water. Potential wildfire intensity would remain elevated. An intense wildfire with severe effects could have several detrimental effects on water quality, including loss of riparian vegetation, which could increase temperature and decrease dissolved oxygen; introduction of sediment; release of nutrients stored in vegetation, potentially increasing nitrate and phosphorus loads; possible introduction of heavy metals from soils and geologic sources in the burned area; and introduction of fire-retardant chemicals into streams at levels that become toxic to aquatic organisms (Neary et al. 2005).

Activities proposed under all action alternatives could disturb soil. The effect of this disturbance on water quality depends on the site characteristics and extent of the area disturbed and the proximity of the disturbance to waterbodies. Alternative 1 would treat the most acres and conduct the most road work, resulting in the most potentially disturbed acres. Alternative 2 proposes activities on fewer acres and Alternative 4 on the fewest, which may result in lower potential for soil disturbance. Roads proposed for reconstruction that cross existing drainages or are located within water influence zones (listed on page 3-80) could contribute to higher runoff volumes, accelerated runoff rates, and resulting sediment and pollutant transport. None of these roads is in a Class III watershed. Application of Forest Plan standards and Regional Watershed Conservation Practices (Appendix A) would minimize these effects, and impacts would decrease as vegetation becomes reestablished in disturbed areas.

Burning proposed under Alternatives 1 and 2 may introduce sediment and nutrients into surface water. The intensity and severity of prescribed burns are, however, generally much lower than those of wildfires, resulting in release of fewer nutrients and less soil erosion (Neary et al. 2005).

Class III Watersheds

In Bear Den Canyon watershed, the NFSR 855.2A low water crossing at Lost Houston Creek (identified as a connected disturbed area) would be reconstructed to reduce sedimentation potential under Alternative 1. Three unclassified roads would be decommissioned under all action alternatives. These roads total 1.3 miles and include U680046, a 0.5-mile road located in a drainage bottom. Pre-use maintenance such as rock placement to repair scattered areas of surface damage would take place on approximately 5.3 miles of classified roads under Alternatives 1 and 4 and on 2.2 miles under Alternative 2. No new road construction is proposed in this watershed under any alternative.

In Beaver Creek watershed, pre-use maintenance would take place on NFSR 851.1B under all action alternatives to improve drainage structures and harden the surface so that water no longer runs down the road. This action would eliminate or reduce the disturbed area that is currently connected to the drainage system. Eleven unclassified roads (4.2 miles) would be decommissioned under all action alternatives, including 1.2 miles that follow drainage bottoms. No new road construction is proposed in this watershed

under any alternative.

These activities would generally be expected to improve watershed condition by disconnecting disturbed areas from the drainage network and decreasing total disturbed area.

Stream Morphology

Stream morphology is affected by flood volume, flow velocity, amount of sediment in the system, and streambank vegetation. Human activities and natural events can influence these factors. Road/stream crossings and roads located in riparian areas can cause vegetation cover to decrease, which may destabilize stream banks and widen channels. Livestock grazing can also result in loss of vegetation in riparian areas, destabilizing stream channels. Livestock tend to congregate in riparian areas and can trample banks and introduce sediment into the channel, which can result in embedded substrate and channel aggradation. Landslides can alter stream courses and introduce large amounts of sediment directly into channels, resulting in channel aggradation downstream.

Narrow valley bottoms and steep side slopes are characteristic of drainages in the Burner project area. Valley bottoms are typically less than 300 feet wide and have narrow vegetation zones. In places, the vegetative buffer zones may be too narrow to filter sediment before it reaches the stream. These areas may need sediment barriers such as logs or straw bales (USFS 2006a).

Under the no action alternative, direct effects from human activities such as cattle grazing, timber harvest, mineral exploration, and recreation are expected to continue at current trends. In the Beaver Creek and Bear Den Canyon watersheds, roads would continue to affect stream morphology.

Under all action alternatives, proposed activities would result in ground disturbance and increased use of existing roads, some of which cross streams or are close to stream channels. This could result in sediment deposition in stream channels. Disturbed areas can be connected to streams by way of roads or other bare areas that are inadequately buffered. Increased sediment in stream channels can alter channel width, depth, and gradient and the relative balance between pools and riffles, causing channel braiding and the accumulation of fines (USFS 2006a). Stream crossings may be widened, resulting in erosion of streambanks both upstream and downstream of the crossing. Effects of each alternative on sedimentation are discussed in more detail in the Water Quality section, above.

Increases in peak flows could affect channel morphology under all action alternatives, and under the no action alternative if beetle infestation or wildfire reduces basal area substantially. Increased peak flows may result in channel scouring and streambank erosion. Effects of the alternatives on peak flow are discussed in more detail in the Water Quantity section (page 3-79). Increased peak flows would have the most potential to affect channels that are currently unstable, such as portions of Ogden Creek.

Compliance with Forest Plan Direction

Standard 1209 (manage vegetation treatments so that stream flows are not changed to the extent that long-term stream health is degraded): The above section on Water Quantity discusses the effects of land treatments and roads on flow regime. Measurable increases in stream flow are not expected at the 7th-level watershed scale, although they may have the potential to occur at a smaller watershed scale. Disconnecting CDAs and decommissioning roads could help conserve site moisture and protect stream health from damage by increased runoff.

Floodplains

Digital Q3 floodplain data available from the Federal Emergency Management Agency (FEMA) indicate that there are no 100-year floodplains in the Burner project area. Non-regulatory floodplains are discussed in more detail in the riparian ecosystems section.

Wetlands

Wetlands are some of the most productive and dynamic habitats in the world. The physical, chemical, and biological interactions within wetlands are often referred to as wetland functions. These functions include surface and subsurface water storage, nutrient cycling, particulate removal, maintenance of plant and animal communities, water filtration or purification, and groundwater recharge. Similarly, the characteristics of wetlands that are beneficial to society are called wetland values. Some examples of wetland values include reduced damage from flooding, water quality improvement, and fish and wildlife habitat enhancement (USFS 2006b).

In the Black Hills, riparian/wet meadow communities typically occur as mosaics of small patches. Based on National Wetlands Inventory, there are approximately 2.4 acres of wetland in the project area. The majority of wetlands in the project area were created by beavers and occur in riparian areas.

Wetlands are protected under Executive Order 11990, which directs agencies to preserve and enhance the natural and beneficial values of wetlands. Additional protection for wetlands is found in Section 404 of the Clean Water Act, which regulates the discharge of fill or dredged materials into wetlands.

Ongoing direct and indirect effects on wetlands would continue under Alternative 0. Direct impacts to riparian and wetland ecosystems are typically obvious and occur from direct disturbances such as the clearing of vegetation, over-utilization by livestock or wildlife, roads or trails, placement of fill material, and wildfire. Indirect impacts are typically less obvious and can be more difficult to identify or quantify. Examples include changes in water quantity or flow regimes resulting from events such as water diversion or loss of beaver; changes in water quality such as an increase or decrease in sediment loading; and spread of noxious weeds (USFS 2006b).

Indirect effects may occur under all action alternatives due to ground-disturbing activities. These activities could introduce sediments into wetlands, reducing wetland values and functions. The severity of impact is related to the proximity of ground-disturbing activities to wetlands and the extent of the activity. Since the majority of wetlands in the project area are related to historic beaver activity on streams, the level of impacts from sedimentation would be similar to impacts to riparian ecosystems (below), stream morphology (page 3-84), and water quality (page 3-83).

Riparian Ecosystems

Riparian areas are located adjacent to streams and around natural springs, seeps, fens, and reservoirs. These areas are highly productive and biologically diverse, providing habitat for a wide variety of terrestrial and aquatic wildlife (USFS 2006a). Riparian ecosystems provide shade, bank stability, fish cover, and woody debris to aquatic systems. They also provide key wildlife habitat, migration corridors, sediment storage and release, and surface-ground water interactions. Activities that alter riparian vegetation may also alter the performance of these functions.

Alternative 0 would have no new effects on riparian ecosystems. Effects from existing roads and past harvest activities would continue. Alternative 1 may result in the most total disturbed acres and may have the greatest impact on riparian ecosystems, followed by Alternative 2. Alternative 1 would also be expected to disturb the most acres due to road work and may have the potential for the greatest direct

impact on riparian areas from road use. Alternative 4, with the fewest disturbed acres, would most likely have the fewest effects on riparian ecosystems.

Activities conducted in the water influence zone would require adherence to the appropriate design criteria associated with Forest Plan standard 1301/WCP management measure 3 to ensure that riparian areas are not adversely affected and long-term stream health is maintained.

Compliance with Forest Plan Direction

Standard 1301 (in the water influence zone next to perennial and intermittent streams, lakes, and wetlands, allow only those actions that maintain or improve long-term stream health and riparian ecosystem condition):

Stream channels in the project area were assessed in 2006. Twenty culverts and nine low-water crossings were assessed on both system and non-system roads crossing perennial and intermittent streams. Road/stream crossings were surveyed on Ogden, Tent Canyon, Richardson, Beaver, Whitelaw, Lost Houston, Sundance, and Lytle Creeks and/or their tributaries. Visual inspections of stream channels focused on reaches of Ogden Creek and its largest tributary, Richardson Creek. These reaches were selected for survey based on high levels of mountain pine beetle infestation, proposed activities, and past activities in these drainages. Information derived from the stream assessments is included in the effects analysis elsewhere in the Water Resources section. All activities conducted within the water influence zone require full adherence to appropriate Design Criteria associated with Forest Plan standard 1301 and other relevant direction to ensure that stream and riparian areas are not adversely affected and that long-term stream health is maintained.

Figure 3-3. Seventh-level Watersheds

Cumulative Effects

Water Quantity

Under the no action alternative, potential wildfire intensity would remain elevated. Intense fires can result in loss of vegetative cover, a decrease in the accumulation of litter and other decomposed organic matter on the soil surface, and the possible formation of water repellent soils, which would increase streamflow discharge.

Impacts from treatment practices and other treatment practices would be short term and impacts would be expected to decrease once vegetation is reestablished on treatment acres. Road construction may have more lasting impacts. Surface runoff from roads still in use may increase peak flow. However, Forest Plan Standards 1109 -1111 direct that roads be rehabilitated once their intended use has finished and impacts from new roads would be short term and should be minimal if the roads are rehabilitated.

Water Quality

Under the no action alternative, roads, cattle grazing, and recreation would continue to have cumulative impacts on water quality. Natural events such as landslides would continue to add sediment to surface water, increasing temperature and decreasing dissolved oxygen.

Although many of the impacts to the Beaver Creek watershed occur outside the Burner project area, the project area is located in the headwaters of this watershed and any impacts to water quality would have a cumulative impact on downstream water quality. The Bear Den Canyon watershed is already impacted by roads and has naturally high erosion rates, resulting in sedimentation issues. Surface disturbing activities that would occur under all the alternatives could cause additional sedimentation. This would have a cumulative impact on water quality in a watershed that is already at risk. Improvement actions in these watersheds described on page 3-83 and application of Forest Plan standards and Regional Watershed Conservation Practices would be expected to decrease the risk of additional impacts on water quality.

Although Alternative 4 may result in the fewest impacts to water quality due to fewer treatment acres and less road work, it could result in higher wildfire intensity than the other action alternatives because of higher remaining fuel loads. Impacts to water quality from severe fires would be the same as outlined under the no action alternative. It is expected that any effects of the action alternatives would be minimized by compliance with Forest Plan standards and guidelines and would decrease once vegetation is reestablished in disturbed areas.

Continued use of off-road motorized vehicles may contribute to a cumulative increase in the level of soil disturbance in the project area by compacting or displacing soil and exposing soil to erosive elements. Forest-wide travel management planning currently under way may affect this contribution. Proposed area closures would, if effective, reduce the contribution of off-road vehicle use to cumulative effects.

Stream Morphology

Roads and road crossings would continue to have an effect on stream morphology under all alternatives. Erosion from ongoing activities such as cattle grazing, recreation, and road use would continue to contribute sediment into stream channels, resulting in potential channel aggradation. Beaver activity and other natural impacts (such as landslides) would continue to affect stream morphology. Potential wildfire intensity would remain elevated under the no action alternative. A high-intensity wildfire could increase peak flows and result in channel scouring.

Increasing disturbed acres and constructing new roads under the action alternatives may have an additive effect on sedimentation in areas already impacted by roads and other surface-disturbing activities. Changes to stream morphology may occur as streams adjust to the additional inputs of sediment. These changes may be visible long after the disturbed area has been rehabilitated. Compliance with Forest Plan standards and guidelines is expected to minimize effects on stream channels.

Riparian Ecosystems

Cumulative effects from grazing, roads, and recreational use would continue to impact riparian ecosystems under the no action alternative. Under the action alternatives, creation of transitory range through timber harvest coupled with the change from season-long livestock grazing to a deferred grazing strategy in the Ogden Allotment would be expected to have a positive cumulative effect on the riparian areas in that allotment. The action alternatives may also result in additional inputs of sediment, which could have a cumulative effect on riparian areas already impacted by ongoing activities. Increased use of existing roads located in riparian areas could result in additional losses of vegetation and increased sediment inputs, which over time would degrade riparian functions and decrease the filtering capability of riparian vegetation. Cumulative impacts would be minimized by compliance with Forest Plan standards and guidelines.

Riparian Ecosystems

Under the no action alternative, lack of management activities would allow potential wildfire intensity to remain high in many parts of the project area. High-intensity fires could negatively affect wetland hydrology and vegetation. Under all alternatives, wetlands would continue to be protected by Forest Plan standards and guidelines, CWA section 404, and Executive Order 11990. Compliance with these laws and policies would minimize any cumulative impacts to wetlands.

3.3.3 Transportation System

The existing transportation system was inventoried in 2004 and parts reviewed in 2006. Alternative 0 (Table 3-20) shows the length of existing roads by type in the project area. The area is considered open for motorized travel except for Management Area 3.32 and closed roads.

Direct, Indirect, and Cumulative Effects

Table 3-20 displays road access effects by alternative.

Table 3-20. Road Management by Alternative

Road Management	Road Length (miles)			
	Alternative 0	Alternative 1	Alternative 2	Alternative 4
Open year-round	54.5	40.8	41.3	39.5
Closed year-round with gate	28.0	23.5	23.5	23.5
Closed year-round with barrier	10.9	3.5	2.9	2.0
Total	*93.4*	*67.8*	*67.7*	*65.0*
Decommissioned	0	25.8	25.8	28.6

All action alternatives would decrease open road mileage through decommissioning of unclassified (non-system) roads. This activity would take place as funding allows. Decommissioning would be accomplished through a variety of means, including ripping, seeding, recontouring, or blocking, depending on the condition of the road. If vegetation already blocks the road, no additional action may be needed.

None of the alternatives propose changes to closure status of existing National Forest System roads. Differences among the action alternatives are due to variation in the mileage of non-system roads added to the system and construction of new roads. New roads would be closed following use.

Under all action alternatives, the Forest Service would need to acquire right-of-way from a private land owner to access the isolated NFS parcel in Township 52 North, Range 63 West, section 31.

Table 3-21 shows changes to road density for each alternative.

Table 3-21. Road Density by Type and Alternative

Category	Road Density (miles of road per square mile)			
	Alternative 0	Alternative 1	Alternative 2	Alternative 4
Open Road Density, Project Area NFS Lands	2.0	1.5	1.5	1.4
Total Road Density, Project Area NFS Lands	3.4	2.4	2.4	2.3
Open Road Density, MA 5.4 NFS Lands (Summer)	1.5	1.2	1.2	1.1

Forest Plan objective 5.4-207 sets a goal of less than one mile of open road per square mile of land in MA 5.4 in winter. Summer open road density in MA 5.4 would range from 1.1 to 1.5 miles per square mile depending on alternative. While there are no seasonal road closures, snow invariably blocks the main access roads from mid-December through at least late March. This essentially reduces open road density in MA 5.4 to near zero. The Warren Peak Highway is groomed for use as a snowmobile trail each winter. This ensures lack of access for wheeled vehicles between December 15 and March 31. Density of snowmobile trails is approximately 0.45 miles per square mile in MA 5.4.

3.3.4 Fire Hazard and Fuel Loading

This section presents an analysis of the project area from a fire hazard and fuels management perspective. The general analysis of the landscape is considered as well as site-specific forest fuels conditions.

Existing Condition

Fire History and Fire Regime

Historically, fire was a major force in shaping and determining the structure and composition of the ponderosa pine forests of the western United States, including those of the Black Hills. Periodic low- to medium-intensity ground fires thinned the forest and removed most of the ladder fuels. Continuous fuels did not exist to allow such fires to burn completely through a forest. Research in the Black Hills near the Burner project area indicates this fire regime was the norm, but that if a somewhat wetter period (perhaps a few years of much higher than average precipitation) caused a gap or missed fire interval, fuels would accumulate and stand density would increase until the next dry cycle. Then a larger, more intense, stand-replacing fire burned though the area, which would be outside the norm of regular low-intensity surface fire (Brown 2003).

The composition and structure of today's forest is the result of a combination of aggressive fire suppression and past management activities. Photos and records from the late 1800s and early 1900s indicate that today's forests are more continuous, uniform, and dense than under historical conditions. Fire regime is now dominated by large, intense, stand-replacement fires. These fires are difficult to control and can have substantial impacts on environmental and economic resources.

In 1936, the Sundance Fire burned about 8,400 acres on the east side of the project area. The burned area is still in early successional stages and is forested mainly with aspen. In 1985, the Bear Den and Reuter Fires burned 225 acres in the west and south parts of the Burner project area. The Houston Bear Den Fire burned 183 acres in 1989 near Warren Peak. The Lytle Creek Fire burned 10 acres at the edge of the Houston Bear Den Fire in 1994, and the second Sundance Fire burned 282 acres in 2000. Small fires undoubtedly occurred in the project area between 1936 and 1985, but specific records are not available.

The Forest Plan directs that all wildfires in the project area be suppressed. The Appropriate Management Response for MAs 3.32, 5.1, and 5.4 requires contain, confine, and control strategies in all cases for wildfires (Forest Plan standard 4101). The only difference among these MAs is the suppression objective. In MA 3.32, the objective is to suppress wildfires before they reach 10 acres in size. In MA 5.1, the objective is 5 acres, and in MA 5.4, 15 acres.

Of considerable consequence is the ongoing mountain pine beetle infestation. In ponderosa pine, mountain pine beetle infestation can sometimes be a stand-replacing event, and fire usually follows the outbreak within 15 years (Samman and Logan 2000).

Condition Class

The National Fire Plan (2000) describes fire regime condition classifications that relate to ecosystem components. The Black Hills is currently in condition classes 2 and 3 (Schmidt et al. 2002). With the exception of previously burned areas and non-pine cover types, most of the project area is in condition class 3. This indicates that fire regimes are substantially altered from the historical range, dramatically changing fire size, frequency, intensity, severity, or landscape patterns. This condition was caused by the extended period of suppression of wildfires. In addition, the absence of prescribed fire from most of the

project area for the last 20 or more years has allowed this unnatural condition to develop. Key ecosystem components have been lost and in order to manage these areas to condition class 1 (where fire regimes are within their historical range of variability), mechanical treatments may need to precede broadcast burning.

Portions of the project area that have been burned with prescribed fire or wildfire, or that have had recent mechanical fuel treatments, are in condition class 2, where fire regimes have been moderately altered from their historical range by decreased fire frequency. To restore their historical fire regimes, these lands may require some level of restoration through prescribed fire or mechanical treatments.

Fire Hazard

Fire hazard increases as the amount and continuity of surface and canopy fuels increase. As fuel amounts on a given landscape increase and fuel profiles become more vertically and horizontally continuous, wildfire intensity in that landscape is expected to increase. Fires in areas with high fire hazard have the potential to exhibit more extreme fire behavior with more severe effects than those with a low hazard rating. Forest Plan objective 10-01 states than fire hazard in 50 to 75 percent of the wildland-urban interface and 50 percent of other areas should be low or moderate. Most of the project area is outside wildland-urban interface, with the exception of the southern edge where the Sundance Fuel Reduction project is under way. Stand data indicate that fire hazard on approximately 57% of NFS lands is low or moderate. Most of the low and moderate hazard stands are in MA 3.32 and areas affected by wildfire in the last two decades, such as Bear Den Canyon. The high and very high hazard stands are concentrated in the north-central through south-central parts of the project area, corresponding with the main beetle infestation.

Potential Fire Behavior

Existing average fuel loading is generally low to moderate except in stands infested by mountain pine beetle. Expected flame lengths would be relatively short across most of the project area, but torching and crown fire are likely under some weather conditions in infested stands. Under most conditions, calculations suggest that approximately 52 percent of forested acres in the project area would experience surface fire. Forty-two percent would experience passive crown fire while active crown fire is predicted for the remaining six percent. These figures were calculated from pre-beetle infestation stand inventory and may not accurately reflect the changing conditions caused by beetle infestation.

Travel Management

The existing road system allows adequate access for fire suppression and fuels management purposes. The Forest utilizes light wildland fire engines because of the high density of roads. This has proven to be relatively efficient means to move resources in the project area. Despite the relatively good access provided by the road system, numerous fires across the Forest in recent years have required air support to assist with access and suppression. Roads that allow suppression forces to move quickly also allow for easy access for the public. Future closure of non-system roads would decrease the potential for human-caused fires but may also reduce the ability of suppression forces to quickly reach fires.

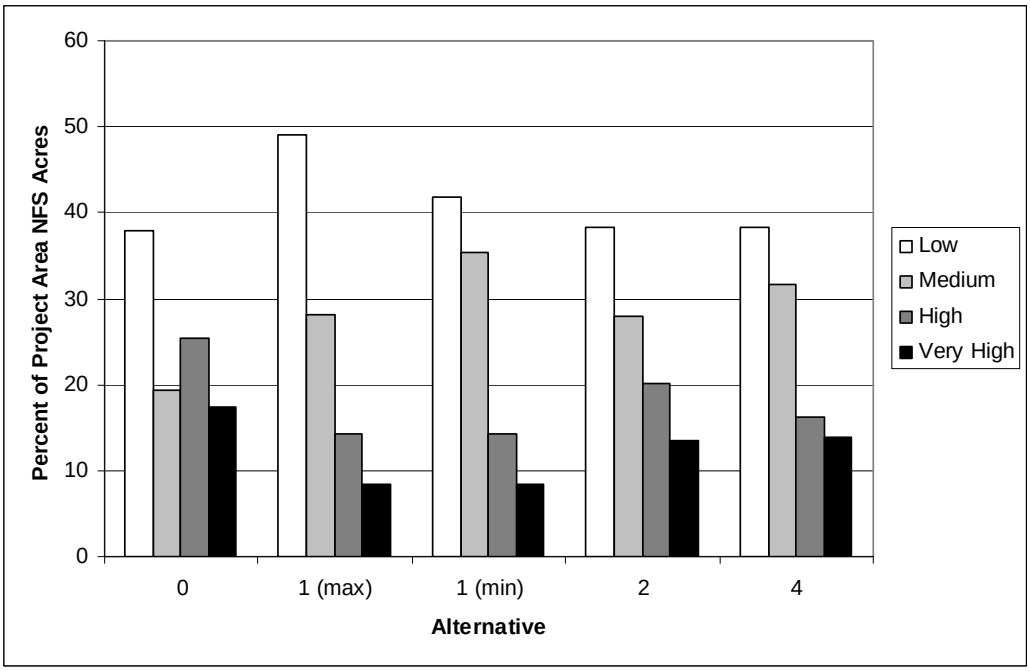
Effects Analysis

Direct and Indirect Effects

Under Alternative 0, mountain pine beetles are likely to continue to cause standing and down fuels to accumulate. In uninfested stands, surface and ladder fuels would accumulate over time. Condition class would continue to move away from the historical range. Continued accumulation of these fuels would increase potential fire intensity and rate of spread. A wildfire in the infested stands could be very difficult to suppress and could put the public and firefighters at increased risk. A large, intense fire burning tree crowns across a large area would cause the loss of wildlife and sensitive plant habitats, timber resources, and visual quality. Heating and loss of vegetation could negatively affect soils and watersheds.

Alternatives 1, 2, and 4 would reduce fire hazard across the project area. Fire hazard in pine stands is displayed below by alternative. Alternative 1 (max) represents the maximum infestation scenario, and 1 (min) represents the minimum infestation scenario. This chart has been modified from the version in the draft EA to include all cover types, as addressed by Objective 10-01.

Figure 3-4. Fire Hazard by Alternative



As shown in Figure 3-4, approximately 57 percent of the project area has low or moderate fire hazard. Alternative 1 would increase this to about 77 percent under either infestation scenario and would break up concentrations of high/very high hazard stands. Alternatives 2 and 4 would result in about 66 and 70 percent of the pine acres at low or moderate hazard, respectively, and would leave larger concentrations of high/very high hazard stands in the east-central part of the project area as compared to Alternative 1. All action alternatives would contribute to objective 10-01. Proposed actions would increase ground fuels (logging slash) in some stands, but this effect would decrease after one to two years as needles fall and post-sale fuel reduction takes place. The overall effect of all action alternatives would be a decrease in fire hazard and continuity of hazardous stands, potentially decreasing future wildfire intensity.

Most of the forested stands in the project area are projected to have surface or passive crown fires under most conditions. Wildfire behavior in beetle-infested areas may be extreme for the first three to five years following infestation and then would moderate considerably as trees fall and fuels deteriorate. Under Alternative 0, potential fire intensity and rate of spread would remain elevated for this period of time in areas of existing and future beetle infestation. Depending on the course of the infestation, this condition could continue to expand across the project area and onto adjacent ownerships. Alternative 1 would moderate potential fire behavior by reducing amount and continuity of fuels. Proposed thinning would open the forest canopy, which reduces the likelihood of a fire reaching and spreading among tree crowns. Proposed fuel treatments and prescribed fire would reduce fuel loads and alter the arrangement of fuels by breaking up horizontal continuity and raising crown base height. In total, the proposed actions would reduce the chance of a wildfire spreading quickly and burning intensely. These effects would reduce the difficulty and danger of suppression. Alternative 2 would have similar effects but would leave more of the project area susceptible to extreme fire behavior. Alternative 4 would alter potential fire behavior less than the other action alternatives but may reduce the chance of fire spreading between ownerships at least as much due to placement of treatments.

All activity fuels would be treated to meet objective 10-04 and the criteria stated in guideline 4110. Whole-tree yarding removes much of the logging slash that would contribute to fireline intensities exceeding 300 BTUs/second/foot and places the slash in mechanical harvester piles at the landings. Much of the non-commercial thinning slash would either be chipped and mulched or piled and burned.

Cumulative Effects

The cumulative effects analysis area is the project area, including private inholdings. Past, present, and future actions are described starting on p. 3-1.

Decades of fire suppression have allowed stem density, basal area, and ladder fuels to increase across the analysis area, while recent and ongoing beetle infestation have increased the hazard posed by these fuels. Almost all pine stands are dominated by mature trees; there are few young stands. Timber management and livestock grazing have removed biomass but also contributed to a decrease in average tree diameter and loss of open areas. The Sundance timber sale and Sundance Fuel Reduction project have reduced fire hazard in the project area.

Alternative 0 would add to the effects of fire suppression and beetle infestation without reducing basal area or removing biomass through timber harvest or fuel treatments. Condition class would continue to move further from the historic range of variability in uninfested areas but would ultimately improve where beetles and possibly fire decrease stocking. Continued infestation would increase the area that would eventually regenerate to form young pine stands, improving age-class diversity across the project area. Potential wildfire intensity and rate of spread would increase, threatening substantial damage to various resources. The cumulative effect could be evident for decades.

Alternatives 1, 2, and 4 would work against many of the cumulative effects of fire suppression and beetle infestation by removing fuels, reintroducing fire, and decreasing stand density generally without reducing average tree diameter. The resulting condition class would be closer to the historic range. Where beetle infestation has already killed or heavily infested stands, eventual regeneration of young pine would improve age-class diversity and spatial arrangement of structural diversity across the project area. Proposed treatments are designed to decrease infestation, mainly by thinning. This treatment would decrease buildup of hazardous fuels but would not diversify stand structure or age distribution, resulting in large, contiguous areas continuing to be dominated by mature pine. This additive effect would be greatest under Alternative 1 and least under Alternative 2, which includes small areas of regeneration

harvest in addition to thinning. All alternatives would act against the cumulative effect on condition class. Alternatives 1 and 2 would have the greatest influence on this cumulative effect through use of broadcast burning. The action alternatives would decrease potential wildfire intensity and size and would not add substantially to negative cumulative effects.

3.4 SOCIAL CONSEQUENCES

This section discusses resources that are primarily social in nature, including recreation, minerals, scenic integrity (visual resources), heritage resources, and economics. The existing conditions of these resources in the project area are described and each alternative's potential direct, indirect, and cumulative effects on these resources are discussed.

3.4.1 Recreation and Travel Management

Recreational uses of the Burner project area include both developed and dispersed types. Two developed Forest Service campgrounds, Reuter and Sundance, lie within the project area. There are about 53 miles of motorized and non-motorized trails for a variety of summer and winter activities, including about 25 miles on both National Forest System and unclassified roads. Other uses include hunting, dispersed camping, recreational driving, and visiting the Warren Peak fire lookout tower.

There are approximately 93 miles of roads on NFS lands in the project area. Of these roads, about 55 miles are open year-round to public travel, while the remainder are closed year-round. The Warren Peak Highway, which is the main access route to the area, is groomed in winter for use as a snowmobile trail. This effectively closes most project area roads to wheeled vehicles from early December until the highway is clear of snow.

The Recreation Opportunity Spectrum (ROS) for MAs 5.1 and 5.4 is defined by the Forest Plan as Roaded Natural, allowing for a variety of alterations to the environment. MA 3.32 has an ROS of Semi-primitive Non-motorized, meaning vegetation may be altered to enhance recreational opportunities, provide wildlife habitat, or to create vistas.

Direct and Indirect Effects

No changes to the road system are proposed under Alternative 0. Motorized and non-motorized recreational activities would remain unchanged from existing conditions. Beetle infestation has already killed numerous trees along parts of the Upper Ogden, Ogden Ridge, Ogden Creek, and Richardson Fire trails and parts of the snowmobile trail system; continued beetle infestation could affect recreational experiences. Dead trees could detract from scenery, block trails, and pose a safety hazard. Infestation could also result in forest openings providing scenic vistas.

Timber harvest, fuel reduction, and prescribed burning proposed under the action alternatives can benefit recreational activities. Removing dead and down trees and reducing forest density creates park-like stands that many visitors find pleasing. The openness of the forest improves sight distance, improving opportunities for viewing wildlife. Proposed treatments may also reduce maintenance needs along trails by decreasing the number of fallen and hazardous trees. Vegetation treatments would allow scenic overlooks from some of the trails.

Some visitors find timber harvest and mechanical fuel reduction treatments disruptive to recreational experiences, especially during and for one to three years after completion of activities. Logging slash and disturbed ground detract from the natural appearance of the forest. Prescribed fire is likely to result in scorched ground and occasional pockets of dead trees, which some may find distracting. Activities would affect limited parts of the trail systems and project area at any one time. Following disposal of slash and revegetation of skid trails, native-surface roads, and burn sites, most visitors would have little awareness that the activities had taken place.

Since the main access point for winter activities is the Reuter Campground trailhead, proposed activities requiring access by wheeled vehicles during snowmobile season (usually December 15 through March 31) could eliminate this recreation opportunity. Plowing of the Warren Peak Highway would prevent access to the rest of the trail system for snowmobiling. To prevent this effect, proposed activities requiring access from the highway would take place only from April through mid-December unless conditions warrant otherwise.

Forest Plan standard 5.4-9101 prohibits off-road motorized vehicle use in MA 5.4 between December 15 and May 15. MA 5.4 in the project area is relatively inaccessible to wheeled vehicles in winter due to snow and lack of access from the Warren Peak Highway. All action alternatives would implement standard 5.4-9101 by imposing a prohibition on off-road motorized vehicle use annually between December 15 and May 15. Because access during this period is already minimal, users would not be substantially affected by the closure. In addition, snowmobiles would be restricted to designated trails under all alternatives to comply with standard 5.4-9103. Most snowmobile use on NFS lands in MA 5.4 is on trails, but snowmobilers accustomed to riding off-trail may find the new restriction limiting.

Under all action alternatives, the northeast corner of the project area (Figure 2-2) would be closed year-round to off-road motorized use. This is consistent with travel management in the adjacent Dean project area and MA 3.32. Consistent travel management in the Dean area, MA 3.32, and this part of the Burner area would reduce the potential for user confusion and improve ease of enforcement. Under Alternative 2, the portion of MA 5.4 north of Tent Canyon would also be closed year-round to off-road motorized use to reduce the potential for damage in Tent, Ogden, and Cole Canyons. Alternative 4 would close all of MA 5.4 in the project area to off-road motorized use year-round. This would decrease opportunities for motorized recreation (other than snowmobiling) close to Sundance. Users may be displaced to other areas of the National Forest or other public lands.

In MA 3.32, Alternatives 1 and 2 include non-commercial thinning and burning in planted pine and non-system road decommissioning. Alternative 4 includes a small amount of wildland-urban interface thinning and road decommissioning. These activities would comply with Forest Plan direction for MA 3.32 emphasizing natural-appearing landscapes and non-motorized recreation.

Special uses permitted in the project area would not be affect by the proposed activities. Each alternative includes measures for protection of permitted improvements.

Open road miles would decrease from 55 to about 40 under all action alternatives due to closure of unclassified roads. Some of the roads proposed for closure are used and would continue to be used as non-motorized trails. Road closures would decrease opportunities for recreational driving but also decrease disturbance of those seeking to get away from motorized vehicles in MA 3.32. Hunters who prefer a quiet, walk-in hunting experience would benefit. Some hunters may find themselves displaced from favorite motorized hunting spots, though almost all of MA 5.1, and the central part of MA 5.4, would remain within one-quarter mile of an open road.

Closure or decommissioning of roads could affect both motorized and non-motorized recreation, depending on the method used. For example, a road that is recontoured to match the surrounding landscape may be difficult to walk, while a road that is covered in slash to prevent motorized access without being recontoured could still be used by hikers.

Activities such as log hauling and slash treatments could directly affect recreational activities. Roads used for log hauling would be busier than normal during harvest and follow-up activities. Since most of the roads in the project area have only one lane, visitors may have to pull off the road or back up to a turnout to allow passage of larger vehicles. Many Forest visitors already expect to occasionally meet large vehicles because of timber sales, rock hauling, and movement of cattle in trailers.

Cumulative Effects

The cumulative effects area for recreation as a whole is National Forest System lands in the project area. Past, present, and future actions are described at the beginning of Chapter 3. The cumulative effects area for motorized recreation is NFS lands in the Bear Lodge Mountains.

Both closure and improvement of roads over the years has decreased opportunities for some types of motorized recreation, such as driving on rough, challenging roads. Construction and improvement of roads have increased opportunities for recreational driving and provided easy mountain bike routes and access for non-motorized recreation, but these same actions have decreased solitude and remoteness. By decreasing open road mileage, Alternatives 1, 2, and 4 would add to cumulative effects of road closures on motorized recreation opportunities and decrease cumulative effects on non-motorized recreation. Alternative 0 would not change the cumulative effects of roads in the project area.

As the demand for motorized recreation has increased, conflicts between motorized and non-motorized users have also become more common. Winter closure of MA 5.4 to off-road motorized use, as proposed under all alternatives, would reduce the potential for conflict, decreasing this cumulative effect and potentially improving the recreational experience for non-motorized users within the project area and motorized users elsewhere on the district.

Proposed closures and restrictions may displace motorized recreation to other areas of the district. Approximately 85 percent of NFS lands in the Bear Lodge Mountains are currently open to off-road motorized vehicles. Area closures planned under the Dean and Planting projects (northeast of the Burner project area and in the north Bear Lodge Mountains, respectively) would reduce this to 71 percent. Alternatives 1, 2, and 4 would decrease this figure further in winter, but because MA 5.4 in the project area is already relatively inaccessible during the winter, the actual incremental effect on users would be minimal.

3.4.2 Minerals

According to the Bureau of Land Management (BLM), there are approximately 456 active mining claims in the project area. Active claims must be recorded in the County assessor's office, filed with the BLM, and have boundaries identified on the ground. Two exploration projects for locatable minerals (e.g., gold, copper, silver) were completed in 2006 in the project area. One consisted of re-opening trenches dug in the 1980s. The trenches were reclaimed when work was completed. The other project consisted of drilling several exploration holes and included construction and rehabilitation of drill pads. A proposal to drill approximately 20 additional holes is currently being analyzed. The project area also includes one gravel pit.

Alternative 0 would have few effects on any activities associated with mineral exploration. Trees killed by continuing beetle infestation could fall across roads, temporarily delaying access. Proposed activities would not prevent mineral exploration in active mining claims or location and filing of additional claims. Alternatives 1, 2, and 4 could result in cutting or burning of trees or claim markers. Most modern claims are surveyed and platted using geopositioning technologies, so any inadvertent destruction of markers would be a minor inconvenience. Thinning and burning could also facilitate exploration activities by removing vegetation and improving access.

Cumulative effects on the mineral resource include development of an extensive road system that facilitates mineral exploration. The action alternatives would decommission certain unclassified roads that could provide access for future exploration. Almost all of MA 5.1 and the central part of MA 5.4 would remain within one-quarter mile of an open road, indicating continued access to most areas.

3.4.3 Scenic Integrity

Scenic Class

Scenic Class measures the relative value of discrete landscape areas having similar characteristics of scenic attractiveness and landscape visibility. Scenic Class is used to compare the value of scenery with the value of other resources. The components of Scenic Class are Scenic Attractiveness (which is based on human perceptions of the intrinsic beauty of landform, water characteristics, vegetative pattern, and cultural land use) and Landscape Visibility (which is based on the distance zones from the observer and the concern level for scenery). Higher Scenic Class indicates the importance of maintaining scenic value. Scenic Class values can range from 1 to 4, with 1 being highest and 4 lowest. About 60 percent of the Burner project area is designated as Scenic Class 2, with the remaining third divided between Classes 1, 3 and 4. Most of the Scenic Class 1 is in the southeast and southwest parts of the project area where hillsides are visible from Interstate 90.

Scenic Integrity Objectives

Scenic Integrity Objectives (SIOs) are management objectives adopted from Scenic Class values. Scenic Integrity is a measure of the degree to which a landscape is visually perceived to be “complete.” The highest Scenic Integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal. SIOs range from High to Unacceptably Low. Approximately 28 percent of the Burner project area has an SIO of High, 54 percent Moderate, and 18 percent Low. SIO is rated High in Management Area 3.32 and the southwestern part of the project area visible from Interstate 90.

Existing Scenic Integrity

Existing Scenic Integrity represents the current status of a landscape. It is based on visual changes that detract from the scenic quality of the area. Direct human alterations may be included if they have become accepted over time as positive landscape character values. Existing scenic integrity is measured in degrees of deviation from the natural appearance of the landscape character type. These ratings give an indication of the present level of visual quality and visual evidence of management activities. The frame of reference for measuring achievement of scenic integrity levels is the valued attributes of the existing landscape character unit being viewed. In natural or natural-appearing character, this is limited to natural or natural-appearing vegetative patterns, features of water and rock, and landforms.

The Burner project area is part of the Bear Lodge Mountains, which protrude from the surrounding prairie lands. The project area is visible in the background and on the skyline from Interstate 90 and Wyoming State Highways 14 on the southwest and 111 on the east. The main travel corridor within the project area is the Warren Peak Highway (NFSR 838). The project area is noted for dense conifer stands in rolling terrain, openings on Warren Peak and in drainages, and stands of aspen and other hardwood trees. Forested areas are predominantly populated by ponderosa pine communities on south aspects and mixed pine/hardwood communities on north aspects. Water features are limited to narrow streams. Apparent human alterations in the form of roads have generally been accepted over time as part of the positive cultural landscape character attributes. Vegetation alterations in the form of various silvicultural prescriptions are common in roaded parts of the project area. Red-needled and dead trees due to beetle infestation are visible from the Warren Peak Highway and fire lookout. The existing scenic integrity of the Burner project area is generally Moderate to High, depending upon viewing location and distance.

Direct and Indirect Effects

Under the no action alternative, mountain pine beetle infestation is likely to continue. Depending on the course of the infestation, beetle-killed trees could continue to be obvious on the landscape for the next several years. Fuel loading would continue to build, increasing potential fire severity. If a large, stand-replacing fire followed the infestation, effects could be evident for many years in the form of large openings, areas of dead standing trees, and scorched trees.

Alternatives 1, 2, and 4 would modify the appearance of forest stands in parts of the project area. Actions and effects would be concentrated in Management Area 5.1, with fewer effects in MA 5.4, and little change in MA 3.32. Mechanical fuel treatments would result in evident color changes (fresh-cut versus weathered or dead trees from beetle infestations) in the immediate foreground. Quantity of material to be treated and distribution across the landscape would determine how easily these treatments can meet the assigned Scenic Integrity Objectives. Large quantities of material with limited dispersion usually meet a Low Scenic Integrity Objective in the foreground. Moderate or low quantities with good dispersion and no piles usually meet a Moderate Scenic Integrity Objective in the foreground.

Most of the beetle infestation has taken place in MA 5.1, where SIO is Moderate in most areas. Beetle infestation and proposed treatments are both likely to produce large quantities of woody material. The action alternatives would treat or remove much of this material, achieving a Moderate SIO following completion of treatment. Piled slash would generally be burned within one or two years. Burning of slash depends on weather conditions that aid in containing the fire to the immediate area. Once the dried slash is burned, burn marks are evident on the ground. Normally, these burn marks are no longer visible once new vegetation grows up the following spring. Sites where large piles resulting from whole-tree yarding are burned often require more time to revegetate and may need scarifying, seeding, and noxious weed treatment to fully recover. Scorch marks may be evident on the boles of adjacent trees.

Broadcast burning proposed under Alternatives 1 and 2 would move the forest toward a more park-like appearance, with tree boles more evident, little dead vegetation, and a variety of tree sizes. Depth of view into the stands would be enhanced, reducing the strong contrast of open space and closed space. Shrubs often increase growth in burned areas, depending upon the amount of tree cover. Previous low-intensity prescribed fires in and near the project area have had few negative impacts on scenery. Within one year, obvious evidence of burning has been covered by new vegetation, and within three years few signs of burning are visible. Areas burned with low-intensity fire often meet a High Scenic Integrity Objective within one to two growing seasons. Most proposed burns are expected to have similar results. Burns conducted in areas of heavy beetle infestation may take longer to revegetate; most of these sites are on north aspects, however, where aspen and other hardwoods are likely to respond well to fire and grow

quickly.

The beetle infestation is currently not obvious from Interstate 90 or State Highway 14 or 111 due to the distance and oblique viewing angle. Depending on the course of the infestation, trees with red needles could become evident from these travelways. Proposed treatments would not stand out when viewed from this distance and would cause gradual, subtle changes as background scenery. Viewed from some parts of the Warren Peak Highway and trails in the project area, red-needled and dead trees dominate the foreground and middleground. Effects of Alternatives 1 and 2 would be evident at this viewing distance as reduction in stand density, ground disturbance due to road work, linear corridors on hillsides where cable yarding takes place, and temporary presence of increased amounts of down wood. Effects would no longer be obvious when revegetation has occurred, generally within one to five years.

Cumulative Effects

The cumulative effects analysis area for scenic integrity is the project area, including non-NFS lands. Past, ongoing, and foreseeable activities affecting visual resources include timber harvest, fuel reduction, wildfires, and road construction. The effects of these actions are not readily visible from state or interstate highways (with the exception of the Sundance Fire area) but are evident from within the project area. Activities proposed under the action alternatives, as well as no action, could add to these effects. The incremental change in cumulative effects under any alternative would be negligible because of proposed activities' location in designated scenic classes (mostly class 3) and SIOs (mostly moderate or low), distance from major travel corridors, and the application of the specified design criteria to maintain landscape integrity.

3.4.4 Heritage Resources

The National Historic Preservation Act of 1966 (NHPA) provides specific guidance to federal agencies on considering potential effects on heritage resources resulting from agencies' management activities. These guidelines or protocols are found in 36 CFR 800, Section 106. Federal agency heritage programs are also mandated by policies and standards set forth in the National Environmental Policy Act of 1969, Executive Order 11593 of 1971, the Archeological Resource Protection Act of 1979, the American Indian Religious Freedom Act of 1978, the Native American Graves Protection and Repatriation Act of 1990, and Executive Order 13175 of 2000.

The Black Hills National Forest manages and protects heritage resources on public land for the purpose of public interpretation, cultural importance to Native Americans and other cultural groups, and for scientific research. Under Section 106 of NHPA, heritage properties are evaluated for their eligibility for nomination to the NRHP. Potential effects on sites considered to be eligible, potentially eligible, or Traditional Cultural Properties must be considered. Protection or mitigation treatments are used to avoid or reduce adverse effects.

Approximately 16,028 acres were inventoried for this project. Approximately 15,444 acres were inventoried through previous reports and 584 acres were intensively inventoried in 2005 (Niwot Archeological Consultants, Inc. 2005). These inventories located 31 heritage properties. Three sites are considered eligible or potentially eligible to the National Register of Historic Places (NRHP). All of these sites are prehistoric and include lithic scatters and a rock shelter. A report detailing probable effects and proposed mitigation was submitted to the Wyoming State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officers (THPOs).

Mitigation or protection measures such as site avoidance, capping or plating site surfaces, and altering adverse effects are possible in consultation with the SHPO, Native American tribes, and other applicable interested parties. Effects on sites can also be reduced through archeological recordation, structure recordation, interpretation, monitoring, and restrictive covenants.

The cumulative effects area for heritage resources is the project area, including all ownerships.

Direct, Indirect, and Cumulative Effects

Alternative 0

Alternative 0 would allow beetle infestation to continue and potential wildfire severity to increase. In the event of a severe wildfire, any remaining combustible materials at heritage sites could be damaged or destroyed, and sites in the burned area would be subject to exposure and erosion.

Alternative 1

Proposed timber harvest, fuel reduction, and road work would result in varying degrees of soil disturbance, which has the potential to adversely affect heritage resources. Alternative 1 proposes these actions on a total of about 6,400 acres, 14 percent more acres than Alternative 2 and 80 percent more than Alternative 4. Two NRHP-eligible properties are located adjacent to proposed treatments. Design criteria (page 2-11) require avoidance of all eligible and potentially eligible sites. With specified design criteria, there would be no direct effects on known heritage resources. Any new heritage properties found during implementation would be protected from disturbance until evaluated. Direct adverse effects could occur if personnel implementing projects find previously unknown heritage properties. If, however, previously unknown heritage properties are located during implementation, all activities would cease until the site has been evaluated by the district archaeologist, in consultation with the Wyoming SHPO. Field inventory that has been conducted in affected areas minimizes the potential for this event to occur.

The primary indirect effect on any heritage resource site is likely to be exposure of contributing cultural features and artifacts resulting from removal of surface vegetation associated with timber harvest and fuel reduction activities. Until understory vegetation becomes an obstacle to travel, proposed treatments may allow increased access. This could result in increased incidences of vandalism or looting. Elsewhere, proposed road closures may discourage motorized prospecting.

Proposed treatments would reduce potential wildfire intensity and resulting exposure of heritage properties. Alternative 1 would work against the cumulative fuel buildup resulting from beetle infestation and fire suppression, but construction of new roads would result in a small addition to the cumulative effects of increased access. Because other roads would be closed or decommissioned and new roads would be closed after construction until needed for future activities, the additive effect is expected to be negligible.

Alternative 2

Activities would be similar to those of Alternative 1 but would occur across a smaller area. One NRHP-eligible property is located adjacent to an area proposed for commercial timber harvest. All eligible and potentially eligible sites would be protected as described above. Effects would be similar to those described for Alternative 1, but because actions would take place on a smaller area, the potential for inadvertent adverse effects on unknown sites and possible adverse effects of increased access would be lower.

Alternative 4

Activities similar to those of Alternative 1 would occur on a smaller and more dispersed area. Commercial timber harvest would take place on a smaller area than under the other action alternatives. Prescribed fire is not proposed. Two NRHP-eligible properties are located adjacent to proposed treatment areas. All eligible and potentially eligible sites would be protected as described above. Because no roads would be constructed, no prescribed burning would take place, and timber harvest would take place on fewer acres, the potential for adverse effects would be the lowest of the action alternatives.

3.4.5 Environmental Justice

Executive Order 12898 (February 11, 1994) directs Federal agencies to focus attention on human health and environmental conditions in minority communities and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States.

There are no permanent residences in the Burner project area. As a whole, Crook County's population is less than two percent minority (Wyoming Economic Analysis Division 2004). During the course of this analysis, no alternative resulted in any identifiable effects or issues specific to any minority or low-income population or community. The agency has considered all input from persons and groups regardless of age, race, income, status, or other social or economic characteristics.

3.4.6 Economics

Figures generated by economic analysis of timber projects are usually used as a means to compare alternatives (rather than as an absolute measure) because timber prices tend to fluctuate widely. For example, average sawtimber stumpage price in the Black Hills was $228.00 per thousand board feet in 1999. However, between January of 2000 and March 2003 the average price was $157.40 per thousand board feet. There is no way to predict the probable price at which a future timber sale would sell, and actual economic efficiency of this project depends on that factor.

Direct, Indirect, and Cumulative Effects

Economic analysis of Alternatives 1 and 4 using current stumpage rates indicates that revenues would exceed costs. Costs would exceed revenues under Alternative 2. Various costs and benefits were not included in this analysis. Some of these, such as recreational activities, take place across the Forest and the Black Hills region. Recreation has an economic effect on local communities, but there is insufficient information to determine this specific project's contribution to this effect. Fuel reduction projects are costly in the short term, but the cost of a wildfire that may have been prevented by the fuel reduction could be exponentially higher. This cost is difficult to fully take into account in economic analysis. Other non-market factors, such as the value of habitat for rare species, are difficult to quantify and compare directly to commodities.

The economic analysis was generated using Quick Silver, a Forest Service economic analysis program customized for the Rocky Mountain Region and the Black Hills National Forest. Present net value (the

future benefit of the project discounted to the present) is $394,174 for Alternative 1, -$68,805 for Alternative 2, and $523,352 for Alternative 4. The benefit/cost ratio is 1.19 for Alternative 1, .95 for Alternative 2, and 1.39 for Alternative 4, indicating benefits would exceed costs under Alternatives 1 and 4. Values are higher for Alternative 4 because this alternative does not include prescribed fire.

The Black Hills area economy was dominated by mining, timber harvest, and agriculture for many years. The region's economy is now well diversified, but the future of some timber operators in the highly competitive forest products industry continues to be uncertain. The proposed actions would contribute to the local economy by producing forest products and employment and through procurement of services and products associated with project implementation.

4.0 ACRONYMS AND REFERENCES

4.1 LIST OF ACRONYMS

AMP Allotment Management Plan

ATV All-Terrain Vehicle

BA Biological Assessment

BE Biological Evaluation

BHNF Black Hills National Forest

BMP Best Management Practice

CDA Connected Disturbed Area

CEQ Council of Environmental Quality

CFR Code of Federal Regulation

CMAI Culmination of Mean Annual Increment

DBH Diameter at Breast Height

EA Environmental Assessment

FEIS Final Environmental Impact Statement

FFE Fire and Fuels Extension

FSH Forest Service Handbook

FVS Forest Vegetation Simulator

IDT Interdisciplinary Team

KV Knudson Vandenberg

MA Management Area

MIS Management Indicator Species

MMBF Million Board Feet

MMCF Million Cubic Feet

MPB Mountain Pine Beetle

NEPA National Environmental Policy Act

NFMA National Forest Management Act

NFS National Forest System

NFSR National Forest System Road

NRHP National Register of Historic Places

ORV Off-Road Vehicle

POL Products Other than Logs

R2 Region 2 of the USFS

RMBO Rocky Mountain Bird Observatory

ROS Recreation Opportunity Spectrum

RPA Resources Planning Act

SCS Soil Conservation Service

SS Structural Stage

USDA United States Department of Agriculture

USFS United States Forest Service

VQO Visual Quality Objective

WCPH Watershed Conservation Practices Handbook

WDEQ Wyoming Department of Environmental Quality

WGF Wyoming Game and Fish Department

WIZ Water Influence Zone

WYNDDB Wyoming Natural Diversity Database

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The following agencies, organizations, tribal governments, and individuals were contacted during preparation of this environmental assessment.

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Government Agencies
Bureau of Land Management
Crook County Attorney
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Crook County Land Use Planning and Zoning
US Fish and Wildlife Service
Wyoming Commercial Development Authority
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Tribal Governments and Organizations
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Northern Arapaho Business Council
Northern Cheyenne Tribe
Oglala Sioux Tribe
Rosebud Sioux Tribe
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Biodiversity Conservation Alliance
Black Hills 4-Wheelers
Black Hills Forest Resource Association
Dakota Territory Cruisers
Motorized Recreation Council of Wyoming
National Wild Turkey Federation
Native Ecosystems Council
Neiman Sawmill

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Pope and Talbot, Inc.
Prairie Hills Audubon Society
Rocky Mountain Elk Foundation
South Dakota Chapter, Sierra Club
The Nature Conservancy
Wyoming Chapter, Sierra Club
Wyoming Stock Growers Association
Wyoming Trail Riders Association
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