CEMENT PROJECT AREA
FINAL ENVIRONMENTAL ASSESSMENT

BEARLODGE RANGER DISTRICT
BLACK HILLS NATIONAL FOREST
USDA FOREST SERVICE

JULY 2003

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Glossary (Terms, Abbreviations, and Acronyms)

BA
Basal area – The cross-sectional area of a stand of trees measured 4.5 feet from ground level. The area is expressed in square feet per acre.

BMPs
Best management practices – Land management methods, measures or practices intended to minimize or reduce water pollution.

Board Foot
A unit of timber measurement equaling the amount of wood contained in a board one inch thick, 12 inches long, and 12 inches wide.

Canopy Closure
The percentage of the ground and/or sky covered by vegetation and/or branches. These are perceived from a human point of view perpendicular to flat ground.

CCF
One hundred cubic feet (of wood volume).

CFR
Code of Federal Regulations

Classified Road
A road that is constructed, maintained, and intended for long-term vehicle use.

Closed Road
A road that is closed to all vehicular traffic for more than one year.

CMAI
Culmination of mean annual increment – The point at which a tree or stand achieves its greatest average growth, based on expected growth and assumed management systems and utilization standards.

Commercial Thinning
Removing from a stand some of the trees that have reached sufficient size to be manufactured into a product in order to improve tree spacing and increase growth.

Commercial Timber Sale
The selling of timber from National Forest System lands for the manufacture of commercial products such as lumber, plywood, etc.

Cover Type
The vegetative species that dominates a site.

Cull Logs
Logs that do not meet commercial specifications due to defects in the wood.

Decommissioned Road
In this document, a decommissioned road is one that is permanently removed from the transportation system, revegetated, and made impassible or as nearly so as possible.

DBH
Diameter at breast height – The diameter of a standing tree at a point 4.5 feet from ground level.

EA
Environmental assessment

FEIS
Final environmental impact statement

Forb
Any herbaceous plant other than those in the grass, sedge, and rush families (any non-grasslike plant that has little or no woody material).

FSH
Forest Service Handbook

Fuel Loading
The volume of the available or burnable fuels in a specified area, usually expressed in tons per acre.

Fuel Treatment
Any manipulation or removal of fuels to reduce the likelihood of ignition and/or lessen potential damage and resistance to control.

FVS
Forest Vegetation Simulator

Habitat Effectiveness
The capability of an area to support elk or deer based on forage, cover, open roads, and the spatial distribution of these factors.

Hard Snag
A dead or partially dead tree composed primarily of sound wood.

Hardwoods
Broadleaf trees or shrubs.

IDT
Interdisciplinary team – A group of individuals with different specialized training.

***Ips* (Pine Engraver Beetle)**
A genus of bark beetle that feeds beneath the bark of pines, typically killing branches, tops, or entire trees.

Landing
Any place where round timber is assembled for further transport.

Late Succession
Ecosystems distinguished by old trees and related structural features.

Logging Slash
The wood residue left on the ground after timber harvest (tops, branches, etc.).

Lopping
Cutting fallen tree branches and stems into smaller pieces.

MA
Management area (see p. 3)

Mass Movement
Down-slope movement of a portion of the land's surface, such as a single landslide or the gradual downhill movement of the whole mass of loose material on a slope face.

MBF
Thousand board feet

MIS
Management Indicator Species – Species selected to monitor the effects of planned management activities on populations of wildlife and fish, including those that are socially or economically important.

Mitigation
See p. 27.

MMBF
Million board feet

Monitoring
The sample collection and analysis of information regarding Forest Plan management practices to determine how well objectives have been met, as well as the effects of those management practices on the land and environment.

Natural Regeneration
The renewal of a tree crop by natural means without seeding or planting done by people.

NEPA
National Environmental Policy Act of 1969

NFMA
National Forest Management Act of 1976 (amends the Forest and Rangeland Renewable Resources Planning Act)

NFSR
National Forest System Road – A forest road under the jurisdiction of the Forest Service.

Noxious Weeds
Those plant species designated as weeds by federal state laws; generally non-native, aggressive, and difficult to manage.

Patch Clearcut
The harvesting in one cut of all trees in an area not more than 10 acres in size.

PFA
Post-fledging family area (see p. 66)

POL
Products other than logs – Products such as posts, poles, and fiber from trees or parts of trees less than sawlog size.

Precommercial Thinning
Removing from a stand some of the trees that are too small to make a merchantable product in order to improve tree spacing and increase growth.

Prescribed Burning
Controlled application of fire under specified environmental conditions that allow the fire to be confined to a predetermined area while producing the fire intensity and rate of spread required to attain planned resource management objectives.

R2
Region 2 (Rocky Mountain Region of the Forest Service)

Road Density
Miles of road per square mile of land.

Road Prism

The portion of the road within the limits of excavation and embankment.

Salvage Harvest
Removal of damaged, dead, or dying trees resulting from insect and disease epidemics, wildfire, or storms to recover logs before they have no commercial value for production.

Sanitation Cutting
The removal of trees occupied by insect or disease pests to reduce pest populations and limit their spread.

Sawtimber
Trees suitable in size and quality for producing logs that can be processed into lumber; generally those with a diameter of 8 inches or greater.

Seedtree Cutting
A harvest method that leaves a small number of seed-bearing trees singly or in small groups to provide seed for regeneration of the site.

Sensitive Species
Those plant and animal species identified by the Regional Forester for which population viability is a concern.

Shelterwood Seedcutting
A harvest method that leaves a portion of the mature stand in place as a source of seed.

Skidding
Moving logs from the stump to a collecting point.

SS
(Habitat) structural stage (see p. 51)

Stored Road
In this document, a stored road is one that is closed year-round between periods of use for resource management (separated by years) using berms, rocks, or other barriers instead of a gate.

Unclassified Road
A road that is not constructed, maintained, or intended for long-term highway vehicle use, or a travelway resulting from off-highway vehicle use.

USDA
United States Department of Agriculture

USDI
United States Department of the Interior

VSS
Vegetation structural stage (p. 66)

WCPH
Watershed Conservation Practices Handbook (FSH 2509.25)

INTRODUCTION

The Black Hills National Forest proposes to harvest timber, thin dense forest stands, reduce hazardous fuel conditions, enhance wildlife habitat, improve roads, and restrict motorized use of other roads in the Cement project area. Part of the project area would be closed to all motorized travel. The Cement project area is located southeast of Sundance, Wyoming, and is within the Bearlodge Ranger District, Black Hills National Forest. This action is needed in order to produce wood fiber, decrease risk of wildfire and insect infestation, reduce open road density, and improve tree growth.

The environmental analysis documented here is tiered to:

1) The 1997 Revised Land and Resource Management Plan ("Revised Forest Plan") for the Black Hills National Forest.
2) The Final Environmental Impact Statement ("FEIS") associated with the Revised Forest Plan.
3) The environmental assessment and decision notice for the 2001 Phase 1 Amendment ("Phase 1 Amendment") to the Revised Forest Plan.

The analysis also references the file titled Analysis and Evaluation of the Cement Project Area ("project file"). The project file documents the interdisciplinary team's evaluation of effects.

The Black Hills National Forest is implementing the Revised 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 EA documents the site-specific effects of implementing the proposed actions and alternative actions. The FEIS and Revised Forest Plan 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.

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from 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 five parts:

Purpose of and Need for Action: The section includes information on the history of the project proposal, 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.

Alternatives Including the Proposed Action: This section provides a description of the agency's proposed action as well as alternative methods for achieving the stated purpose. This discussion also includes possible mitigation measures. Finally,

this section provides a summary table of the environmental consequences associated with each alternative.

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

Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

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

1 PURPOSE OF AND NEED FOR ACTION

Chapter Contents

1.1 Project Area Location

The project area is located in Crook County, Wyoming, in the northwestern Black Hills (Figure 1). Legal description is shown in Table 1.

Project area location Legal description		
Township	**Range**	**Section/s**
50 North	60 West	4-9, 16-18
50 North	61 West	1-5, 9-16, 21-27
51 North	60 West	31, 32
51 North	61 West	15, 21-23, 25-28, 33-36
Sixth Principal Meridian		

Table 1. Cement project area location

The Cement project area encompasses 17,510 acres of National Forest System land and 2,615 acres of private land, for a total of 20,125 acres. Landmarks include Cement Ridge, Surprise Gulch, Williams Gulch, Plato Gulch, and Rattlesnake Canyon. Proposed activities would occur on National Forest System lands. Log hauling may occur across areas of private land on which the Forest Service has acquired right-of-way.

1.2 Management Areas

The Revised 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 Revised Forest Plan includes a description of desired future condition, goals, objectives, standards, and guidelines. National Forest land in the Cement project area is allocated to the following management areas (Figure 2):

4.1 – Limited Motorized Use and Forest Products Emphasis (1,343 acres)
These areas are managed for non-motorized recreation, timber and forage production, visual quality, and a diversity of wildlife habitat. Roads provide intermittent commercial access, but are normally closed to other than administrative use.

Figure 1. Project area vicinity

Figure 2. Management areas

5.1 - Resource Production Emphasis (16,167 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.

The ID team reviewed the management area designations and found them appropriate.

1.3 Needs and Opportunities

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

1.3.1 Revised Forest Plan Goals and Objectives vs. Existing Conditions

The Revised Forest Plan includes multiple-use goals and objectives for management of the Forest. These goals and objectives are described in Chapter 1 of the Revised 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 Revised Forest Plan direction to the conditions that currently exist in the project area. The comparisons show where needs and/or opportunities for action exist.

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.*

Objective 105: *Prohibit motorized vehicle use in wetlands, wet meadows, and riparian areas, except at specified locations and times of the year.*

The only perennial streams in the project area are within short distances of springs and seeps, but heavy rainstorms can cause water to flow temporarily in other channels. The wet meadow near Guidinger Spring has been rutted by motorized vehicles, contributing sediment to a short perennial stream. This stream channel shows evidence of bank sloughing, possibly from cattle grazing.

Sedimentation is occurring or could occur after rainstorms in other locations due to placement of existing roads, damaged or inadequate drainage structures, and motorized vehicle use. Opportunities exist to improve conditions by repairing, re-routing, or closing roads.

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

Objective 201: *During the planning period conserve existing hardwood communities and restore historic hardwood communities by 10% forestwide over 1995 conditions on sites capable of supporting these communities.*

The project area includes about 1,173 acres of aspen, 629 acres of birch, and 8 acres of oak cover type. Conifers are growing into some of the aspen stands due to lack of disturbance (p. 16). If left undisturbed, natural succession would eventually convert the dominant cover type to pine. There is a need to maintain diversity in forest cover types for wildlife habitat, natural fuel breaks, scenery, and ecosystem health. An opportunity exists to set back succession in these stands through timber harvest.

Objective 209: *Manage at least 5% of the forested landbase for the grass/forb structural stage.*

There are currently 45 acres of grass/forb structural stage in forested cover types, or 0.3% of the forested landbase. There is a need to provide additional grass/forb stage for forage production. An opportunity exists to create grass/forb stage through timber harvest, especially patch clearcutting (clearcuts less than 10 acres in size).

Objective 211: *In ponderosa pine forested portions of a watershed, maintain an average of 2 hard snags per acre on south-facing slopes and 4 hard snags per acre on north-facing slopes, well dispersed across the watershed through the rotation. Calculate as a per-acre average for the watershed; some acres may have no snags while others may exceed the average. In other forest types maintain an average of 6 hard snags per acre, well dispersed across the watershed.*

There is no quantitative data on existing snags. The project area was analyzed assuming that existing snag density does not meet Forest Plan direction. Most of the 7th-level watersheds in the project area currently have sufficient trees at least 20" in diameter to provide large-diameter snags over time (p. 58).

Large-diameter snags are an important habitat component for many wildlife species. There is an opportunity to increase the number of snags by creating them from live trees. Long-term availability of large snags could be increased by silvicultural treatments that would retain large-diameter trees and increase their growth rate.

Objective 213: *Maintain or enhance existing riparian area biodiversity, physical structure and size.*

Objective 214: *Restore riparian shrub communities across the forest by 500 acres during the plan period on sites capable of supporting this community.*

Small riparian areas exist near a few springs in the project area. Roads and cattle grazing compromise the riparian area at Guidinger Spring. There is an opportunity to improve riparian conditions by closing or re-routing roads and excluding cattle.

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

The project area provides habitat for game species such as deer, elk, and turkeys. There are no fish-bearing streams or lakes in the project area. High open road density and lack of forage currently compromise habitat value in the project area for deer and elk. There is an opportunity to increase habitat value by closing roads and creating forage through timber cutting, prescribed fire, and other actions.

Objective 218: *Conserve or enhance habitat for resident and migratory non-game wildlife.*

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

Objective 221: *Conserve or enhance habitat for sensitive species and species of special interest (management indicator species).*

The bald eagle is the only threatened, endangered, or proposed species known to use the general area. The species has not been observed in the project area. Eagles are winter residents in the Black Hills, but no nesting occurs. No other threatened, endangered or proposed species or their critical habitats are known to exist in the project area.

Seven animal species and four plant species listed by the Rocky Mountain Region of the Forest Service as "sensitive" have been documented in the project area (pp. 60 and 92). Habitat for other sensitive and management indicator species exists in the project area.

There is a need to conserve or enhance habitat for these species and an opportunity to do so through thinning, fuel reduction, prescribed fire, and transportation system changes.

Objective 223: *Use management ignited fires and prescribed natural fires to achieve desirable vegetative diversity and fuel profiles on 8,000 acres [across the National Forest] per year for the next decade.*

Objective 224: *Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area.*

Objective 227: *Manage 28,900 acres [across the National Forest] of activity fuels and 4,000 acres [across the National Forest] of natural fuels each year during the next decade, consistent with the need to protect life, property and natural resources from the threat of wildfire.*

Undesirable fuel profiles exist in parts of the project area. Of particular concern are parts of the Surprise, Williams, and Rattlesnake drainages, where a snowstorm broke the tops out of many trees in November 2000. There is a need to reduce fuel accumulation in these areas and an opportunity to do so using prescribed fire and mechanical treatments.

Encroaching forest has reduced amount and quality of forage on south-facing slopes used by wintering big game. There is an opportunity to reduce forest cover and improve forage by burning these slopes.

Risk of fire occurrence is rated as high in the project area, and fuel flammability is considered moderate. Years of fire suppression have increased the potential for large crown fires. There is a need to reduce this potential to protect sensitive species habitat, timber values, private land, and visual quality in the area. There are opportunities to reduce fuels and large fire potential through timber harvest, fuel treatments, and prescribed burning.

Objective 226: *Develop fuel management and protection strategies for intermixed landownerships in partnership with private, state and other federal agencies.*

The project area includes 2,615 acres of intermixed private land. Thirty-one percent of the project area is within ¼ mile of private land. There is a need to reduce the risk of fire spreading to adjacent ownerships and an opportunity to work with landowners towards this end.

Objective 228: *Within planning units where outbreaks of mountain pine beetles could threaten management objectives, maintain or reduce acreage of ponderosa pine stands that are in medium or high risk condition for infestation.*

In the project area, 3,292 acres (22% of the pine acres) are at high risk of mountain pine beetle infestation, and another 7,432 acres (50% of the pine acres) are at medium risk.

There are currently no large beetle infestations in the project area, though trees attacked or killed by beetles can occasionally be found in most pine stands. Mountain pine beetles are native to the Black Hills, so this type of low-level, endemic occurrence is to be expected. Large-scale infestations are more likely to occur where pine stands are in the high-risk category (USDA Forest Service [2] p. III-226).

Since the late 1990s, several thousand acres in the northeastern Black Hills have been affected by a mountain pine beetle epidemic. There are currently many smaller pockets of beetle infestation in the Black Hills, especially near Deerfield Lake and on Warren Peak in the Bearlodge Mountains. Beetle populations have generally been increasing since the late 1990s.

There is a need to minimize the potential for loss of timber and other values to mountain pine beetles. There is an opportunity to reduce the potential for infestation by thinning dense timber stands and conducting sanitation harvest.

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

Objective 303: *Offer 838 MMBF of sawtimber and 21 CCF of roundwood per decade.*

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.

Objective 309: *Provide the following changes to the National Forest System roads and two-track roads in support of long-term sustainable production of commodities. Road construction:*

280 miles/decade. Road reconstruction: 870 miles/decade. Road obliteration: 140 miles/decade. Two-track obliteration: 270 miles/decade.

There are about 99 miles of National Forest System roads and 39 miles of unclassified roads (two-tracks) on all ownerships in the project area. About 103 miles of roads are accessible year-round, including approximately 23 miles of roads that are technically closed but can be driven on due to ineffective or vandalized closures. Average road density is 4.4 miles of roads per square mile of land, including 4.29 miles per square mile on National Forest System lands.

The roads analysis process for the project area (Roads Analysis Report, Cement Project Area, Version 1.0) showed that there is a need for access to conduct management activities and allow motorized recreation, but also a need to reduce maintenance costs, sedimentation, disturbance of wildlife, and negative effects on non-motorized recreation opportunities. In other words, there is a compelling need to improve some roads while closing or obliterating others.

Goal 4. Provide for… a range of recreational opportunities in response to the needs of Black Hills National Forest visitors and local communities.

Goal 4.1-401: *Emphasize non-motorized recreational opportunities.*

The Revised Forest Plan directs that off-road motorized travel is to be prohibited in Management Area 4.1, and that roads will "generally" be closed to motorized vehicles. Part of the Cement project area is in Management Area 4.1. Most of the roads are open, and motorized off-road travel is allowed. There is a need to comply with Revised Forest Plan direction.

1.3.2 Purpose of and Need for Action

In summary, the purpose of and need for action in the Cement project area is to provide a sustainable supply of commercial timber consistent with Revised Forest Plan standards and guidelines, reduce hazardous fuels, maintain or enhance wildlife habitat, improve management of the transportation system, and reduce sedimentation. Other Revised Forest Plan goals and objectives, such as those associated with scenic integrity and heritage resources, would be met through implementation of standards and guidelines.

1.4 Issues

1.4.1 Public Involvement

Public involvement in this project began in October 2001 when the Cement project was listed in the Black Hills National Forest's Quarterly Schedule of Proposed Actions. Public scoping was conducted in March 2002. Section 5 of this document contains a list of individuals and organizations contacted during scoping.

1.4.2 Identification of Relevant 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 general public. The Forest Service separated the issues into two groups: relevant (or "significant", as directed by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and 1501.7)) and non-relevant 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…" Relevant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-relevant 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-relevant issues and reasons regarding their categorization as non-relevant may be found in the project record.

The Forest Service identified five relevant issues raised during scoping. These issues include:

1. Effects on biodiversity

- The proposed actions might have negative effects on the area's biodiversity, especially in combination with the cumulative effects of past activities such as timber harvest, road construction, and fire suppression.
  Indicators: Condition of habitat for threatened, endangered, proposed, sensitive, and management indicator species.

2. Timber harvest

- Forest management can provide raw materials for the local wood products industry.
  Indicator: Volume of sawtimber and roundwood that would be produced.

3. Travel management

- Decommissioning of roads and closure of roads with berms, rocks, or other barriers could decrease options for future multiple-use management and increase wildfire suppression response time.
  Indicators: Miles of roads open, decommissioned, and closed using gates or other means; percentage of project area land base within 0.25 mile of an accessible road.
- Restrictions on road use could decrease opportunities for motorized recreation but increase opportunities for non-motorized recreation.
  Indicators: Miles and density of open roads.
- Existing open roads may have a negative effect on wildlife habitat.
  Indicators: Deer and elk habitat effectiveness; condition of habitat for other species affected by open roads.

4. Fuels and prescribed fire

- High fuel loading in some parts of the project area could lead to dangerous wildfires.
  Indicator: Acres, type and location of proposed fuel treatments.
- Prescribed fire can escape and cause damage if not applied wisely.
  Indicator: Acres, type, and location of prescribed fire proposed.
- Prescribed fire could reduce crown fire probability more than mechanical treatment alone and could enhance wildlife habitat.
  Indicators: Crown fire likelihood; condition of habitat for sensitive and management indicator species.

5. Risk of insect infestation

- Lack of thinning and other forest management could increase the risk of infestation by insects such as mountain pine beetle.
  Indicator: Acres of pine at low, medium, and high risk of beetle infestation.

1.5 Decisions to be Made

This EA does not document a decision. The purpose of this document is to disclose the effects and consequences of proposed actions and alternatives. The responsible official will make decisions based on consideration of this analysis.

Decisions to be made for this project are:

- Should resource management activities such as timber harvest, timber stand improvement, transportation system management, fuel reduction, monitoring, and associated actions be implemented in the Cement project area at this time? Should Management Area 4.1 be entirely or partly closed to motorized travel?
- If so, where in the project area should these actions occur? What design criteria and mitigation measures should be applied?

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the proposed actions, the no action alternative, and several alternatives not considered in detail. This chapter also compares the alternatives in terms of their environmental impacts and their achievement of objectives.

Chapter Contents

2.1 Description of the Alternatives, Including No Action

This section describes the alternatives considered in detail. Table 2 (p. 38) summarizes proposed activities.

2.1.1 Alternative 1 (No Action)

The Forest Service Handbook (FSH) requires the Forest Service to study the no action alternative in detail, and to use it as a baseline against which impacts of action alternatives can be measured (FSH 1909.15, 14.1). 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 may still occur.

This alternative does not address objectives and needs for timber harvest, travel management, fuel reduction, or insect infestation.

How Alternative 1 Addresses the Issues (see Issues, page 11)

1. Effects on biodiversity

In the short term, the no action alternative would preserve all existing wildlife habitat. Natural processes would continue to alter the forest. Dense stands would remain and may stagnate, resulting in stable or increasing risk of fire and insect infestation. Existing large-diameter trees would remain and density of large-diameter snags would probably increase over time. Sensitive species habitat would

not be altered by management activities, though high open road density would continue to compromise habitat for some species.

2. **Timber harvest**

   Under Alternative 1, no timber harvest would take place. Wood fiber would not be provided at the current time. Much of the timber proposed for removal at this time would be available for use later, though increased stand density and mortality could reduce productivity through the rotation as well as increasing the risk of loss due to wildfire or insects or disease.

3. **Travel management**

   Open road density would remain high. All existing access would remain for fire suppression, motorized recreation, and other activities.

4. **Fuels and prescribed fire**

   No prescribed burning or other fuel treatments would take place at this time. Fuel loading and resulting wildfire hazard would continue to increase.

5. **Risk of insect infestation**

   The risk of mountain pine beetle infestation would continue to increase.

2.1.2 Alternative 2

Focus of Alternative 2

Vegetation management and associated activities would focus on production of wood fiber, reduction of hazardous fuels and mountain pine beetle risk, and management of the road system. Harvest treatments would produce about 10,390,000 board feet of sawtimber and 40,000 cubic feet of roundwood. All trees exceeding 20" in diameter would be left to provide future large-diameter snags, except in patch clearcuts and aspen enhancement treatments. Ongoing activities such as recreation, fire suppression, and road maintenance would continue to occur.

Stand-by-stand proposals are described in the project file. A comparison of alternatives can be found on 38.

Silvicultural Treatments

The following silvicultural treatments (timber harvest) are proposed. Treatments are displayed in Figure 3 (p. 20).

- **Commercial thinning and Products-Other-than-Logs (POL) thinning.** Thinning of mature or pole-sized trees in pine stands would take place on 765 acres. Residual basal area would average 60 to 80 square feet per acre and would vary within stands to provide wildlife habitat and visual variety. Smaller, unhealthy, and poorly formed stems would be cut to increase growth of remaining trees. For commercial purposes, mature timber (sawtimber) is usually considered to be over 9" in diameter. Products other than logs are made from trees generally 5-9" in diameter. On 687 acres, stands consist of a mix of tree sizes, and both sawtimber and POL would be thinned. On 78

acres, most of the trees are under 9" in diameter, and only POL thinning would take place. Primary objectives of these treatments include production of wood fiber and increased growth and vigor of the remaining trees to reduce risk of loss to pathogens. Another objective is to raise canopy height, decreasing ladder fuels and attendant fire severity and rate of spread. Thinning would be followed by prescribed burning in some stands to further reduce ladder fuels; therefore, cut trees would generally be removed from the stand to reduce fire intensity.
Note: Due to a limited market for smaller-diameter wood products and wood chips, timber purchasers often opt not to buy the POL part of a timber sale. Cutting of these stems is critical to meeting the objectives of thinning in the Cement area. If a timber purchaser opts not to take POL, these trees will be cut via service contract or other means.

- **Shelterwood seedcut** or **seedtree cut.** These silvicultural treatments remove some of the mature trees to open the stand and allow young trees to regenerate and become established (547 acres). A shelterwood seedcut leaves more mature trees than a seedtree cut. These treatments would retain enough large trees to provide a seed source and future large-diameter snags. The primary objective is establishment of pine regeneration.
- **Overstory removal.** Where seedlings and saplings have become established, most of the mature trees would be cut to allow maximum growth of the new stand (236 acres).
- **Commercial thinning/overstory removal.** In stands with mixed forest conditions, thinning would take place in areas with dense, mature pine, and most or all mature trees would be removed where pine seedlings and saplings exist. These treatments would take place on 52 acres.
- **Shelterwood seedcut/overstory removal** or **seedtree cut/overstory removal.** These treatments would take place on 1,501 acres in stands with only patches of pine regeneration. Where there is sufficient regeneration, an overstory removal harvest would take place. In areas with few seedlings or saplings, more mature trees would be left as a seed source.
- **Patch clearcuts.** All trees would be cut in patches ranging in size from one to seven acres. Totaling 92 acres, the purpose of these small openings is to provide forage for various wildlife species and improve the balance of vegetation structural stages in goshawk post-fledging habitat (p. 66).
- **Storm salvage.** Storm-damaged trees would be removed from 145 acres. Broken-top trees would be cut to reduce the risk of insect infestation. Harvest would be followed by fuel treatment (lopping or mechanical piling) and low-intensity burning to reduce fire hazard.
- **Precommercial thinning.** Saplings would be thinned to improve growth (1,171 acres). This treatment would reduce stand density through selection of the best-formed, healthiest trees within the spacing guidelines. Primary goals are to improve growth, preclude stand stagnation, and reduce continuity of fuels. Resulting slash in excess of fuel guidelines would be piled, chipped, or removed to reduce fire danger and pathogen habitat.
- **Sanitation.** Mountain pine beetle populations appear to be at endemic (low) levels in the Cement project area, but potential for infestation exists. Alternative 2 includes provisions for response to local infestations in the project area. If an infestation occurs, cutting of beetle-infested trees (sanitation) would take place where necessary

in patches up to five acres in size. Total area treated would not exceed 250 acres (1.7% of the project area pine acreage, or 15% of the older, dense forest). Harvest would take place in areas accessible from existing roads and would comply with design criteria and mitigation listed in Section 2.2. No permanent roads would be constructed. If a large infestation were to occur, a new analysis and decision with updated information would be required. The objective of this treatment is to limit the spread of mountain pine beetle infestation so that loss of healthy stands, including dense stands, is minimized.

Where logging slash exceeds fuel guidelines or visual standards after commercial harvest, standard timber sale contract provisions ensure it would be piled, chipped, or otherwise appropriately managed to reduce fire hazard. See "Fuel treatments" section below.

Restoration Treatments

- **Aspen enhancement.** Encroaching pine would be removed from 17 acres of aspen to prevent succession of these hardwood stands to pine. The proposed action originally called for 509 acres of this treatment in mixed aspen/birch stands, but botanical surveys showed that many of the stands contain high-potential sensitive plant habitat. Pine generally exists as a scattered overstory and does not appear to be regenerating or encroaching on these stands. Removal of the overstory pine would not have been a benefit to these stands or the sensitive plant habitat, while disturbance of the ground and understory vegetation could have had a negative effect. Therefore this treatment was dropped in all but the aspen stands in which succession to pine is taking place and disturbance of sensitive plants is unlikely.
- **Guidinger Spring area restoration.** Unclassified road U725 would be closed using boulders, brush, or other physical barriers. Parts of the road would be ripped using mechanized equipment to remove ruts and restore drainage. To avoid compaction and further rutting in the wet meadow, heavy equipment would not be used near the spring. Livestock would be prevented from walking in the stream by fencing or other livestock management methods.

Fuel Treatments

The objective of the proposed fuel treatments is to reduce continuity of fuels across the landscape, vertical continuity of fuels ("ladder fuels"), and overall fuel available to carry a wildfire. Treatments are displayed in Figure 4 on p. 21.

- **Thin, lop, pile, and burn**. Dense pockets of small trees would be thinned. Cut trees and other fuels would be lopped into smaller pieces and piled. Concentrations of fuel would then be burned. These treatments would take place on 660 acres to reduce density and height of fuel and potential fire intensity.
- **Machine piling.** Excess fuels would be piled using heavy equipment on 123 acres. Piles would be burned and pile sites scarified and seeded.
- **Hand piling.** Excess fuels would be piled by hand on 38 acres too steep for mechanized equipment. Piles would be burned and pile sites seeded.
- **Moderate-complexity prescribed burns.** This type of broadcast burn would take place on 850 acres. The purpose of the treatment is to consume fuels on the ground

and kill lower branches on some trees, reducing the chances of a wildfire getting into tree crowns. In some stands, this treatment would follow thinning. Fire lines and a detailed prescribed burn plan would be required.

- **Low-complexity prescribed burns.** On 935 acres, concentrations of fuels would be burned on south-facing slopes in winter or spring when surrounding areas are still snow-covered. These burns would reduce naturally occurring fuels and maintain a more open forest structure typical of these sites. A prescribed burn plan would be prepared, but constructed fire lines would usually not be necessary.
- **Logging slash.** Treatment of logging slash after timber harvest is a provision of the standard timber sale contract. Mechanical treatment of these "activity fuels" would take place in all harvest units where fuel loading would exceed Revised Forest Plan direction.

Transportation System and Travel Management

The following road improvements are proposed (Figure 5, p. 22).

- **Road construction.** To access harvest units, six different road segments totaling 3.8 miles would be constructed. Unclassified roads totaling 12.78 miles would be converted to classified roads, including 6.9 miles that would require some reconstruction. Roads that would be converted (and, in most cases, closed) include U008, U009, U400, U500, U502, U503, U504, U505, U506, U507, U515, U600, U635, U700, U702, U709, U718, NS21, and NS25.
- **Reconstruction.** Sixty-three miles of existing road would be reconstructed. Reconstruction would consist mainly of adding drainage structures to prevent the road surface from becoming muddy, and adding or improving surfacing. Realignment off the existing template would not occur as part of reconstruction.
- **Pre-use maintenance.** Minor maintenance would take place in spots on 2.9 miles of existing road. This would involve blading ruts, addition of gravel in soft spots, cleaning ditches, and other minor repairs where problems exist.

Travel management changes (see Figure 5, p. 22):

- **Area closure.** According to the Revised Forest Plan, roads in Management Area 4.1 (see Figure 2, p. 5) are to be closed to motor vehicles, and off-road motorized travel is not allowed. The NFSR 819.1 road system, located in the northeast corner of the project area (on the ridge between Surprise Gulch and Idol Gulch), is in MA 4.1. There is a gate on NFSR 819.1 at the junction with NFSR 819.1B, but it is not effective. Alternative 2 would close the area north of NFSRs 803.1 and 866.1 (approximately 1,343 acres) to motorized travel on and off roads, except for administrative purposes, to comply with Revised Forest Plan direction. The gate on 819.1 would be moved to a better spot and backed up with rocks or other barriers.
- **Gating.** Twelve miles of Forest Service system roads currently open year-round would be gated year-round. These include the NFSR 804.1A system, 805.3G, and 805.3I, all of which access the area between Rattlesnake Canyon and Wagon Canyon. This system was previously closed with a gate at the junction of 804.1A and 805.3 (Wagon Canyon road). The gate was removed for the Wagon timber sale. A new gate would be installed at this location and the gate on NFSR 805.3A repaired.
- **Storage.** Thirteen miles of Forest Service system roads currently open year-round would be closed using barriers such as rocks, slash, and berms. These roads would

be revegetated, possibly requiring scarification and seeding. Storage is often a more effective way to close a road than gating, and requires less maintenance. Because these roads are expected to be required for resource management in the future, the road prism would remain. Roads that would be stored are scattered across the project area. Among them are the roads in Management Area 4.1 and NFSRs 866.1C, D, F, and G (all south of Williams Spring). Most of these roads currently have ineffective closure gates, which would be replaced by barriers. Six miles of unclassified roads for which there is a long-term need would be added to the Forest Service road system and put in storage.

- **Decommissioning.** Twenty-three miles of currently open roads would be decommissioned. These roads are either not needed for current or future management or causing sedimentation due to location, often on wet soils. Most of the roads proposed for decommissioning are unclassified, including U725 and U763 near Guidinger Spring. Parts of three Forest Service system roads would be decommissioned. NFSRs 803.1C and 803.1D are dead-end spurs off Surprise Gulch that are located in draw bottoms. NFSR 805.2 is an isolated road segment not needed for management and with legal access limited by private land. A short section of NFSR 866.1 that connects Surprise Gulch to 866.1C, D, and associated roads would be decommissioned to ensure effective storage of these roads.

Objectives of proposed travel management include reduction of maintenance costs and negative effects on wildlife habitat, soils, and water while retaining a transportation system that meets current and future resource management needs. From a soil and watershed standpoint, the specific objective of road decommissioning and road storage is to control erosion by (1) decreasing the production, interception, and rapid transport of runoff by restoring or augmenting the natural drainage of the road template; and (2) decreasing sediment transported to waterways. Measures may include installation of waterbars, rolling dips, or erosion matting; the addition, replacement, upgrade, or removal of existing non-functional drainage structures (e.g., culverts); ripping to remove ruts; re-contouring; placement of slash and boulders; tree planting; and reseeding. Roads proposed for use under Alternative 2 would be repaired prior to use. Work on other roads will take place as funding allows.

Ineffective closures of other roads would be repaired, improved, or moved to better locations.

Post-project Activities

The following additional actions would take place after implementation of this alternative. More details on monitoring items may be found in the project monitoring plan (Appendix C).

- Regeneration surveys would follow shelterwood seedcuts, seedtree cuts, and patch clearcuts.
- Cull live trees, excepting those left for snag replacement, would be cut following overstory removals, shelterwood seedcuts, and seedtree cuts.
- Non-commercial conifers would be cut after merchantable trees are removed from patch clearcuts and aspen enhancement treatments.

- Prescribed burn areas would be monitored after burning to determine the effectiveness of the treatment and any need for temporary modification of grazing systems.
- Road restriction effectiveness and area closure compliance would be monitored.
- Areas where soil is disturbed or exposed by project activities would be monitored for noxious weeds. Any noxious weed infestations would be treated using herbicides, biocontrol, or other methods. Effectiveness of these treatments would be monitored.
- Effectiveness of riparian restoration would be monitored.
- Snag retention in commercially harvested timber sale units would be monitored. Snags may be created from remaining live trees (see mitigation, p. 33).

How Alternative 2 Addresses Significant Issues (see Issues, page 11)

1. **Effects of vegetation management on biodiversity**

   In the short term, Alternative 2 would temporarily disturb existing wildlife habitat in the locations proposed for treatment and road work. Natural processes would continue to alter the remainder of the project area. Thinning and fuel treatments would reduce the risk that wildfire would cause large-scale habitat changes. The loss of some dense stands would reduce habitat for species associated with these conditions. Northern goshawk nesting and post-fledging habitat would be maintained or enhanced. There would be fewer trees in all diameter classes except those over 20", but more openings and forage. Individuals of a number of sensitive and management indicator wildlife species could be harmed (p. 60), though there would be no negative effects on populations or species as a whole. Reductions in open road density would improve habitat for big game and species that use snags.

2. **Timber harvest**

   This alternative would result in commercial wood products and should increase productivity of treated stands. Harvesting trees now could leave less timber volume for harvest in the near future.

3. **Road restrictions**

   Open road density would decrease. Many roads would be put into storage (blocked with physical barriers rather than gated). These changes would reduce maintenance costs, disturbance of wildlife habitat, and opportunities for motorized recreation, and could increase response time for wildfire suppression.

4. **Fuels and prescribed fire**

   Fuel loading would decrease. Use of prescribed fire would increase the time that fuel treatments remain effective, contribute to nutrient cycling, and increase forage production.

5. **Risk of insect infestation**

   Risk of mountain pine beetle infestation would decrease in treated stands.

Figure 3. Timber harvest – Alternatives 2 and 3

Figure 4. Fuel treatments and precommercial thinning - Alternative 2

Figure 5. Travel management - Alternative 2

2.1.3 Alternative 3

Focus of Alternative 3

Silvicultural treatments proposed under Alternative 3 are the same as those proposed under Alternative 2. Differences between the alternatives are described below. A comparison of alternatives can be found on page 38.

Timber volume produced would equal about 10,390,000 board feet of sawtimber and 40,000 cubic feet of roundwood.

Stand-by-stand proposals are described in the project file.

Silvicultural Treatments

See Alternative 2 description (p. 14).

Fuel Treatments

The intent of the proposed fuel treatments under Alternative 3 is the same as under Alternative 2 (reduce horizontal and vertical continuity of fuels and overall fuel available to carry a wildfire). In response to public comments, Alternative 3 proposes only mechanical fuel treatments in stands where both mechanical treatments and prescribed fire would take place under Alternative 2 (see Figure 6, p. 25).

- **Moderate-complexity prescribed burns.** This type of broadcast burn would take place on 84 acres, in comparison to 858 acres under Alternative 2. Effects are discussed on page 106.

Transportation System and Travel Management

Travel management changes (Figure 7, p. 26):

- **Area closure.** Under Alternative 2, motorized travel both on and off roads would be prohibited in all of Management Area 4.1 (shown in Figure 2, p. 5). Under Alternative 3, off-road travel would be prohibited in Management Area 4.1, but NFSR 819.1 would remain open year-round. The ineffective gate on 819.1 near the intersection with 819.1B would be removed. Spur roads off 819.1 would remain closed.
- **Gating.** Eight miles of Forest Service system road currently open year-round would be gated year-round, including some that would be put in storage under Alternative 2. In addition to the roads listed for gating under Alternative 2 (p. 17), these include some of the spur roads off 819.1 , several spur roads off the upper end of Surprise Gulch, and several roads between Surprise and Williams Gulch that would be put in storage under Alternative 2. Twenty-four miles of unclassified roads would be converted to Forest Service system roads and closed with gates rather than stored or decommissioned. Unclassified roads U008 and U630, which parallel NFSR 804.1 (Rattlesnake Canyon) on the adjacent ridge, would be gated rather than decommissioned. The section of U725 that passes close to Guidinger Spring would be decommissioned, but the rest of this road and U763, which allow passage of high-

clearance vehicles between Cement Ridge and the upper end of Surprise Gulch, would be repaired and added to the Forest Service road system.

- **Conversion.** Unclassified roads that would be converted to classified and, in most cases, closed until needed again include U009, U400, U500, U502, U622, U635, U700, U709, U718, U758, U759, NS21, and NS25.
- **Storage.** Six miles of road currently open year-round would be put in storage.
- **Decommissioning.** Twelve miles of currently open road would be decommissioned.

Post-project Activities

See Alternative 2 (p. 18).

How Alternative 3 Addresses Significant Issues (see Issues, page 11)

1. **Effects of vegetation management on biodiversity**

   Effects of timber harvest would be the same as those of Alternative 2 (p. 19). Fewer road closures and less acreage of prescribed fire are proposed than under Alternative 2. As a result, beneficial effects on wildlife habitat, soils and water, and wildfire hazard would occur to a lesser degree than under Alternative 2.

2. **Timber harvest**

   See Alternative 2 (p. 19).

3. **Road restrictions**

   Open road density would decrease. Relative to Alternative 2, more roads would remain open, more would be gated, and fewer would be put into storage. These changes would have similar effects to Alternative 2, but would retain more opportunities for motorized recreation and have less effect on response time for wildfire suppression.

4. **Fuels and prescribed fire**

   Fuel loading would decrease. As compared to Alternative 2, the lack of prescribed fire after thinning would decrease the length of time that the treatment would reduce fire hazard (p. 19).

5. **Risk of insect infestation**

   See Alternative 2 (p. 19).

Figure 6. Fuel treatments and precommercial thinning - Alternative 3

Figure 7. Travel management - Alternative 3

Treatment Timing

The law generally prohibits the harvest of stands before they reach their maximum growth rate (NFMA, 16 U.S.C. 1604(m)). Exceptions in the 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 (part m1 of the law). Further exceptions are allowed in order to achieve multiple-use objectives other than timber harvest (part m2).

Alternatives 2 and 3 would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in part m2 of the law, and include the following: precommercial thinning, commercial thinning, patch clearcuts, aspen enhancement, storm salvage, sanitation, and fuel treatments. These treatments are proposed to meet the Revised Forest Plan multiple-use objectives stated earlier in this assessment.

2.2 Mitigation and Design Criteria Common to Action Alternatives

Mitigation measures allow the project to:

a) Avoid impacts altogether by not taking a certain action or parts of an action.

b) Minimize impacts by limiting the degree or magnitude of the action and its implementation.

c) Rectify the impact by repairing, rehabilitating, or restoring the affected environment.

d) Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the action.

e) Compensate for the impact by replacing or providing substitute resources or environments.

(40 CFR 1508.20)

The standards and guidelines in Chapter 2 of the Revised Forest Plan have a similar function but apply to all areas of the Forest when implementing activities. Chapter 3 of the Revised Forest Plan includes measures that apply to specific management areas. Standards and guidelines from the Revised Forest Plan applicable as mitigation or design criteria would be specified in the Project Implementation Guide that will be prepared if an action alternative is selected. The implementation guide would also include site specifics not included in this environmental assessment to protect integrity of heritage sites and other sensitive features. Mitigation measures and design criteria additional to the Revised Forest Plan standards and guidelines are listed below. These measures would apply to either action alternative.

1) Dust

a) Dust control may be done with water, magnesium chloride, calcium chloride, or equivalent.

2) Fuel Treatments

a) Where the combination of existing fuel loading and slash resulting from precommercial thinning would exceed Revised Forest Plan direction, slash would either be chipped or piled and burned away from the remaining live trees.

b) Each prescribed burn proposal would be reevaluated prior to completion of a detailed burn plan. The intent of this review is to verify that site conditions are appropriate for each planned burn and that site-specific objectives can be met.

c) Prescribed burning would be implemented only under conditions defined in a prescribed burn plan.

d) Disposal of slash piles created through commercial harvest, timber stand improvement, 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.

3) Heritage Resources

a) Known heritage sites would be protected. The existing roads that cross heritage sites 48CK619 and 48CK624 would be plated prior to use. Heritage sites would be avoided during all other proposed activities. Specific locations are described in the project file rather than this environmental assessment to protect site integrity.

b) If previously unknown heritage resources were discovered during project activities, the timber sale administrator would stop ground-disturbing actions at the site and notify the district archeologist.

c) Leaders of projects described in this environmental assessment would review heritage maps and implement mitigation measures for sites listed in the project file.

4) Improvements

a) 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.

5) Northern Goshawk

a) Activities proposed within ¼ mile of active goshawk nests would not take place between March 1 and August 31. Areas that may be affected are listed in the project file. Use of currently open roads would not be affected by this measure. *Reference: Revised Forest Plan standard 3111*

b) Timber harvest proposed within post-fledging areas associated with active goshawk nests would not take place in more than one cutting unit at any given time. Areas that may be affected are listed in the project file. *Reference: Revised Forest Plan guideline 3113 (to be treated as a standard)*

6) Noxious Weeds

a) Before any timber sale package is finalized, weed infestations in project operating areas and along access routes would be inventoried by District staff responsible for the noxious weed program. Monitoring of the area for noxious weed infestations would continue during the timber sale (see Monitoring Plan, Appendix C). If new noxious weed infestations that could be spread by timber sale activities were found during implementation, actions to prevent spread would be taken.

b) As required under the Black Hills National Forest Noxious Weed Management Plan (approved January 18, 2003), contracts and permits issued as part of this project would include measures to prevent spread of noxious weeds. Where proposed activities would occur in areas infested with high densities of noxious weeds considered to be at high risk for spread, off-road equipment associated with the activity would be washed before leaving the site to prevent spread of weeds to adjacent National Forest and private lands. Known areas meeting these criteria would be identified by District staff prior to completion of any timber sale contract associated with this project.

c) 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.

d) District staff responsible for the noxious weed program would inspect stockpiled gravel annually for weed infestation in coordination with the project engineer.

e) Native vegetation would be retained to the maximum extent possible during proposed actions.

f) 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 weed-free mulch as necessary.

7) Products Other than Logs

a) If the purchaser of any timber resulting from this project does not opt to take POL, the treatment would take place as a post-sale activity. Whether done separately or incorporated into a timber sale unit, all POL thinning would require removal of cut stems.

8) Public Safety

a) Appropriate signing or other cautionary measures would be implemented in conjunction with all management activities to ensure public safety. Implementation of these measures would be the responsibility of the person initiating the action (e.g., logging contractor, prescribed fire manager).

9) Range

a) 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.

b) Roads, landings, and slash piles would be located out of meadows and draw bottoms whenever possible to reduce loss of forage and to protect key grazing areas.

c) If log hauling or movement of heavy equipment related to proposed timber harvest were to result in damage to cattle guards, repair would be the responsibility of the timber purchaser.

10) Recreation

a) 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 snowmobile trail use would be made at the time of timber sale appraisal and contract preparation. If conflicts appeared likely between use of the trails and specific logging units or haul routes, logging would be restricted between December 1 and March 31 unless a logical and desirable alternative snowmobile route was found. Only those units and/or roads that were in conflict would be restricted so that logging operations could proceed in the remainder of the sale area.

b) 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.

11) Regeneration

a) Existing pine regeneration would generally be protected in stands proposed for overstory removal harvest. Timber in these stands would be felled and skidded with mechanical equipment (whole-tree yarding) where this would best protect regeneration. Provisions related to felling, bucking, and whole tree yarding would be included in the timber sale contract. Proposed overstory removal stands are shown in Figure 3 (p. 20) and listed in the project file.

   Skid trails within these stands would generally be at least 80 feet apart with location approved by the sale administrator prior to commencement of logging. Landing locations would, where feasible, take advantage of existing openings or areas with no regeneration.

b) To ensure regeneration, stands proposed for seedcuts would be logged in the summer or early fall where feasible to maximize the site scarification provided by the skidding operation, provided there were no concerns related to riparian areas, noxious weeds, or sensitive plant species. *Reference: Revised Forest Plan standard 2408b*

12) Revegetation of Disturbed Areas

a) 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 in seed/plant 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 perennial species could 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. *Reference: Revised Forest Plan guideline 1110 (to be treated as a standard)*

b) Timber sale roads would be seeded after construction but prior to timber harvest if any part of the gap between construction and harvest would occur during or 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 have no unacceptable effects.

13) Road Restrictions

a) *During Proposed Activities* – 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.

b) *During Proposed Activities* – 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 prior to the seasons except to allow administrative traffic to pass. Gates would be closed again immediately after traffic passes.

The purpose of the above restrictions is to minimize removal of snags and down woody material for firewood, reduce effects on wildlife habitat, and maintain big game security areas during hunting seasons.

c) *Design* – Timber sale units would be laid out to facilitate proposed road restrictions (e.g., forest around proposed gates and other barriers would be left uncut to maintain obstructions and discourage driving around the gate or barrier). Details would be specified in the Project Implementation Guide.

d) *Design* – Some roads proposed for closure or decommissioning are traditionally used as cattle trails. Conflicts between these activities would be resolved through design of closure structures or method of decommissioning. Details would be specified in the Project Implementation Guide.

14) Scenery

a) Where treatments would be visible from Sensitivity Level 1 corridors (Interstate 90, Wyoming 585), edges of treatment units would be feathered into untreated stands to mimic natural forest/opening edge typically found in this landscape. Affected stands are listed and mapped in the project file and would be included in the Project Implementation Guide.

b) Where overstory removal, seedcut, and/or seedtree treatments would form blocks over 50 acres in size, harvest design would mimic natural vegetation patterns. Methods may include: 1) irregular unit shape, 2) blending unit edges into surrounding vegetation patterns, 3) leaving residual trees in clumps, and 4) simulating the extension of a natural meadow. Affected stands are listed in the project file and would be included in the Project Implementation Guide.

c) Any cutting units on relatively steep terrain would blend into adjoining stands to reduce visual impact. A landscape architect would be involved in design of these transition zones. Affected stands are listed in the project file and would be included in the Project Implementation Guide.

15) Sensitive and Other Rare Plants

a) Foxtail sedge (*Carex alopecoidea)*, a Region 2 sensitive plant species, occurs in two locations in the project area. These populations would be avoided during all proposed activities. Specific locations are listed in the project file and would be included in the Project Implementation Guide. A botanist would be consulted prior to placement of roads, skid trails, and other ground-disturbing activities in the vicinity of these areas.

b) If it became necessary to conduct any ground-disturbing activities (e.g., log landing or skidding) in areas outside of proposed timber sale units and outside areas surveyed for sensitive plants, a botanist would be consulted prior to implementation of the activity.

c) RIS site 0121040006 is proposed for shelterwood seedcut/overstory removal harvest. The lower (northern) slopes of this site are high-potential sensitive plant habitat, while the upslope areas are drier with pine and aspen. Sale preparation personnel would consult a botanist on locating the habitat type break on the ground, and mechanical disturbance of the high-potential habitat would be avoided. If it were necessary to skid logs across this habitat, a limited number of skid trails would be designated in consultation with a botanist.

16) Sensitive Species Contingencies

a) One or more of the sites to be harvested as part of this project would be set aside after harvest unit preparation and marking. If 1) a sensitive species site or population or heritage site were discovered during implementation of the project and 2) it is in the government's best interest to leave unharvested a portion of the timber sale in order to protect the site or population, all or part of the set-aside unit/s may be harvested to offset the lost timber volume. If the above conditions do not occur, the set-aside unit/s would be harvested as a small sale or through other means. The site/s to be set aside will be identified in the Decision Notice if an action alternative is selected.

b) Of the 13 documented land snail colonies within the project area, three are in the vicinity of proposed prescribed burns. None of these colonies contain sensitive species. No actions would occur at colony sites or in a buffer to be placed around each colony. 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 impacts to that specific colony.

c) Disturbance of any newly discovered colonies of land snails would be avoided. A buffer area around newly discovered colonies would be determined by the District wildlife biologist based on site-specific conditions.

17) Snags and Down Woody Material

a) 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.

b) *Existing snags:* If post-harvest snag retention monitoring in timber sale harvest units showed that (1) snags that existed prior to harvest were no longer standing and (2) average snag density per acre in the harvest unit was below Revised Forest Plan direction, snags would be created from remaining live trees to meet this direction unless snag density and distribution across the associated watershed were known to comply with Revised Forest Plan direction. To

provide sufficient trees for potential snag creation, an average of two live trees per acre (on south aspects) or four live trees per acre (on north aspects) would be retained in addition to live trees retained for other purposes in shelterwood seedcuts, seedtree cuts, and overstory removal cuts. These trees would be in the larger diameter classes on the site and could be clumped rather than evenly distributed across the stand. Where possible, they would be grouped with existing snags and generally not located on flat, open ground near open roads to prevent cutting for firewood.

c) *Future large-diameter snags:* To ensure compliance with standards 2301 and 2302, sufficient large-diameter live trees would be retained in each harvest unit to ensure availability of large-diameter snags over the rotation. Modeling indicates that retention of all trees over 20" in diameter would provide the required density and distribution of these trees across each watershed. Therefore, no trees over 20" in diameter would be cut in any harvest unit (except patch clearcuts and liberation cuts) unless they pose a hazard to worker safety.

d) If standard 2308 (retention of down woody material) were to conflict with direction regarding fuel loading or visual quality, standard 2308 would take precedence.

e) Cull logs or felled cull trees would be left on site (unless cutting were done using whole-tree harvest methods) to contribute to nutrient cycling and provide habitat for small wildlife species.

18) Water and Soils

a) Mandatory management requirements found in the Watershed Conservation Practices Handbook (Forest Service Handbook 2509.25), State of Wyoming Best Management Practices, and Revised Forest Plan standards and guidelines would be applied to proposed activities as needed for protection of soil and water.

b) Nearly all proposed activities would take place on soils identified by the Crook County Soil Survey as having a high erosion risk. Therefore, the following special provisions, intended to minimize the amount of exposed bare soil, offsite transport, and soil displacement, would apply: 1) Heavy equipment would avoid streams and swales except to cross at designated points, when building crossings, doing restoration work, or if protected by at least one foot of packed snow or two inches of frozen soil. 2) On slopes over 30%, harvesting and skidding methods that minimize the amount of soil displaced into piles or windrows would be used in order to leave soil intact and in place. Affected RIS sites are identified in the project file and would be included in the Project Implementation Guide. 3) Prescribed burns would be conducted when soil, duff, and large fuels are sufficiently moist to retain beneficial duff as ground cover for prevention of erosion. (Watershed Conservation Practices Handbook, Crook County Soils Interpretation Guide)

c) Protected streamcourses, as determined by the project hydrologist (see map in project file), would be included in the timber sale contract.

d) To prevent detrimental compaction to soils, use of heavy equipment would be limited to periods when soils are sufficiently dry that the equipment does not cause ruts or are frozen to a depth of at least 2" in stands 0122040001, 0122050119, 0122050125, and 0122050225. These stands are located north of Surprise Gulch in the far northern part of the project area. *Reference: Revised Forest Plan guideline 1104*

e) Within the Guidinger Spring area in T50N, R60W, Sections 4 and 9, road obliteration activities would be conducted using special precautions to protect the spring and wet meadow. East of the stream crossing, U725 would not be ripped to avoid compaction and further rutting by machinery in the wet meadow. The section of U725 west of the stream crossing (which can be accessed by machinery from 803.1 and the northwestern portion of U725 in Section 5) would be obliterated to remove ruts and restore drainage. Slash, boulders, or other barriers would be placed on the trail and at entrances to the spring/wet meadow area to discourage further vehicular use. Temporary or permanent exclosure fencing may need to be installed in order to further protect the riparian resources of Guidinger Spring.

19) Wildlife – Miscellaneous

a) Visual screening would be retained along 20% of the length of NFSRs 863, 803, 804, 868.1, and 875, and along 20% of the perimeter of existing and created openings. Vegetation along these roads would be cleared at the minimum width (six feet from the shoulder). The maintenance clearing specifications "top of cut to bottom of toe" would be dropped. Exceptions would be clearing for construction and clearing to maintain or create a safe sight distance.

b) To reduce effects of continuously even tree spacing on wildlife and scenery, commercial thin treatments would emphasize tree health and crown size over spacing. Overstory removal, shelterwood seedcut, and seedtree cuts would include variable spacing in stands referenced in item 14(b) (p. 32).

2.3 Monitoring Common to All Action Alternatives

The district interdisciplinary team would monitor implementation of Alternative 2 or 3. At least one interdisciplinary team meeting/field review would occur prior to the advertisement of any commercial timber sale to ensure that the objectives in this EA are carried through the layout phase of the timber sale. The project area would be monitored by the interdisciplinary team during and following project implementation to ensure that objectives are met and mitigation measures are followed and effective. The

final monitoring review would be conducted two years after a timber sale is closed. All interdisciplinary team field reviews would be documented and a final monitoring report completed after project implementation.

Some of the project implementation monitoring would be done by the timber sale administrator or other contract administrators. Other resource specialists would be involved in monitoring of specific mitigation measures relating to their particular resource area. Appendix C, the Monitoring Plan, includes details on what would be monitored, timing and frequency, purpose, and responsible party.

2.4 Consistency with Revised Forest Plan and Phase 1 Amendment

The Revised Forest Plan and Phase 1 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. Under the Phase 1 Amendment, certain guidelines are to be treated as standards (see USDA Forest Service [3] Appendix). Goals are broad, general statements of desired end results of management, and objectives describe measurable desired results to work towards achieving goals.

This project is within the scope of the Revised Forest Plan analysis, and contains no unusual or extraordinary features or circumstances. A full accounting of project compliance with Revised Forest Plan and Phase 1 Amendment direction is located in the project file. All action alternatives considered in detail meet Revised Forest Plan and Phase 1 Amendment direction.

2.5 Alternative Development Process, Including Alternatives Considered but Eliminated from Detailed Study

The project planning team developed the proposed action to meet objectives identified from a comparison of existing conditions and Revised Forest Plan direction. Timber harvest proposals were modified after public scoping based on new information, including discovery of new goshawk nests and sensitive plant sites. This revised proposed action formed Alternative 2. The types, extent, and objectives of timber harvest proposed under the proposed action and Alternative 2 are the same. Public input led to the development of Alternative 3, which varies from Alternative 2 in travel management and prescribed burning proposals. Project objectives, needs, and issues did not suggest development of alternate timber harvest proposals.

The team also considered other alternatives to the proposed action. Following are brief descriptions of alternatives not considered in detail and reasons for eliminating them from detailed analysis.

No commercial timber harvest. A commentator requested an alternative that included no commercial timber harvest. This alternative was not fully analyzed for three reasons: 1) this option is represented by the no action alternative, 2) providing commercial timber is part of the purpose of and need for action, and 3) timber harvest is an economical means of implementing many fuel reduction and habitat improvement projects.

Only prescribed burning. A commentator requested an alternative that consisted only of prescribed burning. This alternative was not fully analyzed because it would not address most parts of the purpose of and need for action. Furthermore, many of the proposed burns could not be conducted to achieve the desired conditions if not preceded by mechanical treatment (e.g., thinning before burning in a dense stand). Fire suppression over the years has substantially altered the fire regime in relation to its historical range, and a gradual reintroduction of fire is necessary to work towards a more natural condition.

Change Management Area 5.1 to 4.1. A commentator requested that Management Area designation for the entire project area be changed to 4.1 (Limited Motorized Use and Forest Products Emphasis). The primary difference between the current designation of 5.1 (Resource Production Emphasis) and 4.1 is travel management; motorized vehicles are essentially prohibited, except for administrative use, and off-road motorized travel is not allowed. Management Area allocation was determined during Forest Plan revision. In the absence of a clear reason for a change of this magnitude, the decision maker elected not to fully analyze this alternative.

No fuel treatments. A commentator requested consideration of an alternative without any fuel treatments. This alternative was not developed because reduction of hazardous fuels is a key part of the purpose of and need for action. Fuel conditions in parts of the project area pose a hazard to nearby private land and to resource values on public land, and fuels resulting from silvicultural activities would add to this problem if not reduced to acceptable levels. Some of the potential effects of this alternative are represented by the no action alternative.

2.6 Comparison of Alternatives

Table 2 compares activities proposed under the alternatives. Figures are approximate. Treatment definitions and descriptions begin on 14.

Activities by Alternative			
Activity	**Alt. 1 (No Action)**	**Alternative 2**	**Alternative 3**
Fuel management treatments[1]			
Hand pile fuels	0	38 acres	38 acres
Lop fuels	0	660 acres	660 acres
Machine pile fuels	0	123 acres	123 acres
Moderate complexity burn	0	850 acres	84 acres
Low complexity burn	0	935 acres	935 acres
Roads			
New construction	0	3.8 miles	3.8 miles
Conversion from unclassified	0	12.78 miles	21.81 miles
Reconstruction	0	63.4 miles	63.4 miles
Pre-use maintenance	0	2.9 miles	2.9 miles
Roads open year-round	80.2 miles	44.7 miles	52.6 miles
Roads currently open to be gated year-round	0	12.0 miles	32.3 miles
Roads currently open to be put in storage (blocked)	0	19.1 miles	6.1 miles
Number of road closure gates	32	30	38
Roads currently open to be decommissioned	0	21.7 miles	12.7 miles
Vegetation management treatments[1]			
Commercial thin – 60 BA	0	196 acres	
Commercial thin – 80 BA	0	491 acres	
Commercial thin/Overstory removal	0	52 acres	
Commercial thin/POL	0	958 acres	
Aspen enhancement	0	17 acres	
Overstory removal	0	236 acres	
Patch clearcuts	0	92 acres	
"Products other than logs" thin	0	78 acres	
Storm salvage	0	145 acres	
Shelterwood seedcut	0	529 acres	
Seed cut/Overstory removal	0	1,322 acres	
Seed tree cut	0	18 acres	
Seed tree cut/Overstory removal	0	179 acres	
Precommercial thin	0	1,171 acres	

[1] See p. 16 for fuel treatment descriptions
[2] See p. 14 for vegetation treatment descriptions

Table 2. Activities by alternative

Table 3 compares the response of each alternative to the major issues.

Response of Alternatives to Issues			
Issue	**Alternative 1**	**Alternative 2**	**Alternative 3**
Effects of vegetation management on biodiversity			
Effects on snags *p. 56*	Existing snags may continue to be illegally cut for firewood. In the immediate future, there would be no change in the number or distribution of green trees over 20" in diameter. Large trees in dense stands would remain at higher risk of loss due to fire or pathogens. Watersheds deficient in these trees are predicted to meet guideline 2306 direction within 20 years.	There would be less likelihood of loss of snags to firewood cutters near newly closed roads. Snags posing a safety hazard may be lost during logging operations. Proposed mitigation would prevent a decrease in the number and distribution of green trees over 20" in diameter. Proposed thinning would improve growth of large trees and reduce risk of mortality due to fire or pathogens. Watersheds deficient in large trees would be predicted to meet guideline 2306 direction within 20 years.	Closure of fewer roads would leave a higher potential for loss of snags along open roads. Otherwise similar to alternative 2.
Effects on sensitive and other rare plant species *p. 92*	No immediate effects. Over time, increasing fire hazard could lead to stand-replacing fires that could have negative effects on sensitive plant habitat.	Proposed actions could cause a loss of individual sensitive or rare plants, but proposed mitigation would prevent effects on known populations and minimize negative effects on high-potential habitat (p. 32). Reduction of fire hazard may prevent destruction of habitat by stand-replacing wildfires.	Closure of fewer roads could allow vehicles to enter high-potential habitat and disturb soils and vegetation. Otherwise similar to alternative 2.
Effects on threatened or endangered wildlife species *p. 59*	No effects.	No effects.	No effects.
Effects on northern goshawk *p. 66*	Alternative 1 would have no immediate effects on goshawks or their habitat. Continued development of dense understory could reduce suitability of foraging habitat in nest stands. Tree size and stand density would continue to increase if no natural disturbances took place.	No actions are proposed in any stands with known goshawk nests. Precommercial thinning and fuel treatment proposed in potential nest stands would improve foraging habitat and reduce risk of stand-replacing fire. Timber harvest and fuel reduction would take place in post-fledging areas and would improve the balance of vegetation structural stages. Timing restrictions would prevent or minimize adverse effects.	There would be less burning, resulting in less increase in habitat diversity. Otherwise similar to alternative 2.

Issue	Alternative 1	Alternative 2	Alternative 3
Effects of vegetation management on biodiversity continued			
Effects on other sensitive wildlife species *p. 60*	No immediate effects. Over time, increasing fire hazard could lead to stand-replacing fires that would have negative effects on habitat for most sensitive species but positive effects on some others.	Individuals of some sensitive species could be adversely affected by the proposed actions, but there would be no effect on populations.	Closure of fewer roads would leave a higher potential for loss of snags along open roads and damage to moist habitats. Less increase in habitat diversity due to less burning. Otherwise similar to alternative 2.
Effects on management indicator species *p. 84*	No immediate effects. Over time, increasing fire hazard could lead to stand-replacing fires that would have negative effects on habitat for several species.	Individuals of some species could be adversely affected. Improvement of forage and habitat diversity due to prescribed fire would benefit most MIS. Road restrictions would improve habitat for big game and snag-associated species.	Similar to alternative 2. There would be less burning, resulting in less increase in forage and habitat diversity. Fewer road closures would result in less improvement of big game habitat.
Timber harvest			
Percent of project area proposed for commercial timber harvest	n/a	25%	Same as alternative 2
Percent of project area harvested commercially since 1987 *(approximate)*	61%	72%	Same as alternative 2
Approximate sawtimber volume proposed for harvest	n/a	10,390,000 board feet (approximately 20,780,000 cubic feet)	Same as alternative 2
Approximate POL volume proposed for harvest	n/a	40,000 cubic feet	Same as alternative 2
Road restrictions			
Miles of roads open to motorized vehicles year-round	80.18	44.66	52.62
Miles of roads proposed for decommissioning	n/a	21.7 miles	12.7 miles
Miles of roads closed with gates	25.4 miles	32.92 miles	55.12 miles
Miles of roads closed with barriers	0.62 miles	35.8 miles	17.53 miles
Management of motorized vehicle use in management area 4.1	NFSR 819.1 open year-round to motorized vehicles (ineffective gate). Spur roads closed with varying effectiveness. Off-road	Area closure (motorized travel on and off roads prohibited).	NFSR 819.1 open year-round to motorized vehicles. Motorized travel on other roads and off roads prohibited.

	motorized travel allowed.		
Issue	**Alternative 1**	**Alternative 2**	**Alternative 3**
Road restrictions continued			
Management of motorized vehicle use in management area 5.1	Roads open unless designated closed. Off-road travel allowed.	Roads open unless designated closed. Off-road travel allowed.	Roads open unless designated closed. Off-road travel allowed.
Open road density (summer)	3.58 miles/square mile	1.81 miles/square mile	1.96 miles/square mile
Number of road closure gates	32	30	38
Fuels and prescribed fire			
Proposed mechanical fuel treatments	n/a	821 acres	821 acres
Proposed prescribed burns	n/a	1,758 acres	1,019 acres
Risk of insect infestation			
Percent of project area ponderosa pine stands by mountain pine beetle infestation risk *p. 45*	High risk = 23% Moderate risk = 52% Low risk = 25%	High risk = 15% Moderate risk = 36% Low risk = 49%	High risk = 15% Moderate risk = 36% Low risk = 49%
Proposed thinning *(Precommercial thinning would overlap other treatments in some stands)*	n/a	Commercial = 1,775 acres Precommercial = 1,171 acres	Commercial = 1,775 acres Precommercial = 1,171 acres

Table 3. Response of alternatives to issues

The following section compares how the alternatives would address the significant issues. Issues are described in detail on page 11.

1. **Effects of vegetation management on biodiversity**

   Alternative 1 would not disturb existing wildlife and rare plant habitat. All dense forest habitat would remain, and the susceptibility of these stands to stagnation, pathogens, and fire would increase over time. Under Alternatives 2 and 3, some existing habitat would be disturbed; extensive mortality would be less likely in treated stands, and growth of trees in treated stands would increase. Each of the alternatives would retain trees at least 20" in diameter, but Alternatives 2 and 3 would cut many smaller trees. Alternative 2 would increase habitat effectiveness for deer and elk more than Alternative 3.

2. **Timber harvest**

   Alternatives 2 and 3 would produce the same amount of wood fiber and increase growth in treated stands. Under Alternative 1, this timber would be available for harvest at a later date.

3. **Road restrictions**

   Alternative 1 would maintain current travel management. Alternatives 2 and 3 would repair existing closures and restrict motorized travel on other roads. Under Alternative 2, unneeded roads and problem roads would be decommissioned. More roads would be closed using barriers rather than gates, potentially increasing closure effectiveness and reducing maintenance costs. Alternative 3 would keep more roads open, decommission fewer roads, and install more gates.

4. **Fuels and prescribed fire**

   Alternative 1 addresses the concerns of those who find prescribed burning an unacceptable risk. Alternatives 2 and 3 would reduce fuel loading using both mechanical methods and prescribed fire. To increase the effectiveness of mechanical treatments, Alternative 2 would burn considerably more acres than Alternative 3.

5. **Risk of insect infestation**

   Alternative 1 would not reduce stand susceptibility to mountain pine beetle and other insects. Alternatives 2 and 3 would reduce risk substantially in treated stands.

3 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

Chapter 3 of the Revised Forest Plan FEIS (Affected Environment and Consequences) discusses the short and long term effects, irreversible and irretrievable commitment of resources, and adverse environmental effects that cannot be avoided when 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 Revised Forest Plan FEIS, and therefore the effects are not repeated here. This EA is tiered to Chapter 3 of the FEIS to avoid repetition and to allow this description to focus on the site-specific effects that would result from implementation of the proposed alternatives.

Chapter Contents

3.1 Biological Consequences

3.1.1 Forest Vegetation

Summary of Effects on Forest Vegetation

- Alternative 1 would not change the current trends in forest vegetation or provide any timber volume at this time.
- Alternatives 2 and 3 would provide 10,390,000 board feet of sawtimber and 40,000 cubic feet of roundwood while improving stand diversity.
- Both action alternatives would reduce risk of insect infestation in treated stands.
- The action alternatives would not have significant effects on forest vegetation.

This section summarizes the silviculturist's report (located in the project file), which contains data, research references and detailed analysis of effects on the timber resource. Issues are listed for each topic to which they are relevant (see issue description on page 11).

Timber Production

The level of timber production associated with this project is part of Issue 2.

Alternative 1 would not harvest any timber volume at this time. Alternatives 2 and 3 would produce an estimated 10,390,000 board feet (about 20 million cubic feet) of sawtimber from 4,461 acres. Both alternatives would also produce about 40,000 cubic feet of roundwood.

Any treatment that reduces stand density increases risk of trees being blown down by strong winds, especially when combined with heavy snow. Under Alternatives 2 and 3, shelterwood seedcut, overstory removal, and seed tree prescriptions would decrease basal area substantially. These stands would be at increased risk of blowdown until root systems strengthen.

Table 2 (page 38) displays harvest treatments by alternative. General descriptions and illustrations of harvest treatments planned are located on pages II-33 through II-52 of the Revised Forest Plan FEIS.

None of the alternatives would affect long-term pine sawtimber productivity.

Stand Diversity

Stand diversity is part of Issue 2 as a factor in future timber production. As a factor in biodiversity it is part of Issue 1.

Under Alternative 1, natural succession and events such as wildfire and insect infestation would determine stand diversity. Without disturbance, age class distribution would continue to move towards mature stages and away from younger stages.

Alternatives 2 and 3 would improve the balance of ponderosa pine age class distribution by moving some stands from mature to younger age classes through regeneration harvest. Cover type distribution would remain the same.

Alternatives 2 and 3 would decrease acreage in mature age classes. Mature pine stands of low to moderate density would decrease, with a corresponding increase in acreage of seedlings, saplings, and temporary grass and forb areas. The effect of this change would be a more open forest canopy in treated areas, ranging from completely open in patch clearcuts to moderately open in thinned stands. Opening the canopy through timber harvest temporarily makes more sunlight, moisture and nutrients available to understory plants, and these plants (shrubs, forbs, grasses, and conifer seedlings) then can grow faster until competition or age slows growth. Proposed prescribed fire would have a rejuvenating effect on many grass and shrub species, increasing production of forage. Berry-producing shrubs such as serviceberry and raspberry would also benefit from these treatments.

Insects and Diseases

Risk of insect and disease infestation is part of Issue 5.

Revised Forest Plan objective 228 directs maintenance or reduction of ponderosa pine acres at medium or high risk for mountain pine beetle infestation. This analysis uses risk classes based on tree diameter and stand density, developed in Research Note RM-385 (Edminster et al. 1980). Estimated figures immediately following harvest and in 2023 are shown in Table 4 and Figure 8.

Pine acres by mountain pine beetle risk class and alternative, 2003 and 2023.*

	Alternative 1		Alternatives 2 and 3	
Risk Class	**2003 (existing)**	**2023**	**2003 (post-harvest)**	**2023**
Low	3,452	1,824	6,903	3,942
Moderate	7,432	6,747	5,096	6,547
High	3,292	5,605	2,177	3,687

*Does not include 798 acres for which no stand inventory data exists.

Table 4. Mountain pine beetle risk

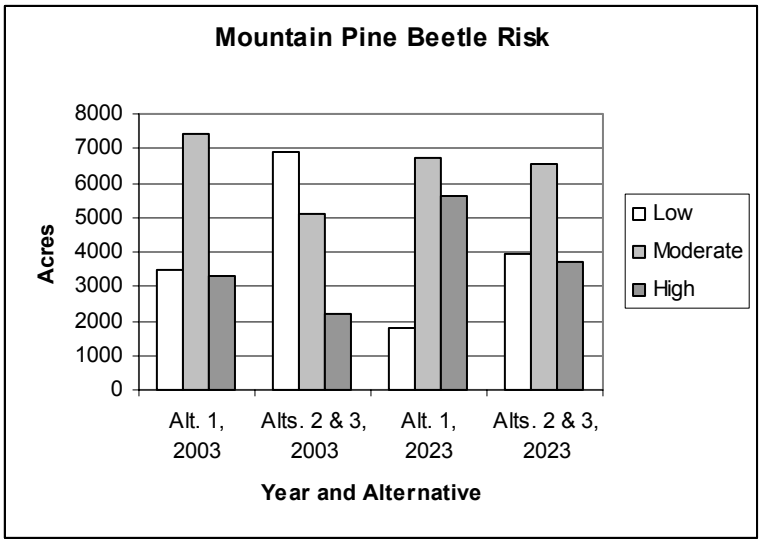

Figure 8. Mountain pine beetle risk

Currently 3,292 acres (22% of the area forested with ponderosa pine) are at high risk of mountain pine beetle infestation. An additional 7,432 acres (50%) are at medium risk. If no action is taken, high risk is projected to increase to 5,605 acres by 2023, while medium risk would decrease to 6,747 acres.

Alternatives 2 and 3 would reduce high and moderate risk acres immediately. By 2023, high risk acres would still be much lower than if no action were taken. Moderate risk acres would be only slightly lower than under the no action alternative due to the younger age classes created by harvest moving into the diameter and density ranges susceptible to beetle infestation. Future thinning would prevent this effect.

The following assumptions were made in determining effects of proposed activities on mountain pine beetle risk: 1) Immediately after treatment, a stand would have low risk of infestation; 2) Stands that would be at high risk in 2023 if not treated would be at moderate risk in 2023 if treated; and 3) Stands that would be at low or moderate risk in 2023 if not treated would be at low risk in 2023 if treated.

Both action alternatives would leave roughly 2,000 acres at high risk of insect infestation. Treatments were not proposed in these stands mainly due to steep slopes, unstable soils, or other operational difficulties, and also to retain older, dense stands for a balance of structural stages in goshawk post-fledging habitat and sufficient large-diameter trees for future snags.

Culmination of Mean Annual Increment

Culmination of mean annual increment (CMAI) has been calculated for all pine stands within the project area. All stands proposed for regeneration harvest for timber production objectives have achieved CMAI. Patch clearcuts proposed to provide forage and improve the balance of structural stages are among the exemptions from CMAI requirements recognized in 36 CFR 219.16(2)(iii) and the National Forest Management Act of 1976, Section 6, subsection m(1),(2).

Cumulative Effects on Forest Vegetation

The cumulative effects analysis area for forest vegetation is the 7th-level watersheds that comprise the project area (Figure 9, p. 49). This area includes 17,510 acres of National Forest System lands and 2,615 acres of land in other ownerships.

Past actions. Black Hills forests have been subject to modification from their essentially untouched pre-settlement state since the 1870s. Forest vegetation has been altered by humans through timber harvest, fire suppression, introduction of exotic species, human-caused wildfires, and grazing by domestic livestock. As a result, more of the landscape is forested, though the trees are generally smaller (Parrish et al. 1996, USDA Forest Service [2] p. III-136).

The project and cumulative effects areas are dominated by the ponderosa pine vegetation series, with smaller areas of quaking aspen and paper birch (Hoffman and Alexander 1987). Application 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 the unregulated harvest of the late 1800s are still evident in places.

Timber sales that have taken place completely or partly within the cumulative effects area since 1987 include Grand, Plato, Pole, Samurai Salvage, Snowstorm Salvage, Surprise, and Wagon. Post-sale activities such as precommercial thinning and fuel treatment have also taken place. Trees in different parts of the cumulative effects area have been damaged by snowstorms three times in the last 15 years.

More than 130 miles of road have been developed in the cumulative effects analysis area on both public and private land. Private land has also been subject to timber harvest, livestock grazing, water diversions, and a limited amount of development.

Current actions. Parts of the Wish timber sale are currently active on National Forest System land in the cumulative effects analysis area. Timber harvest is not known to be taking place on other ownerships. Livestock grazing occurs on National Forest and private land. No mining operations are currently active. Fire suppression, fuel management, and prescribed burning take 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 hunting, driving, and use of all-terrain vehicles and snowmobiles. Development of private land is currently minimal.

Future actions. Reasonably foreseeable future actions include road and utility maintenance, livestock grazing, and recreation. The Welcome/Sand project adjoins Cement to the northeast and is currently in the planning stages with a decision scheduled for late 2003. Other harvest may take place in the future on National Forest System lands, but specific locations and treatment types are not known at this time. If trends across the rest of the Black Hills hold true in this area, development of private land is likely to occur.

Effects. The actions proposed under Alternatives 2 and 3 differ slightly from much of the timber harvest that has taken place previously in that few of the largest trees (over 20" in diameter) would be cut. About 25% of the National Forest land in the cumulative effects area would be treated. Timber harvest has been conducted on about 61% of the National Forest land in the cumulative effects area since 1987. Some of the proposed

and previous treatments overlap, so that the cumulative area treated would total 72% of the National Forest land. Virtually all of the past treatments have been selective harvest, in which one-third to three-quarters of the trees are left standing. Despite the large percentage of the area that has been managed in the recent past, the selective nature of the harvest reduces the likelihood that these actions have made a difference in the resource's ability to sustain itself or potential to do so in the future. The proposed actions would not alter this cumulative effect.

This forest type has produced many millions of board feet of timber over the years. Past timber sales increased growth in harvested stands, but one cumulative effect is that there are fewer areas of large-diameter trees to cut now and in the near future. The proposed treatments would add to this effect; following the implementation of Alternative 2 or 3, there would be few stands of large trees that could be harvested within the next decade without increasing the potential for negative effects on other resources. There would be more areas of small, unmerchantable timber that would need to be thinned to prevent stagnation. The overall rate of timber growth and long-term availability of wood fiber are, however, unlikely to change substantially as a cumulative result of these projects.

Another cumulative effect of past and proposed harvest is that stand structure and composition tend to be fairly homogenous across the analysis area. The forest consists predominantly of pine communities composed of moderate density, single-story stands of mostly mature (though not necessarily large-diameter) stems, interspersed with fully stocked stands of pine seedlings and saplings. The continuous nature of the pine forest can allow crown fires to run for long distances under certain weather conditions. The no action alternative would add to this effect over time, and heavy fuel loading from snowstorms would remain a fire hazard. Alternatives 2 and 3 would counteract this effect to a small degree by varying stand structure, decreasing ladder fuels, and preserving or enhancing hardwood stands.

Cumulative effects on mountain pine beetle activity are not well understood. Little is known about pre-settlement beetle outbreaks (Parrish et al. 1996). Modern silviculture attempts to reduce risk of infestation, but outbreaks still occur. The proposed actions would reduce beetle risk in treated stands and may reduce risk of spread, but risk will continue to be present under all alternatives.

Figure 9. Project area watersheds (cumulative effects area)

3.1.2 Wildlife Habitat

Summary of Effects on Wildlife Habitat

- None of the alternatives would substantially affect **diversity of vegetation types**.
- Under Alternative 1, **stand structure** would trend more towards mature and dense. Alternatives 2 and 3 would increase acreage in openings and younger, more open forest while decreasing acreage of mature stands, especially open, mature stands.
- Existing **late succession** stands would not be altered.
- Existing **snags** that pose safety hazards could be lost, but all others would be retained. Sufficient live trees would remain across each watershed to provide large-diameter snags over time. Road closures could decrease cutting of snags for firewood.
- There would be no effects on **threatened, endangered, or proposed species** under any alternative.
- Alternatives 2 and 3 would have a small chance of harming individuals of **sensitive species** that nest or roost in snags, hide beneath woody debris, or have limited mobility. Populations of these and other sensitive species would not be negatively affected. Increased diversity of understory foraging habitat would benefit a number of species. These alternatives would decrease dense forest by 10% but would also reduce the chance of mountain pine beetle infestation, stand-replacing wildfire, and other events that could drastically alter habitat.
- **Management indicator species** such as deer and elk would benefit from road closures and prescribed fire proposed under Alternative 2 and to a lesser extent under Alternative 3. Habitat effectiveness for these species would improve.
- No significant direct, indirect or cumulative effects are expected to occur as a result of any of the alternatives.

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

Vegetational Diversity

The project area is characterized by ponderosa pine cover type. Approximately 86% of the National Forest System land is in pine, with 10% in hardwoods and 4% in meadows. Dominance of ponderosa pine is a natural condition in the Black Hills, but pine is probably more dominant now than it was historically (USDA Forest Service [2], Parrish et al. 1996) at the expense of openings and hardwoods. Though 81% of the project area overstory consists of mature ponderosa pine stands, the aspen, birch, and regenerating pine that commonly occur in the understory contribute greatly to screening cover and forage for a variety of wildlife species.

White spruce is absent from the Bearlodge Mountains and the project area. This absence appears to be natural, as white spruce has increased elsewhere in the northern Black Hills with the exclusion of fire (USDA Forest Service [2] p. III-130).

Forest structure is generally dominated by stands of mature pine at moderate density. Very dense stands of mature trees are less common. Pure stands of young trees are unusual, but most of the open stands have an understory of pine seedlings and saplings. Forest structural stages (SS) are described as follows:

SS 1: Grasses and forbs
SS 2: Seedlings and saplings
SS 3A: Young, open forest
SS 3B: Young, moderately dense forest
SS 3C: Young, dense forest
SS 4A: Mature, open forest
SS 4B: Mature, moderately dense forest
SS 4C: Mature, dense forest
SS 5: Late succession ("old growth")

Diversity of existing overstory plant communities and structure is shown in Table 5 and Figures 10-12.

Existing structural stage distribution by cover type
Acres

Habitat	SS 1	SS 2	SS 3A	SS 3B	SS 3C	SS 4A	SS 4B	SS 4C	SS 5	Total
Grass	728	0	0	0	0	0	0	0	0	728
Oak	0	0	8	0	0	0	0	0	0	8
Aspen	0	205	148	415	181	51	173	0	0	1,173
Birch	0	0	0	62	15	95	193	264	0	629
Pine	45	81	70	376	176	7,882	4,435	1,592	321	14,972
Totals	773	286	226	853	370	8,024	4,801	1,856	321	17,510

Table 5. Existing structural stage distribution by cover type

Diversity of overstory plant communities and structure after implementation of Alternative 2 or 3 is shown in Table 6 and Figures 10, 11, and 13.

Alternatives 2 and 3 structural stage distribution by cover type
Acres

Habitat	SS 1	SS 2	SS 3A	SS 3B	SS 3C	SS 4A	SS 4B	SS 4C	SS 5	Total
Grass	728	0	0	0	0	0	0	0	0	728
Oak	0	0	8	0	0	0	0	0	0	8
Aspen	0	205	148	415	181	51	173	0	0	1,173
Birch	0	0	0	63	15	95	193	264	0	629
Pine	137	1,048	70	429	174	7,509	3,940	1,348	321	14,972
Totals	865	1,253	226	906	370	7,655	4,302	1,612	321	17,510

Table 6. Alternatives 2 and 3 structural stage distribution by cover type

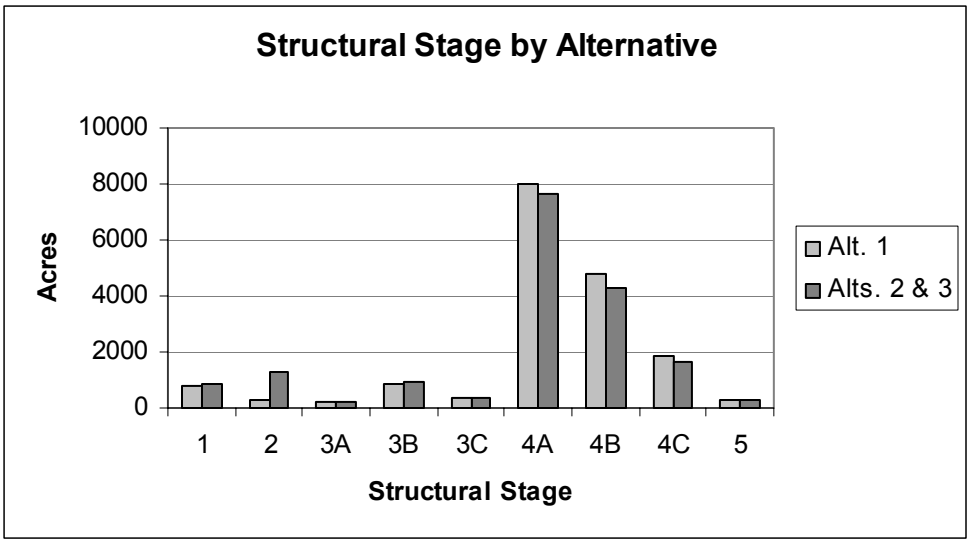

Figure 10. Structural stage distribution

Alternatives 2 and 3 would increase structural stages 1 and 2 through patch clearcuts and overstory removal cuts. Structural stages 4A and 4B would decrease the most, but together would still cover a large majority of the area. Cover type would not change.

Effects on Hardwood Habitat

Aspen, birch and oak are important components of Black Hills habitat diversity. Deer and elk browse aspen and birch, while ruffed grouse and various songbirds use hardwood habitat for feeding and nesting. Young aspen stands are also very important deer fawning habitat (Kennedy 1992).

Revised Forest Plan objective 201 directs Forest-wide restoration of historic hardwood communities by 10% over 1995 conditions. Data from 1995 reported 1,560 acres of hardwood cover types, but this data appears to have underrepresented actual conditions.

Figure 11. Vegetation cover types

Figure 12. Habitat structural stages - Existing

Figure 13. Habitat structural stages - Alternatives 2 and 3

Photo interpretation and field review determined there to be 1,810 acres of aspen, birch and oak.

Alternatives 2 and 3 include aspen enhancement treatments on 17 acres. This treatment would remove all pines from existing hardwood stands to create a more homogenous hardwood stand and prevent pine taking over the sites, which would eventually happen without timber harvest or natural disturbance.

Effects on Dense Conifer Habitat and Late Succession

Dense conifer stands (structural stages 3C, 4C and 5) exist on about 12% of the project area. Mature, dense conifer forest (4C and 5) comprises 11%. Alternative 1 would retain all dense stands. Alternative 2 would decrease acreage in mature, dense stands by 13% and in all dense conifer stands by 12%. Proposed thinning and fuel treatments would increase growth and decrease the likelihood that stands would be lost to insects or wildfire; these stands could develop closed-canopy late succession characteristics over time if future management retains the largest stems and relatively high basal area.

The project area does not contain Management Area 3.7 (late succession forest landscapes). A block of 321 acres on the north side of Plato Gulch exhibits and is managed for late succession characteristics. These stands are structurally diverse with multiple canopy levels and a wide range of tree diameters. Crown closure is generally high. None of the alternatives propose any action in these sites. Scattered inclusions in stands across the project area also exhibit these characteristics.

Effects on Snag Habitat

Snags (dead standing trees) are an important habitat component for many species. Primary cavity nesters such as the black-backed woodpecker excavate their own cavities in dead trees that have rotting heartwood. Secondary cavity nesters such as the white-breasted nuthatch use natural cavities or abandoned woodpecker cavities.

For this analysis, it was assumed that Revised Forest Plan standard 2301 (existing snag density) is not being met in the affected watersheds. Standard 2302 and guideline 2306 apply, and are interpreted to mean that the average number of green snag-replacement trees needed per acre across the landscape for every 20-year cutting cycle is 1.75 on south and west slopes and three on north and east slopes. Other diameter classes must also be represented across the watershed to provide other sizes of snags and to provide 20" snags further in the future.

Effects of Alternative 1 on Snag Habitat

Alternative 1 would have no effect on existing snags and would leave all existing live trees in place as potential future snags. It would have no immediate effect on dense stands, which are habitat for sensitive species such as the black-backed woodpecker. This species reaches greatest abundance where insect infestations occur across a wide area (USDA Forest Service [4]). Alternative 1 could eventually result in increased habitat for black-backed woodpeckers and other snag-associated species, since retention and continued development or stagnation of dense stands would increase risk of infestation.

Risk of wildfire would also increase under Alternative 1. Both large and small fires could create habitat for snag-associated species, though large-scale fires would drastically change habitat for other sensitive species and could result in a future gap in snag availability as new stands grow.

Snags in open-canopy stands are habitat for species such as Lewis's woodpecker and northern flicker. This habitat could diminish over time as open stands regenerate and become denser.

Snag recruitment rates would probably be greatest under Alternative 1 since mortality is more likely in dense stands and a greater overall number of trees would remain.

Using the Forest Vegetation Simulator (Crookston 1990, Stage 1973, Van Dyck 2000, USDA Forest Service [6]), the planning team silviculturist calculated the number of trees in each 2" diameter class from 10" to 20" and the number over 20" in diameter by aspect in each watershed for years 2003 and 2023. Results are shown in Table 7.

Green Tree Retention – No Action
Trees per acre

Watershed	Aspect	Year	Leave Trees Per Acre (10 -12" DBH)	Leave Trees Per Acre (12 -14" DBH)	Leave Trees Per Acre (14 -16" DBH)	Leave Trees Per Acre (16 -18" DBH)	Leave Trees Per Acre (18 -20" DBH)	Leave Trees Per Acre (> 20" DBH)
10120203020205	N	2003	9.4	7.7	6.3	3.9	3.1	4.0
10120203020205	N	2023	12.9	8.9	8.0	5.7	4.1	6.7
10120203020205	S	2003	18.6	12.6	7.7	5.7	3.4	3.4
10120203020205	S	2023	24.7	16.1	11.3	7.1	4.9	6.0
10120203020302	N	2003	22.3	20.5	12.4	5.4	2.9	1.9
10120203020302	N	2023	30.7	20.3	18.1	7.9	4.4	3.8
10120203020302	S	2003	24.5	16.0	15.9	6.2	2.8	2.7
10120203020302	S	2023	36.5	16.8	17.5	11.9	4.3	4.8
10120203020303	N	2003	13.0	11.7	9.0	5.6	4.1	4.1
10120203020303	N	2023	17.1	11.5	11.3	7.7	5.0	6.6
10120203020303	S	2003	13.6	10.3	10.6	8.5	5.8	6.1
10120203020303	S	2023	15.7	12.0	10.5	9.4	8.0	10.0

Table 7. Green pine by watershed, Alternative 1

This alternative complies with standard 2302 and guideline 2306. One watershed currently has only 1.9 trees over 20" in diameter on north slopes, but by 2023 growth models predict that this number would increase to 3.8. On north aspects in all other watersheds, the average number of trees per acre in the 20" and greater diameter classes is currently at or above three and would increase by 2023. On south slopes in all watersheds, the average number of trees per acre over 20" in diameter is currently above 1.75 and would increase by 2023. Other diameter classes would also be well

represented across each watershed so that sufficient large trees and large snags could continue to develop over time.

Spatial distribution of live trees was also modeled. Trees over 20" in diameter are generally well distributed across the watersheds. An area of about 760 acres south of Plato Gulch includes a number of contiguous stands that currently have few trees of this size. This area is split between watersheds "…0302" and "…0205". Smaller diameter classes are well represented in these stands. Thinning is proposed in some of the stands; this treatment would remove smaller trees and increase growth in those remaining.

Effects of Alternatives 2 and 3 on Snag Habitat

Under Alternatives 2 and 3, snags that pose a safety hazard during logging operations would be cut and retained on site, where they would add to the down woody component. All other existing snags would be left standing.

Harvest treatments in pine stands could affect the number and distribution of large green trees. Treatments that leave low basal area across an entire stand (shelterwood seedcut, seedtree cut, overstory removal) would be most likely to have an effect. No treatments are proposed that would remove only the largest trees, and all treatments except patch clearcuts and aspen enhancement cuts would leave all pine over 20" in diameter.

Alternatives 2 and 3 would meet standard 2302 and guideline 2306. Number of green trees over 20" would stay essentially the same. Number of trees per acre in other diameter classes would decrease due to harvest, but projections indicate that more than enough would remain to provide large-diameter green trees and snags over time. Table 8 shows projected trees per acre in each watershed by diameter class in 2003 (the existing, pre-harvest condition) and 2023.

One factor not reflected in the table or easily modeled is the effect of open road density. Though harvest of dead standing trees for fuelwood is currently prohibited on the Black Hills National Forest, field observations indicate that some snags, especially those easily reached from roads, are still lost this way. Under Alternative 2, lower open road density may result in loss of fewer snags to firewood cutters. Alternative 3 would decrease road density from the existing situation, but this alternative's emphasis on using gates rather than rocks, berms or other barriers may allow closures to be breached more easily.

Green Tree Retention – Alternatives 2 & 3
Trees per acre

Watershed	Aspect	Year	Trees Per Acre (10 -12" DBH)	Trees Per Acre (12 -14" DBH)	Trees Per Acre (14 -16" DBH)	Trees Per Acre (16 -18" DBH)	Trees Per Acre (18 -20" DBH)	Trees Per Acre (> 20" DBH)
10120203020205	N	2003	9.4	7.7	6.3	3.9	3.1	4.0
10120203020205	N	2023	12.2	7.5	7.6	5.4	4.0	6.7
10120203020205	S	2003	18.6	12.6	7.7	5.7	3.4	3.4
10120203020205	S	2023	19.7	13.2	9.6	6.1	4.6	6.0
10120203020302	N	2003	22.3	20.5	12.4	5.4	2.9	1.9
10120203020302	N	2023	20.4	10.7	13.0	6.9	3.4	3.8
10120203020302	S	2003	24.5	16.0	15.9	6.2	2.8	2.7
10120203020302	S	2023	23.6	13.6	13.5	10.2	3.8	4.8
10120203020303	N	2003	13.0	11.7	9.0	5.6	4.1	4.1
10120203020303	N	2023	14.6	9.4	10.2	7.1	4.4	6.6
10120203020303	S	2003	13.6	10.3	10.6	8.5	5.8	6.1
10120203020303	S	2023	12.4	8.4	6.0	6.1	5.9	10.0

Table 8. Green pine by watershed, Alternatives 2 and 3

Effects on Down Woody Material

Revised Forest Plan guideline 2308a requires retention of at least 50 linear feet per acre of logs at least 10" in diameter to help trap moisture, reduce soil movement, and provide wildlife habitat. Little quantitative data exists on the amount of down woody material currently in place in the project area. A storm in November 2000 added 15 to 30 tons per acre on about 1,000 acres in the Cement area; although this figure includes smaller-diameter material such as treetops, the majority is composed of fallen tree trunks. Across the remainder of the project area, field reconnaissance indicates that guideline 2308a appears to be met in virtually all forested stands.

Alternative 1 would result in the most down woody material over time, since all available trees would eventually become down logs. To ensure that areas proposed for harvest under Alternatives 2 and 3 are not lacking large, down woody material in the future, cull logs greater than 10" in diameter would be left on site or returned to the site in stands where whole-tree skidding takes place.

Threatened and Endangered Wildlife Species

The bald eagle is the only federally listed species that may occur in the project area. No other threatened, endangered, or proposed species, or their critical habitats, are known to occur in the project area. Habitat does not exist in the project area for the black-footed ferret *(Mustela nigripes)* or mountain plover *(Charadrius montanus)*, and neither of these species has been observed in the project area.

Bald Eagle *(Haliaeetus leucocephalus)*

Bald eagles are common winter residents and spring and fall migrants in the Black Hills area. They are not known to nest in the Black Hills. No bald eagles have been documented in the project area. The potential for effects is very low because of the scale of the project and dispersed, sporadic use of the general area by wintering eagles.

Direct effects
None anticipated.

Indirect effects
None anticipated.

Cumulative effects
None anticipated.

Determination
None of the alternatives would affect the bald eagle or its critical habitat.

Petitioned Species

American Dipper *(Cinclus mexicanus)*

The U.S. Fish and Wildlife Service was petitioned in March 2003 to list the American dipper in the Black Hills as a "Distinct Population Segment". The petitioners also requested that the species be listed under emergency provisions. This species is not currently listed as threatened or endangered.

The American dipper is a bird associated with mountain streams. It can be affected by changes in water quality and quantity. The Cement project area drains into Cold Springs Creek and Sand Creek, on which there are no records of dippers. The action alternatives are not expected to affect perennial or intermittent streams below the project area (see Soil and Water section below), and would have no effect on this species.

Sensitive Wildlife Species

A complete list of sensitive wildlife species in the Rocky Mountain Region can be found on page 5 of Appendix G of the Phase 1 Amendment Environmental Assessment. Of these species, the following have been documented in the project area.

- Black-backed woodpecker (p. 68)
- Black Hills red-bellied snake (p. 78)
- Cooper's Rocky Mountain snail (p. 83)
- Golden-crowned kinglet (p. 73)
- Northern goshawk (p. 66)
- Northern leopard frog (p. 79)

- Tawny crescent (butterfly) (p. 82)

The following sensitive species have not been documented in the project area, but suitable habitat does exist.[1]

- Flammulated owl (p. 75)
- Fox sparrow (p. 71)
- Fringed-tailed myotis (bat) (p. 77)
- Least weasel (p. 76)
- Lewis's woodpecker (p. 69)
- Loggerhead shrike (p. 73)
- Milk snake (p. 81)
- Olive-sided flycatcher (p. 72)
- Purple martin (p. 72)
- Pygmy nuthatch (p. 76)
- Cockerell's striate disc (snail) (p. 82)
- Three-toed woodpecker (p. 70)
- Tiger salamander (p. 79)
- Townsend's big-eared bat (p. 78)
- Western yellow-billed cuckoo (p. 74)

Effects on these species are discussed below.

Northern Goshawk (*Accipiter gentilis)*

The Revised Forest Plan FEIS (Appendix H, pp. H-38 through H-41) discusses the similarities and differences of goshawk habitat in the Black Hills and the Southwest (Reynolds et al. 1992). The Phase I Amendment further refined goshawk management, using structural stages similar to those used in Reynolds et al. (1992) to define a balance of structural stages in post-fledging family areas (forest stands near the nest where young birds learn to fly and hunt). Reynolds' term "vegetation structural stage" ("VSS") is used in the following goshawk discussion, and is a different classification than habitat structural stage ("SS") used elsewhere in this document.

Existing goshawk habitat

Prior to goshawk surveys conducted for this project, Bearlodge Ranger District records indicated that five confirmed goshawk nests existed in the project area. Four of these nests have disintegrated, in part due to snow damage. One additional nest may belong to goshawks but was not occupied in 2002. Surveys took place in 2001 and 2002, and resulted in discovery of five new goshawk nests. Observation of adult and juvenile birds, and the presence of plucking posts and casting perches, confirmed that two of these nests (in two distinct territories) were occupied in 2002. The location of known and potential nesting habitat is not displayed in this document to protect the security of the nests.

Where suitable nesting habitat exists but population data is lacking, the assumption of goshawk presence was made. Potential nest stands and post-fledging family areas ("PFAs") were identified and would be managed to provide suitable nesting and PFA habitat. As a result, eight goshawk territories were identified across the project area: three historic territories with suitable

[1] The project area does not contain suitable habitat for American marten. This species is associated with white spruce, which is not found in the project area or within the project area vicinity. There are no records of marten in the project area. Given the lack of spruce and the project area's position on the edge of the prairie, it is unlikely that marten reside in or travel through the project area.

nesting habitat, three new territories (two of which were active in 2002), and two "assumption of presence" territories. Eight PFAs are associated with these territories. Guideline 3114 directs management of PFAs for a "balance of structural stages". This direction is based on Reynolds et al. Desired distribution of vegetation structural stages in shown in Table 9. Charts 1-8 illustrate the VSS distribution that currently exists in each PFA as compared to the distribution that would result from each of the alternatives and the desired percentage.

Desired post-fledging family area distribution of structural stages				
VSS	**Tree size class**	**Minimum canopy closure %**	**Diameter range (inches)**	**Percent of balance (range)**
1	Grass/forb/shrub	None	0-1	10 (7-13)
2	Seedling/sapling	None	1-5	10 (7-13)
3	Young forest	None	5-9	20 (15-25)
450	Mid-aged forest	50	9-14	13 (8-18)
460	Mid-aged forest	60	9-14	7 (2-12)
550	Mature forest	50	14-20	20 (15-25)
650	Old forest	50	≥20	20 (15-25)

Table 9. Post-fledging family area VSS distribution

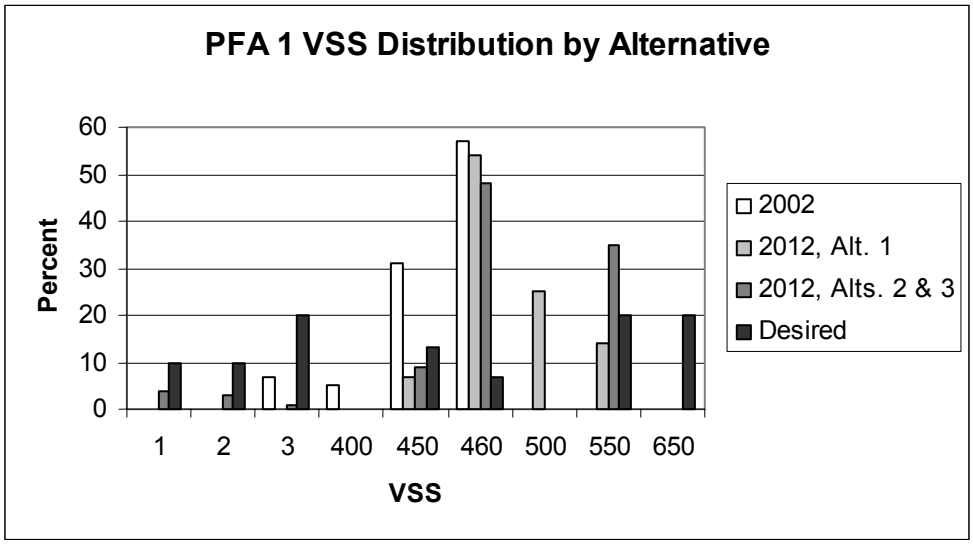

Chart 1. Distribution of VSS classes – PFA 1

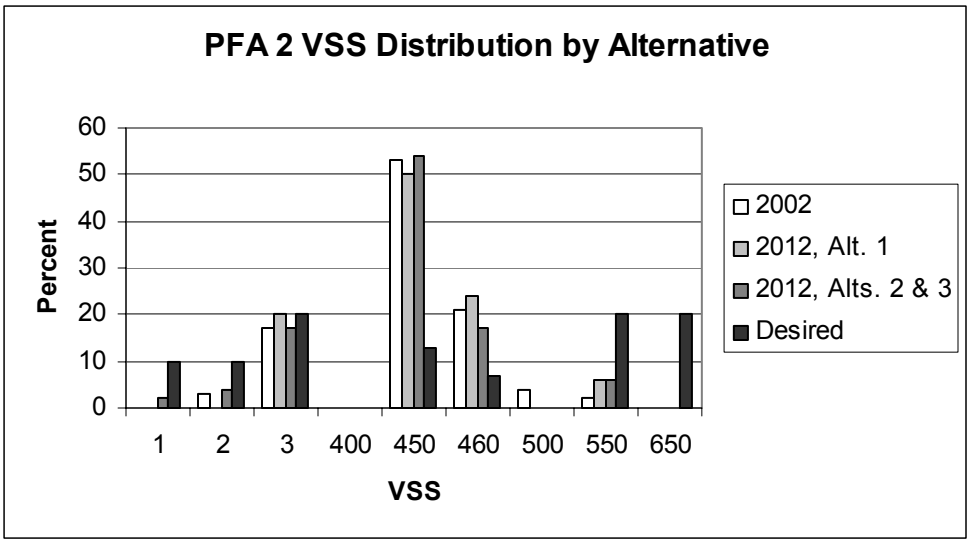

Chart 2. Distribution of VSS classes – PFA 2

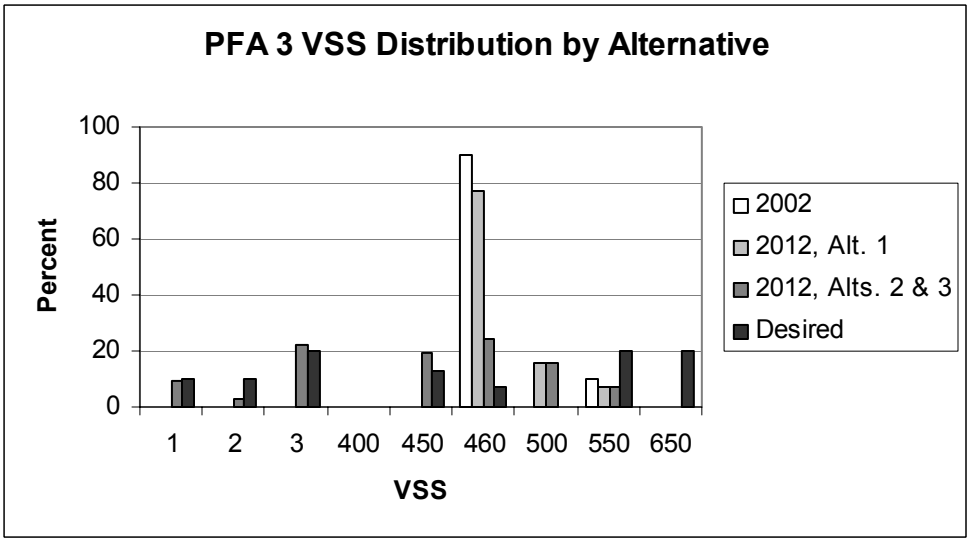

Chart 3. Distribution of VSS classes – PFA 3

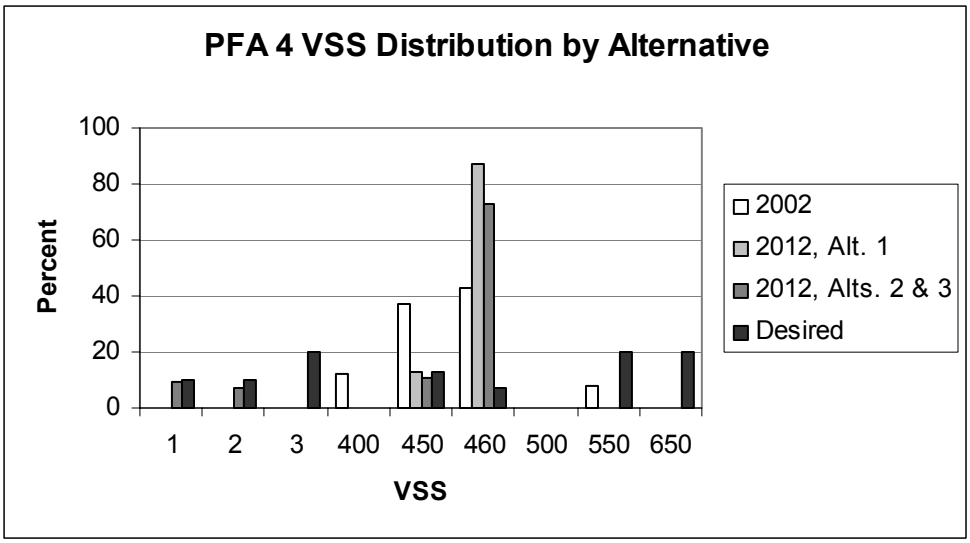

Chart 4. Distribution of VSS classes – PFA 4

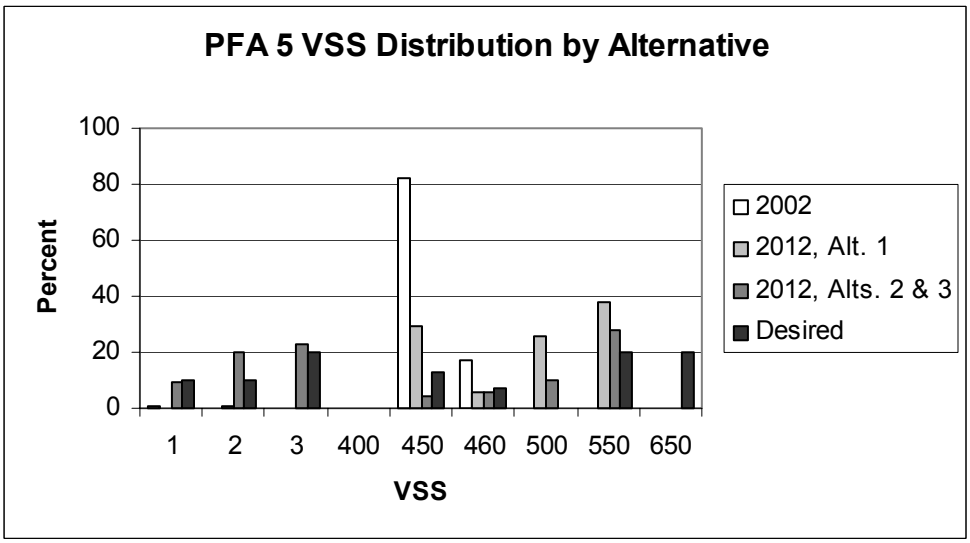

Chart 5. Distribution of VSS classes – PFA 5

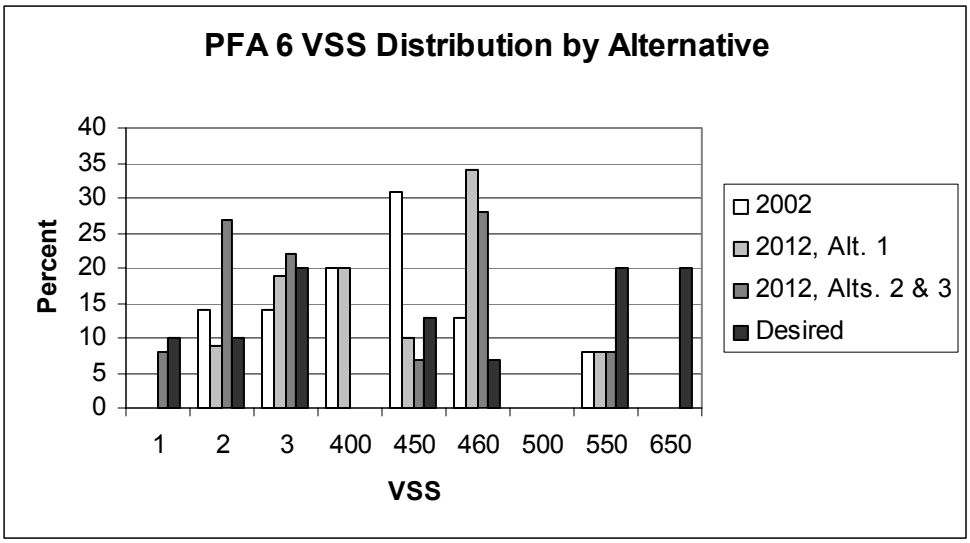

Chart 6. Distribution of VSS classes – PFA 6

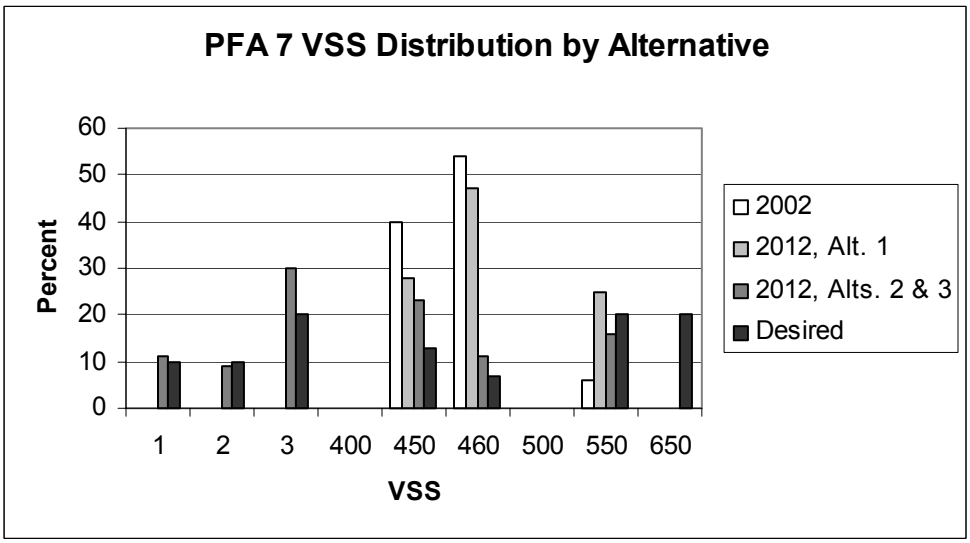

Chart 7. Distribution of VSS classes – PFA 7

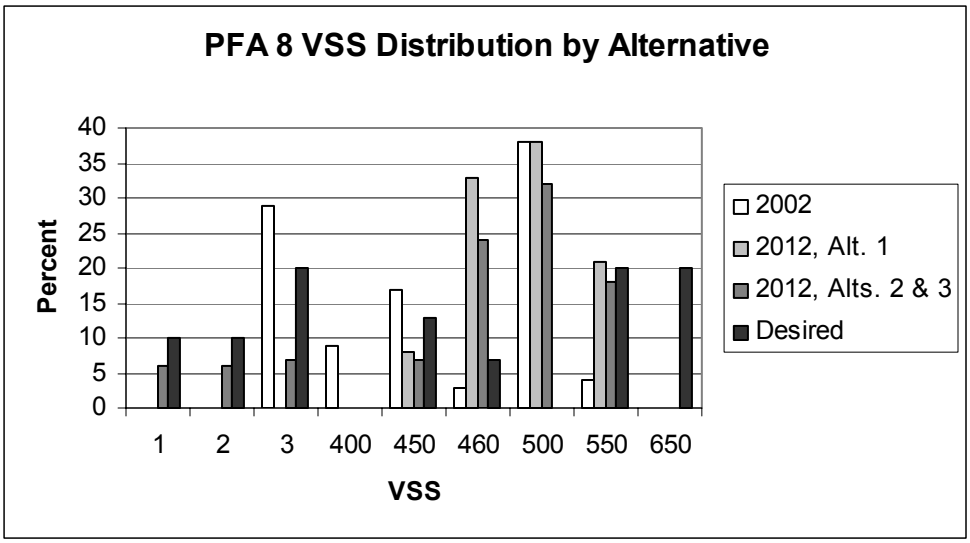

Chart 8. Distribution of VSS classes – PFA 8

Existing VSS distribution in most of the project area PFAs is skewed heavily towards moderately dense stands of trees 9" to 14" in diameter (VSSs 450 and 460). Younger age classes and dense stands of large-diameter trees are deficient.

Direct effects

No activities would occur in any of the stands with active or historic goshawk nests under any of the alternatives. Individual birds could be killed if unidentified, occupied nest trees in currently unknown territories were cut. The potential for this event to occur is low, since goshawk nest surveys would continue throughout project implementation and because goshawks vigorously defend occupied nests, alerting anyone nearby to their presence. Timing restrictions discussed below would minimize effects of activities proposed near known nests.

Indirect effects

Under Alternative 1, PFAs would continue to lack a balance of vegetation structural stages. In the absence of natural disturbance, the current excess in classes with 9-14" trees would gradually move more towards VSS 550 and 650, though stands currently at high density could stagnate. Risk of insect infestation and stand-replacing wildfire would increase.

Under Alternatives 2 and 3, non-commercial treatments would take place in three potential nest stands (those without an active or historic nest). Precommercial thinning would take place in parts of two of these stands to prevent stagnation of pine saplings and open the understory. In another potential nest stand in a different territory, fuels would be lopped, piled, and burned to reduce fire danger. The treatments would reduce risk of loss of this habitat to wildfire. Any additional nests found during project layout or implementation would be managed in accordance with standard 3115.

Under the action alternatives, various treatments are proposed in all PFAs. Detailed tables and charts displaying the resulting changes in VSS distribution are contained in the project wildlife biologist's Biological Evaluation/Biological Assessment, located in the project file. Proposed treatments would move VSS distribution closer to the desired condition by increasing acreage in young, open classes and decreasing stands dominated by 9-14" trees. These alternatives would not decrease acreage in the PFAs of relatively dense stands of larger trees (VSSs 550 and 650). Across the project area, habitat structural stage 4C (trees over 9" in diameter, crown closure at least 70%) would decrease by 13%. Though the action alternatives would protect known nest

stands and, between known territories, other stands currently displaying the most suitable goshawk nesting habitat, there is a chance that goshawks could be using some of the dense, mature pine stands proposed for harvest. Past and continuing surveys reduce the chance that this is the case and thus the chance that a nest stand would be cut. If, despite these efforts, a nest stand were unintentionally cut, provision of replacement nesting habitat would minimize negative effects.

Alternatives 2 and 3 would increase diversity of vegetation and prey habitat in the post-fledging areas. According to Reynolds, critical attributes of post-fledging areas include "interspersed small openings, snags, downed logs, and woody debris". The proposed VSS 1 would result from small patch clearcuts. Other treatments in PFAs would increase acreage in younger, more open stands and allow tree diameter to continue to increase in mature stands rather than stagnating. Prescribed burns and mechanical fuel treatments would open the forest floor, creating more diversity in the understory and habitat for goshawk prey species. The additional prescribed burning under Alternative 2 would create a mosaic of different habitats, increasing plant and animal diversity, and effects would last longer than if mechanical treatments alone were used. The diversification of forest structure in the PFAs is expected to improve goshawk habitat.

Road construction and improvement proposed under both action alternatives would be subject to timing restrictions discussed below. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area.

Cumulative effects

Fire exclusion in the Black Hills has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The no action alternative would continue the trend of increased continuity of forest cover, which could affect goshawks through loss of openings for foraging and development of increased nesting habitat, though risk of stand-replacing fire, which would destroy nesting habitat, would also increase. Conversely, the no action alternative would have less potential to disturb nesting and fledging goshawks, and would leave all potential nesting habitat intact; these effects would decrease the overall cumulative effects of human activity on goshawk habitat in the cumulative effects area. Improved diversity of prey habitat resulting from prescribed burns could have a positive effect on goshawks. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags, also important as prey habitat. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on goshawk habitat.

Timing restrictions

A range of treatments would take place within a quarter-mile of four known nests. Disturbances such as road improvements, timber harvest, and prescribed fire would not take place within a quarter-mile of known nests between March 1 and August 31 unless the associated nest is known to be inactive that year (p. 29, standard 3111). Affected stands and roads are listed in the project file and would be part of the Project Implementation Guide to be prepared if an action alternative is selected.

Treatments in four PFAs would be scheduled to avoid "simultaneous, widespread" disturbance across each PFA unless the associated nest is known to be inactive (p. 29, guideline 3113). Affected stands and roads are listed in the project file and would be part of the Project Implementation Guide to be prepared if an action alternative is selected.

If previously unknown nests are discovered during project implementation, mitigation (p. 29) would minimize negative effects on fledglings.

Determination

Alternative 1 would have no impact on goshawks in the near future. Alternatives 2 and 3 could adversely impact individuals, but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide. These alternatives could impact individuals because, while all stands with known active or historical nests are protected, there is no guarantee that goshawks would choose to nest in the nest stands in the "assumption of presence" territories that do not include an active or historical nest. These stands simply provide habitat of the type research has shown goshawks tend to prefer for nesting. If birds nest elsewhere, there is always the chance that individuals could unintentionally be affected by management activities.

Black-backed Woodpecker (*Picoides arcticus*)

Black-backed woodpeckers are associated with montane coniferous forests (Bent 1939). Weydemeyer and Weydemeyer (1928) found this species to be more abundant in northwestern Montana in woods that had been logged or burned. In the Black Hills, Dykstra et al. (1999) observed more black-backed woodpeckers in harvested stands, and suggested that an increased abundance of woody debris in these stands provided foraging sites. A recent study in the Black Hills (Mohren 2002) found this bird in both immature and mature ponderosa pine stands, but home range analyses showed preference for mature pine stands with at least 70% canopy cover. Black-backed woodpeckers excavate cavities and forage on wood-boring insects in areas with concentrations of dead and decaying trees and logs. Literature suggests a strong tie to insect infestations, post-fire conditions, and snag habitats for nesting, foraging and roosting. A preliminary study in the Beaver Park area of the Black Hills National Forest revealed that black-backed woodpeckers were nearly 50 times more abundant within the core area of mountain pine beetle infestation than in average forested areas across the Forest (Rumble 2002).

The Rocky Mountain Bird Observatory observed nearly 150 black-backed woodpeckers in the Black Hills during surveys in 2001 and 2002 (Panjabi 2001, Panjabi 2003). Most of the observations were in burned areas and late-successional habitats (65% and 18%, respectively). Suitable habitat in the ponderosa pine forests of the Black Hills may be different from the more mesic forest types inhabited by this woodpecker in other areas. The species may be particularly vulnerable to local or regional extinction due to fire suppression and intensive salvage logging operations following fire (Murphy and Lehnhausen 1998, Hutto 1995). Conversely, harvest of green timber may benefit this species by increasing down woody material and thus food resources (Thomas et al. 1979, Dykstra et al. 1999).

Black-backed woodpeckers have been observed in the Cement project area.

Direct effects

Alternative 1 would have no direct effects. Alternatives 2 and 3 could result in loss of nests if occupied nest trees are cut for safety reasons during timber harvest. Cutting of insect-infested trees and hazardous snags would reduce foraging habitat.

Indirect effects

Under Alternative 1, development of dense stands would increase risk of mountain pine beetle infestation in the absence of management or natural disturbance. These conditions and development of ladder fuels would increase the risk of stand-replacing wildfire. Both beetle infestations and stand-replacing fire would create black-backed woodpecker habitat.

Alternatives 2 and 3 include timber harvest prescriptions that would result in loss of large trees and reduction in stand density, though all trees greater than 20" in diameter would be left standing (p. 33). This would meet Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape, and presumably would eventually provide enough

snags for this species. Salvage and sanitation harvest could reduce foraging substrate and potential nesting sites. Silvicultural treatments aimed at reducing insects and disease could decrease abundance of prey species. Prescribed fire proposed under the action alternatives could increase habitat by killing trees, though this effect should not be widespread since the main objective of most of the burns is to clean up fuels in the understory with limited overstory mortality. Thinning treatments would promote the development of larger-diameter trees, which would eventually provide large-diameter snags.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area.

Cumulative effects

Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The no action alternative would continue this trend, though susceptibility to insect infestations and stand-replacing fire would increase with stand density and stagnation; these events would increase habitat for black-backed woodpeckers. Fire suppression would continue under all alternatives, and the type of burns proposed under Alternatives 2 and 3 would most likely not result in the type of post-fire conditions most suitable as black-backed woodpecker habitat. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on black-backed woodpecker habitat.

Determination

Alternative 1 would have no immediate impact on black-backed woodpeckers. Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide.

Lewis's woodpecker (*Melanerpes lewis)*

This species inhabits open country with scattered trees. Open, park-like ponderosa pine forests are believed to be primary breeding habitat (DeGraff et al. 1991). Lewis's woodpeckers are known to nest in burned areas. In the Black Hills, optimal habitat is open, mature ponderosa pine (structural stages 4A and 4B) with snags, and recently burned pine. Snags with a minimum diameter of 12" are recommended (Thomas et al. 1979). This species has not been documented in the project area, and has been recorded in the Black Hills too infrequently to discern population trends (Panjabi 2001, BHNF 2002).

Direct effects

See "Direct effects" section for black-backed woodpecker (p. 68).

Indirect effects

Under Alternative 1, development of dense stands would increase risk of mountain pine beetle infestation. These conditions and development of ladder fuels would increase the risk of severe wildfires. Stand-replacing fire would create Lewis's woodpecker habitat.

Alternatives 2 and 3 include timber harvest prescriptions that would result in loss of large trees and reduction in stand density, though all trees greater than 20" in diameter would be left standing (p. 33). This would meet Revised Forest Plan direction to provide sufficient large-

diameter green trees across the landscape, and presumably would eventually provide enough snags for this species. Salvage harvest could reduce foraging substrate and potential nesting sites. These alternatives would increase the open habitats preferred by this species. Nest trees may be decreased in cutting units. Where logging slash is left on the ground, foraging habitat may increase. Silvicultural treatments aimed at reducing insects and disease could decrease abundance of prey species. Thinning treatments would promote the development of larger-diameter trees, which would eventually provide large-diameter snags.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area.

Cumulative effects

Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The no action alternative would continue this trend, though susceptibility to insect infestations and stand-replacing fire would increase with stand density and stagnation; these events would increase habitat for Lewis's woodpeckers. Fire suppression would continue under all alternatives, and the type of burns proposed under Alternatives 2 and 3 would most likely not result in the type of post-fire conditions most suitable as Lewis's woodpecker habitat. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on Lewis's woodpecker habitat.

Determination

Alternative 1 would have no immediate impact on Lewis's woodpeckers. Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide.

Northern Three-toed Woodpecker (*Picoides tridactylus*)

The three-toed woodpecker is associated with montane forests, most often spruce (Clark et al. 1989). Foraging occurs in areas with abundant dead and decaying trees infested with wood-boring insects, especially newly burned areas (Hutto and Young 1999, Murphy and Lehnhausen 1998, DeGraaf et al. 1991). Nest cavities are excavated in trees with heart rot. Closed-canopy spruce stands are preferred for nesting (Weydemeyer and Weydemeyer 1928), though dense, mature aspen stands are also used in the Black Hills. Keller (1987) suggested that three-toed woodpeckers may be sensitive to forest fragmentation, but Haldeman (1980) found this species in coniferous forests with openings and in logged areas.

The Rocky Mountain Bird Observatory observed 12 three-toed woodpeckers in the Black Hills in 2001. The species has been recorded too infrequently to discern population trends (Panjabi 2001, BHNF 2002). This species has not been documented in the project area.

Direct effects

Spruce is not found in the project area, and mature aspen are not proposed for cutting. Alternative 1 would have no direct effects. Alternatives 2 and 3 could result in loss of nests if any are in aspen or pine trees cut for safety reasons. Cutting of insect-infested trees and hazardous snags could reduce foraging habitat.

Indirect effects

Under Alternative 1, development of dense stands would increase risk of mountain pine beetle infestation. These conditions and development of ladder fuels would increase the risk of severe wildfires. Small wildfires could create three-toed woodpecker foraging habitat, though stand-replacing fires could also destroy preferred habitat.

Alternatives 2 and 3 include timber harvest prescriptions that would result in loss of large trees and reduction in stand density, though all trees greater than 20" in diameter would be left standing (p. 33). This would meet Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape, and presumably would eventually provide enough snags for this species. Salvage harvest could reduce foraging substrate and potential nesting sites. Silvicultural treatments aimed at reducing insects and disease could decrease abundance of prey species, while logging slash left on the ground could provide foraging habitat. Prescribed fire proposed under the action alternatives could increase habitat by killing trees, though this effect should not be widespread since the main objective of most of the burns is to clean up fuels in the understory with limited overstory mortality. Thinning treatments would promote the development of larger-diameter trees, which would eventually provide large-diameter snags. Actions would probably have a negligible effect on this species due to the lack of spruce forest in the project area.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area.

Cumulative effects

Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. In the Bearlodge Mountains and northwestern Black Hills, spruce forest has not increased in the near-absence of fire, suggesting a natural lack of this species. Timber harvest over the years has probably resulted in fewer large-diameter trees, less mortality, and more trees overall. The no action alternative would continue this trend, though susceptibility to insect infestations and wildfire would increase with stand density and stagnation; these events may increase habitat for three-toed woodpeckers. Snag retention and replacement measures included in these alternatives would help assure a long-term supply of snags. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on three-toed woodpecker habitat.

Determination

Alternative 1 would have no immediate impact on three-toed woodpeckers. Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide.

Fox Sparrow *(Passerella iliaca)*

This species inhabits a wide variety of habitats throughout its range, including the undergrowth of deciduous or coniferous forests, brushy woodland edges, burns, and riparian woodlands. Nests are located on the ground, concealed by vegetation. In South Dakota, the fox sparrow is considered an uncommon migrant in the east and a rare migrant in the west (SDOU 1991); it is a rare transient in the Black Hills (Haldeman 1980) and has not been documented in the project area.

Direct effects
If this species inhabits the project area, nests could be destroyed during activities proposed under Alternatives 2 and 3. Alternative 1 would have no direct effects.

Indirect effects
In the absence of natural disturbances, suitable habitat for fox sparrows would probably continue to decrease under Alternative 1. Suitable habitat would be likely to increase under the action alternatives. Silvicultural treatments would enhance open forest habitat with brushy undergrowth, though short-term habitat loss could occur in treated areas. Proposed treatments to enhance hardwood stands would benefit fox sparrows. Insect prey populations may increase with proposed treatments.

Cumulative effects
Suitable habitat may have declined over the years with increasing ponderosa pine habitat and decreasing brushy hardwood areas. Treatments and fire that have promoted non-pine habitats have had a beneficial effect. Hardwood enhancement treatments and prescribed fire proposed under the action alternatives would help counteract cumulative effects.

Determination
Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide. Overall impact of these alternatives on fox sparrows would be beneficial due to increases in preferred habitat.

Olive-sided Flycatcher *(Contopus borealis)*

Olive-sided flycatchers inhabit open coniferous woodlands, burns, clearings, aspen, and birch (DeGraff et al. 1991). Nests are usually built on a high conifer branch. These birds are summer residents only and feed on winged insects from a high branch or tall snag. This species is listed as a casual migrant and possible breeder in the Black Hills (SDOU 1991) and as a common summer resident in northeastern Wyoming. It has not been documented in the project area.

Direct effects
Alternative 1 would have no direct effects. Under Alternatives 2 and 3, nests could be destroyed if trees with occupied nests are cut.

Indirect effects
Under Alternative 1, open habitat would continue to decrease in the absence of natural disturbances. Preferred open habitat would increase under the action alternatives. Tall snags used for perches may be lost in cutting units if they are determined to be a safety hazard. Silvicultural treatments may increase abundance of insect prey sources.

Cumulative effects
Timber harvest may have had a cumulatively beneficial impact on this species through creation of open stands of mature pine. The action alternatives would continue this trend.

Determination
Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide. Overall impact on olive-sided flycatchers would be positive due to increases in foraging habitat.

Purple Martin *(Progne subis)*

This bird inhabits open woodlands, parks, residential areas, and agricultural land (Haldeman 1980). The purple martin is a cavity nester, and aspen or mixed aspen/conifer forests provide good nesting habitat. This species was once common in the Black Hills but was last documented in 1909 (SDOU 1991). There are no recent records of breeding populations in the Black Hills (Peterson 1990).

Direct effects

In the unlikely event that snags with cavities occupied by martins exist and were cut for safety reasons, Alternatives 2 and 3 could result in loss of nests.

Indirect effects

Preferred open habitat would decrease under Alternative 1 and increase under the action alternatives. Silvicultural treatments may increase abundance of insect prey sources. Salvage harvest could reduce potential nesting sites. Protective measures for snags and retention of green trees for snag replacements (p. 33) would provide snag habitat over time.

Cumulative effects

Loss of open, park-like stands may have caused the decline of this species in the Black Hills. The no-action alternative would continue this trend. The action alternatives would temporarily open treated stands but would not create large areas of mature, widely spaced trees with little understory, as would result from frequent, low-intensity fires.

Determination

This species is not currently known from the Black Hills. If it were present, the action alternatives would probably have a beneficial impact on the species due to increases in preferred habitat.

Golden-crowned Kinglet *(Regulus satrapa)*

Golden-crowned kinglets breed primarily in mature, dense coniferous forest, and are uncommon permanent residents of dense spruce stands in the upper elevations of the Black Hills (SDOU 1991). They are found only occasionally in pine habitats, but may winter in deciduous woodlands and thickets (DeGraaf et al. 1991). There is no spruce in the project area, but this species has been observed during winter in project area hardwood thickets.

Direct effects

Because suitable nesting habitat is not found in the project area, direct effects are unlikely to occur.

Indirect effects

Under Alternative 1, aspen stands would continue to be encroached by pine. Aspen enhancement cuts proposed under Alternatives 2 and 3 would enhance the habitat used by these birds in winter. This treatment is proposed on relatively few acres (p. 38), and overall effects on golden-crowned kinglets would be minimal.

Cumulative effects

Past management reduced dense, mature pine habitat, but spruce appears to be naturally absent from the project area. This project would not contribute to any habitat loss or degradation.

Determination

Proposed treatments would have a beneficial impact on this species due to improved hardwood habitat.

Loggerhead Shrike *(Lanius ludovicianus)*

This species inhabits open country with scattered shrubs or small trees and feeds on large insects and small mammals, birds, and reptiles. Most of the habitat in the Cement project area is not suitable for this species. Loggerhead shrikes have not been reported in the project area.

Direct effects
No direct effects are anticipated under any alternative.

Indirect effects
Under Alternative 1, preferred habitat may decrease slightly as open stands become more densely forested. While the action alternatives would temporarily increase open forest, the project area would still provide little suitable habitat. Silvicultural treatments could increase the abundance of small mammal, bird and insect prey.

Cumulative effects
Fire suppression has decreased open habitats. Burning and harvest proposed under the action alternatives would create temporary openings but would have little effect on the cumulative habitat change.

Determination
Proposed treatments are unlikely to impact this species.

Western Yellow-billed Cuckoo *(Coccyzus americanus)*

This species favors moderately dense thickets near watercourses, second-growth woodlands, and brushy areas. Yellow-billed cuckoos will also use open woods, avoiding extremely dense woods and high elevations (Haldeman 1980). Food consists mainly of caterpillars and other insects. Nests are placed in bushes or small saplings (DeGraff et al. 1991).

Western yellow-billed cuckoos are uncommon summer residents in southeastern South Dakota, with scattered records in the southwestern part of the state. There are no records from the higher Black Hills (SDOU 1991). In 2002, however, at least three yellow-billed cuckoos were observed along Beaver Creek in the Bearlodge Mountains. It could not be determined whether the birds were of the western subspecies *(Coccyzus americanus occidentalis)* or the eastern. Nevertheless, this species apparently occurs in the Bearlodge Mountains, and possibly elsewhere in the Black Hills (Panjabi 2003). It has not been observed in the project area.

Direct effects
Alternative 1 would have no direct effects. If this species nests in the project area, there is a small chance that proposed activities could destroy occupied nests.

Indirect effects
Suitable habitat may decrease slightly under Alternative 1 and increase under Alternatives 2 and 3. Treatments may increase prey abundance.

Cumulative effects
Fire suppression has decreased open habitats. Burning and harvest proposed under the action alternatives would create temporary openings and improve hardwood habitats, counteracting cumulative effects to a small degree.

Determination
Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability in the project area nor cause a trend towards federal listing or loss of species viability rangewide. Proposed treatments would have a small beneficial impact overall due to increases in suitable habitat.

Flammulated Owl (*Otus flammeolus)*

Flammulated owls inhabit open ponderosa pine forests and dry montane conifer or aspen forests, often with dense saplings, oak, or other brushy understory growth. This owl is primarily insectivorous, but is known to prey on small mammals and birds as well. Nests are in natural cavities or old woodpecker holes and are reused year after year. Nest sites providing open, mature canopy conditions (providing an open flight path to the nest) appear to be preferred (McCallum 1994). Data suggest that this species may be a long-distance north-south migrant.

This species had not been confirmed in the Black Hills before the summer of 2002. In June 2002, at least one flammulated owl was detected in the north-central hills (Panjabi 2003). These observations do not necessarily prove that a flammulated owl population has become established in the Black Hills; further monitoring is needed.

No owl surveys were done in the Cement project area. Based on published information, it is reasonable to expect that suitable habitat for flammulated owls is present.

Direct effects

If this species occurs in the project area, cutting of snags for safety reasons under Alternatives 2 and 3 could result in loss of nests.

Indirect effects

Under Alternative 1, natural mortality of trees would gradually increase snag numbers. Over time, risk of stand-replacing fire would increase; stand-replacing fire could destroy flammulated owl habitat.

Alternatives 2 and 3 include timber harvest prescriptions that would result in loss of large trees and reduction in stand density, though all trees greater than 20" in diameter would be left standing (p. 33). This would meet Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape, and presumably would eventually provide enough snags for this species. Salvage harvest could reduce potential nesting sites. The owl's prey base may increase due to harvest that would release understory vegetation and improve habitat for insects and small mammals. Proposed thinning and low-intensity prescribed burns would aid in development of owl habitat by reducing stand density and promoting development of understory vegetation.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area

Cumulative effects

Fire suppression has decreased open habitats over time, and vegetation management has probably decreased density of large-diameter snags. The action alternatives would help counteract cumulative effects on flammulated owl habitat through prescribed fire, some types of harvest, and mitigation to ensure that large-diameter trees and snags are present across the landscape. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

Determination

Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability in the project area nor cause a trend towards federal listing or loss of species viability rangewide.

Pygmy Nuthatch *(Sitta pygmaea)*

Pygmy nuthatches are cavity nesters generally associated with open, mature ponderosa pine forest (Scott 1979) with less than 70% canopy cover (Clark et al. 1989). Keller (1992) demonstrated a dependence on snags and relatively large trees. This species is an uncommon resident in the Black Hills. Populations tend to fluctuate yearly; the species has been sighted more frequently in recent years, but its status is uncertain in the northern Black Hills (SDOU 1991). The Rocky Mountain Bird Observatory observed three pygmy nuthatches in the Black Hills in 2001 (Panjabi 2001). The species has been recorded too infrequently to discern population trends, and has not been observed in the project area.

Direct effects

Individual birds could be killed if snags with occupied nests were cut during activities proposed under Alternatives 2 and 3.

Indirect effects

Under Alternative 1, natural mortality of trees would gradually increase snag numbers.

Alternatives 2 and 3 could reduce preferred habitat for this species by removing large overstory trees and cutting hazardous snags. All trees greater than 20" in diameter would be left standing (p. 33). This would meet Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape, and presumably would eventually provide enough snags for this species. The action alternatives could also increase pygmy nuthatch habitat through creation of open pine forest and mature, single-story stands. Silvicultural treatments aimed at reducing mountain pine beetle and other insect pathogens could reduce prey populations. Salvage harvest could reduce foraging substrate and potential nesting sites. Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area.

Cumulative effects

Fire suppression has decreased open habitats over time, but vegetation management has probably decreased density of large-diameter snags. The action alternatives would help counteract cumulative effects on pygmy nuthatch habitat through prescribed fire, some types of harvest, and mitigation to ensure that large-diameter trees and snags are present across the landscape. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

Determination

Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide.

Least Weasel *(Mustela nivalis)*

Least weasels are usually found in grassy or brushy meadows and marsh areas (Burt and Grossenheider 1976) where they feed on mice, shrews, and moles. It is not known if this species occurs in the Black Hills (Higgins et al. 2000). It has not been documented in the project area.

Direct effects
Alternative 1 would have no direct effects. If least weasels occur in the project area, there is a small chance that individuals could be killed during proposed activities.

Indirect effects
Preferred open and brushy habitats may decrease under Alternative 1 and increase temporarily under Alternatives 2 and 3. Prey populations may increase due to proposed actions.

Cumulative effects
Fire suppression has decreased open habitats. Prescribed fire and some types of harvest proposed under the action alternatives would create temporary openings and brushy habitats, counteracting cumulative effects to a small degree.

Determination
If this species is present in the project area, Alternatives 2 and 3 could adversely impact individuals but would not result in a loss of species viability in the project area nor cause a trend towards federal listing or loss of viability rangewide. Overall, the proposed treatments would have a beneficial impact on this species due to increased foraging habitat.

Fringed-tailed Myotis *(Myotis thysanodes pahasapensis)*

This subspecies of the fringed-tailed bat occurs only in certain montane areas of South Dakota and Wyoming. It roosts near entrances to mines and caves that are used for hibernating; tree cavities may occasionally be used for daytime roosting. This species feeds on small moths high in the forest canopy or over dense vegetation close to the ground. Fringed-tailed myotis have been reported in Crook County, though not in the project area.

Direct effects
Individuals could be affected if occupied daytime roost trees are cut during activities proposed under Alternatives 2 and 3. Only hazardous snags would be cut (p. 56), so effect is expected to be negligible. No caves or mines are known to exist in the project area.

Indirect effects
Proposed treatments could benefit this species by increasing prey species as a result of burns (Cerovski 2002), thinning (Dykstra et al. 1999), and the resulting increase in habitat diversity. Salvage harvest could reduce potential roost sites. Protective measures for snags and retention of green trees for snag replacements (p. 33) would provide roosting habitat over time. Road construction proposed under both action alternatives could temporarily increase disturbance of bats and other wildlife, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area.

Cumulative effects
Since there are no known caves or other sites for hibernacula or maternity roosts in the project area, cumulative effects on this species have probably been minimal. Past timber harvest and fire exclusion may have cumulatively altered historic snag distribution and characteristics. Protective measures for snags would prevent any addition by this project to cumulative effects. Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat.

Determination
Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability

rangewide. The action alternatives would have an overall beneficial impact on this species due to increased habitat diversity, decreased risk of stand-replacing fire, and increases in insect prey populations.

Townsend's Big-eared Bat *(Plecotus townsendii)*

This bat inhabits shrub-steppe, forest edge, pinyon-juniper, and moist forest types. It usually roosts in caves, abandoned mines, rock outcrops, and occasionally buildings. Tree cavities may be used for daytime roosting. This bat feeds mainly on small moths high in the forest canopy and will glean insects from leaves. In the Black Hills, this species is the most commonly encountered hibernating bat. Disturbance by humans, especially to hibernacula and maternity roosts, can be a threat to survival of these animals (Barbour and Davis 1969). This species has not been documented in the project area.

Direct effects
See "Direct effects" for Fringed-tailed Myotis, above.

Indirect effects
See "Indirect effects" for Fringed-tailed Myotis, above.

Cumulative effects
See "Cumulative effects" for Fringed-tailed Myotis, above.

Determination
Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide. The action alternatives would have an overall beneficial impact on this species due to increased habitat diversity, decreased risk of stand-replacing fire, and increases in insect prey populations.

Black Hills Red-bellied Snake (*Storeria occipitomeoculata pahasapae*)

This species occurs in the Black Hills of South Dakota and Wyoming (Ashton and Dowd 1992). It is found in moist woodlands with rocks, logs, leaf litter, and other cover. Red-bellied snakes often hibernate in rocky areas and may be killed crossing roads that run between rocky hibernation sites and riparian woodlands. This species feeds on slugs, earthworms, and soft-bodied insects, and are inactive from November through March (Behler and King 1979). This species has been observed in the project area, but records are too vague to determine exact location.

Direct effects
High open road density under Alternative 1 could result in roadkill of snakes. Snakes could also be killed by road traffic, harvest activities, and prescribed fire associated with Alternatives 2 and 3. Proposed road construction would not take place between wetlands or riparian areas and potential hibernacula (standard 3116).

Indirect effects
Alternative 1 would have no immediate indirect effects on this species. In the long term, lack of management or natural disturbance could reduce habitat diversity. Prescribed fire and thinning proposed under Alternatives 2 and 3 would be likely to increase numbers of insects on which this snake feeds (Dykstra et al. 1999, Cerovski 2002). Closure of roads under the action alternatives would reduce the chances of vehicle-caused mortality of snakes on these roads. Attempts to escape from prescribed fire could result in mortality due to predation and roadkill.

These effects are more likely under Alternative 2, which includes more prescribed burning and road closure.

Cumulative effects
Fire exclusion has resulted in a more pine-dominated, continuously forested landscape. The no action alternative would continue this trend. Alternatives 2 and 3 would counteract effects of prior management to some degree by reintroducing fire, reducing stand density, and closing roads. These changes would benefit red-bellied snakes.

Determination
Alternatives 2 and 3 could adversely impact individual Black Hills red-bellied snakes but would not result in a loss of species viability in the project area nor cause a trend towards federal listing or loss of viability rangewide. Overall, the proposed treatments would have a beneficial impact on this species due to decreased motorized traffic and increased prey base.

Tiger Salamander *(Ambystoma tigrinum)*

This species is widespread in North America. Habitat for tiger salamanders is varied, ranging from arid sagebrush plains to mountain forests (Behler and King 1979). Salamanders are often found beneath debris such as down woody material and at night after heavy rains. They are voracious consumers of earthworms, large insects, small mice, and amphibians. The species is known to occur in the Black Hills but has not been reported in the project area.

Direct effects
Under Alternative 1, motorized vehicles could continue to disturb temporarily wet areas, possibly killing salamanders. Under Alternatives 2 and 3, individual salamanders could be killed by timber harvest and related activities taking place while salamanders are active. This is unlikely to occur, since the species is active above ground only rarely, generally during cool, wet weather conditions. Fire effects are not known, though these same wet-weather habits would reduce likelihood of effects from prescribed burns. Prohibition of off-road motorized travel in Management Area 4.1 could prevent negative effects on salamanders.

Indirect effects
Habitat could be disturbed or lost during road construction and timber harvest proposed under Alternatives 2 and 3. Compliance with Best Management Practices and the Watershed Conservation Practices Handbook would minimize disturbance in potential habitat. Proposed burns could benefit salamanders by increasing prey species (Cerovski 2002). Closure of Management Area 4.1 to motorized vehicles could prevent effects on salamander habitat.

Cumulative effects
Fire exclusion and other events have cumulatively altered historic riparian and wetland areas (see p. 94). Habitat trend forest-wide now appears to be stable. The action alternatives include measures to minimize disturbance to wet areas (pp. 32, 34). None of the alternatives is likely to add to cumulative effects.

Determination
Alternatives 2 and 3 could adversely impact individuals of this species but would not result in a loss of species viability in the project area nor cause a trend towards federal listing or loss of viability rangewide. Overall, the proposed treatments would have a beneficial impact on this species due to reduced vehicle traffic and increase prey base.

Northern Leopard Frog *(Rana pipiens)*

The northern leopard frog is found in a wide variety of moist habitats. This species is known to occur throughout the Bearlodge Ranger District in permanent and semi-permanent water sources. During the spring, northern leopard frogs can be found in ephemeral pools and streams. This species has been observed in the project area.

Direct effects
Under Alternative 1, motorized vehicles could continue to disturb wet areas and possibly kill frogs. Road work and timber harvest proposed under Alternatives 2 and 3 could result in the death of frogs, but with implementation of Best Management Practices and Watershed Conservation Practices the chances of this occurring would be small. Road closures and closure of Management Area 4.1 to motorized vehicles could prevent negative effects on frogs.

Indirect effects
Potential habitat could continue to be disturbed by motorized vehicles under Alternative 1. Road work and timber harvest proposed under Alternatives 2 and 3 could temporarily disturb frog habitat. Management activities could also increase populations of insects on which this species feeds (Cerovski 2002). Indirect effects on frogs would be negligible with implementation of measures to prevent or minimize impacts on water quality and moist soils (pp. 32, 34). The proposed closure of Management Area 4.1 to motorized vehicles could prevent negative effects on frog habitat.

Cumulative effects
Fire exclusion and other events have cumulatively altered historic riparian and wetland areas (see p. 94). Habitat trend now appears to be stable. None of the alternatives is likely to add to cumulative effects, and road and area closures may help counteract cumulative effects.

Determination
Alternatives 2 and 3 could adversely impact individuals of this species but would not result in a loss of species viability in the project area nor cause a trend towards federal listing or loss of viability rangewide. Overall, the proposed treatments would have a beneficial impact on this species due to decreased disturbance of habitat.

Pale Milk Snake *(Lampropeltis triangulum)*

This species uses a variety of habitats and is usually found under rotting logs, stumps, or moist debris. Baxter and Stone (1980) show the range of the milk snake to include all of Crook County. They note that this secretive, mostly nocturnal species prefers escarpments and is almost never found in shortgrass communities. Milk snakes feed on small rodents, birds, lizards, and snakes (Behler and King 1979). The species has been documented on the Bearlodge Ranger District, though not in the project area.

Direct effects
Alternative 1 is unlikely to have direct effects on this species. Under Alternatives 2 and 3, individual snakes could be killed during timber harvest and related activities. Because this species is rarely found in the open when these activities would occur (during the day), direct effects are unlikely.

Indirect effects
Alternative 1 is unlikely to have indirect effects on milk snakes. The action alternatives may have indirect beneficial effects from increases in prey populations.

Cumulative effects
Cumulative effects on this species are not well understood. Habitat as described in published literature appears to be widely available in the project area. The proposed actions would have a negligible effect on this habitat.

Determination
Alternatives 2 and 3 could adversely impact individual milk snakes but would not result in a loss of species viability in the project area nor cause a trend towards federal listing or loss of viability rangewide.

Tawny Crescent *(Phyciodes batesii lakota)*

In the Dakotas, this butterfly species appears to be restricted to moist forest borders, particularly in riparian situations, and moist valley bottoms that border riparian woodlands. In South Dakota, the tawny crescent is found only in the Black Hills (Royer and Marrone 1992), where it is found in native prairies and uses only smooth blue aster *(Aster laevis* var. *geyeri)* as its larval host plant. There is also an association with exposed moist soil in forested areas. This species has been observed in the project area.

Direct effects

Alternative 1 is unlikely to have direct effects on this species. Timber harvest and prescribed burning proposed under Alternatives 2 and 3 could destroy host plants and kill butterfly larvae. Proposed actions would avoid areas with moist soils (p. 32, 34).

Indirect effects

In the absence of natural disturbances, long-term increases in forest density under Alternative 1 could decrease this species' preferred habitat. Alternatives 2 and 3 would benefit the tawny crescent by providing open habitat for establishment of smooth blue aster and other native forbs. Proposed actions may also provide a slight increase in water for seeps, springs, and riparian areas (p. 102). The project may have indirect beneficial effects by increasing dogbane *(Apocynum* spp.*)*, used by this species for nectaring.

Cumulative effects

Cumulative effects on this species are not well understood. Habitat as described in published literature appears to be stable in the project area. Active management would increase this habitat.

Determination

Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide. Diversification of habitat would result in an overall benefit to this species.

Cockerell's Striate Disc Snail *(Discus shimeki cockerelli)*

This snail is found in moist environments, especially spruce and mixed spruce/pine, in lowland wooded areas, on riparian toe slopes or talus slopes, generally with north to northeast exposure. The species is closely tied to calcareous soils and limestone outcrops (Frest and Johannes 1993, 2000), and forages on decayed leaves and herbaceous vegetation.

Distribution data for North America are known to be incomplete. Currently this species is known to exist in nine states and two Canadian provinces. Cockrell's striate disc is known to exist at 13 sites in the northern and central Black Hills but might occur in other drainages in the northwestern hills. It is locally abundant in very small colonies. No local population trend data is available.

There are no known colonies of this species in the project area.

Direct effects

Under all alternatives, loss of individuals may occur where motorized vehicles disturb soils. Loss of individuals may also occur if undocumented colonies exist where treatments are proposed under Alternatives 2 and 3. Proposed actions would avoid areas with moist soils (p. 32, 34). Closure of roads and of Management Area 4.1 to motorized vehicles could reduce the potential for damage to snail colonies.

Indirect effects
Suitable habitat could be adversely altered by Alternatives 2 and 3, though this effect would be negligible due to measures to mitigate impacts on moist soils, referenced above. Suitable habitat could also be adversely affected over time by lack of management under the no action alternative if dense stands burn intensely.

Cumulative effects
Past timber harvest and road-building could have adversely affected colonies of this snail. The historical fire regime has been altered by fire exclusion; stand-replacing fires that could result would adversely affect the moist habitats favored by this species, which historically would have been less likely to burn. Because newly discovered colonies would be protected (p. 33) and fuel reduction would occur, the action alternatives would not add to any cumulative effects.

Determination
If this species occurs in the project area, Alternatives 2 and 3 could adversely impact individuals, but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide.

Cooper's Rocky Mountain Snail (*Oreohelix strigosa cooperi*)

The currently identified distribution of this species is the Black Hills of South Dakota and Wyoming. Habitat is moist environments with generally north to east exposures. This snail is loosely tied to calcareous soils and limestone outcrops (Frest and Johannes 1993, 2000) and feeds on decayed leaves and other vegetation. It may be found on decaying woody debris. One snail colony in the project area is known to contain Cooper's Rocky Mountain snails. No local population trend data is available.

Distribution data for this species are known to be incomplete. Populations appear to be limited to suitable habitat in Spearfish Canyon, the upper reaches of Rapid Creek, and a few other areas in the northern Black Hills. This snail might also exist in other drainages in the northwestern hills. Threats to this species include habitat loss due to forest fires, grazing, logging, or other disturbances that could result in drying of moist microsites.

Direct effects
The known snail colony would not be disturbed under any of the alternatives. See also "Direct effects" for Cockerell's Striate Disc, above.

Indirect effects
See "Indirect effects" for Cockerell's Striate Disc, above.

Cumulative effects
See "Cumulative effects" for Cockerell's Striate Disc, above.

Determination
Alternatives 2 and 3 could adversely impact individuals but are not likely to result in a loss of viability on the planning area nor cause a trend toward federal listing or a loss of species viability rangewide.

Other Snail Species of Interest

The Revised Forest Plan contains direction to protect all known colonies of several additional snail species: Vertigo arthuri (von Martens 1882), Vertigo paradoxa (Sterki 1900), Catinella gelida (Baker 1927), Oreohelix strigosa n. subsp., and Oreohelix strigosa berryi (Pilsbry 1915) (standard 3103). Six colonies in the project area contain representatives of the Oreohelix and

Vertigo genera (Frest and Johannes 2002). These colonies would be avoided (p. 33) and would not be impacted by proposed activities.

Management Indicator Species

Management indicator species (MIS) can be used to indicate effects on a wider group of species that share similar habitat requirements. MIS can also be species of particular interest for other reasons, e.g. sensitive species or big game. A number of MIS were used in this analysis to represent effects on all species associated with various habitat types.

Population viability was addressed at the Forest Plan level in the Revised Forest Plan FEIS, its appendices, and Phase 1 Amendment documentation.

This section deals with changes to optimal habitat. Assumptions of optimal habitat characteristics were derived from numerous field guides and research papers (see Appendix A). Detailed discussions are also found in the Revised Forest Plan FEIS, Appendix H, and the Phase I Amendment Environmental Analysis and Biological Assessment/Biological Evaluation. Effects on MIS are discussed below. Analysis species for the project and the habitats they represent are shown below.

Analysis Species	**Habitat Represented/Other Factors**
Bald eagle (p. 59)	Endangered species
Black-backed woodpecker (p. 68)	Closed-canopy snag habitat, R2 sensitive species
Brown creeper (p. 85)	Mature forest, species of special interest
Cockerell's striate disc (p. 82)	R2 sensitive species
Cooper's Rocky Mountain snail (p. 83)	R2 sensitive species
Fringed-tailed myotis (p. 77)	R2 sensitive species
Golden-crowned kinglet (p. 73)	R2 sensitive species
Lewis's woodpecker (p. 69)	R2 sensitive species, open-canopy snag habitat
Merriam's turkey (p. 86)	Big game, species of special interest
Mountain lion (p. 87)	Species of special interest
Mule deer (p. 87)	Species of special interest
Northern goshawk (p. 66)	R2 sensitive species
Ovenbird (p. 88)	Hardwood forest
Pygmy nuthatch (p. 76)	Mature habitat, R2 sensitive species
Rocky Mountain elk (p. 89)	Big game, species of special interest
Three-toed woodpecker (p. 70)	Closed-canopy snag habitat, R2 sensitive species
Townsend's big-eared bat (p. 78)	R2 sensitive species
White-tailed deer (p. 89)	Species of special interest

Other potential management indicator species include:

American marten (see p. 61)
Osprey (associated with lakes larger than the ponds found in the project area)
Mountain goat (associated with cliffs and other rocky areas unlike those found in the project area)
Regal fritillary (associated with grassland openings larger than those found in the project area)
Brook trout (the project area contains only short sections of perennial stream, none of which are fish-bearing)
Brown trout (" ")
Finescale dace (" ")
Lake chub (" ")
Mountain sucker (" ")
(USDA Forest Service [1])

Because the project area does not include suitable habitat for the above species, risk assessments were not completed.

The wildlife biologist's report contains analysis of effects on several other species that are not threatened, endangered, proposed, sensitive, or management indicator species. Because no project issues are related to these species, they are not included in this document.

Brown Creeper (*Certhia americana*) *Represents mature forest habitat; species of special interest*

Brown creepers are found in dense, mature coniferous forests in summer and deciduous forests in winter (Kistler and Fager 1981). Snags at least 10" in diameter with loose bark or old woodpecker holes are required for nesting (DeGraaf et al. 1991). A literature review (Hejl et al. 1995) found that every study on the effects of timber harvesting in the Rocky Mountains suggested that brown creepers are less abundant in harvested than unharvested stands. Mannan and Meslow (1984) also suggested that creepers occur more often in old growth than thinned stands.

In the Black Hills, brown creepers occur in mostly old growth stands and demonstrate a preference for stands with large trees and snags (Dykstra et al. 1999). The Rocky Mountain Bird Observatory almost always observed brown creepers in mature or old growth stands (Panjabi 2001). In the project area, there are about 4,435 acres of mature pine stands with moderate density (structural stage 4B), 1,592 acres of mature pine with high density (4C), and 321 acres of late succession pine (structural stage 5). This species has been observed in the project area.

Direct effects

Individuals could be affected if snags with occupied nests were cut during activities proposed under Alternatives 2 and 3. Only hazardous snags would be cut (p. 33, 56), so effect is expected to be negligible.

Indirect effects

Alternative 1 would not alter the brown creeper's preferred habitat. This alternative would result in an increase in brown creeper habitat over time. It would also, however, allow continued development of ladder fuels and increases in risk of mountain pine beetle infestation. These conditions would increase the risk of severe wildfires. Stand-replacing fire would destroy brown creeper habitat in burned areas, and this habitat would not again be available until large-diameter trees and snags developed.

Alternatives 2 and 3 include timber harvest prescriptions that would result in loss of large trees and reduction in stand density, though all trees greater than 20" in diameter would be left standing (p. 33). This would meet Revised Forest Plan direction to provide sufficient large-diameter green trees across the landscape, and presumably would eventually provide enough snags for this species. Alternatives 2 and 3 would decrease structural stage 4B to 3,940 acres (-11%) and 4C to 1,348 acres (-15%). Stage 5 stands would not be altered.

Potential nesting sites would be lost under Alternatives 2 and 3 if snags are cut as safety hazards. Mitigation and design criteria would minimize loss of existing snags (p. 33). The action alternatives would enhance 17 acres of potential winter habitat. Low-intensity prescribed burning proposed under Alternative 2 and, to a lesser extent, Alternative 3, may increase insect prey populations (Cerovski 2002), though silvicultural treatments aimed at reducing insects and disease could prevent formation of foraging and nesting habitat. Thinning treatments would prevent stand stagnation and allow development of larger trees over time. Risk of stand-replacing fire and resulting habitat destruction would decrease.

Road construction proposed under both action alternatives could temporarily increase disturbance of this species, but all new roads would be closed to motorized vehicles except when access is needed for proposed timber harvest and other activities and again after activities are complete. Road closures proposed under Alternative 2 and, to a lesser extent, Alternative 3, would decrease disturbance across the project area

Cumulative effects

Timber harvest and road building have decreased habitat for this species by removing large trees and snags and preventing widespread natural mortality of large trees. Fire suppression has probably decreased hardwood acreage. This project would continue the trend of loss of mature, closed-canopy stands but would not add to the effect of loss of large-diameter trees, since all trees over 20" in diameter would be retained. Retention of unharvested stands and development of large-diameter trees over time as a result of silvicultural treatments are expected to prevent significant cumulative effects.

Proposed road closures would discourage cutting of snags for firewood. Because all new roads and many existing roads would be closed, proposed road construction and improvement would not add to cumulative effects of roading on wildlife habitat

Summary of effects

Alternatives 2 and 3 would temporarily decrease treated forest stands' suitability as brown creeper habitat. Retention of existing snags, green trees to provide snags in the future, and uncut stands would prevent significant adverse effects.

Merriam's Turkey (*Meleagris gallopavo merriami*) *Big game; species of special interest*

Merriam's turkey inhabits a wide variety of forest types in and around the Black Hills. Turkeys requires large trees for roosting (DeGraff et al. 1991). The species is found in the Cement project area year-round. The Wyoming Game and Fish Department uses winter counts and harvest statistics to determine trend as an index of population; turkey population appears to have increased dramatically since 1996, though weather in 2001 decreased productivity. Currently, area managers feel the population is robust (Sandrini 2001c). Field observations suggest that favorable weather in 2002 increased productivity, as evidenced by brood size and winter flock size.

Direct effects

Alternative 1 would continue to allow more opportunities for road-hunting due to high open road density. Under Alternatives 2 and 3, logging activity and spring burns could destroy nests. Fast-moving fire could kill newly hatched poults; once the poults can fly, losses to the population would be negligible (Hurst 1978). Some roost trees may be lost.

Indirect effects

Under Alternative 1, forest habitat would become denser. No roost trees would be lost to timber harvest. Maintenance of foraging habitat would depend on natural disturbances. High open road density would continue to impact security areas during hunting seasons.

Timber harvest and prescribed fire proposed under Alternatives 2 and 3 would stimulate the growth of forage plants and may reduce litter, exposing insects and seeds. Additionally, fire would reduce brush, allowing better visibility of predators (Hurst 1978). It could also reduce parasites such as ticks and lice (Jacobson and Hurst 1979). Increases in forest edge and invertebrate populations would benefit turkeys. Road restrictions and closure of Management Area 4.1 to motorized vehicles would provide more escape areas during hunting seasons. Some roost trees could be lost to timber harvest, but because forest with trees suitable for roosting

would decrease by only 8%, losses would be negligible. Because Alternative 2 includes the most prescribed fire and road restrictions, it would result in the greatest benefit.

Cumulative effects

Management activities have resulted in a general increase in preferred habitat over time. The action alternatives would continue this trend. Harvest of mature trees has probably resulted in loss of roosting habitat, though potential roosting habitat still exists on a large majority of the cumulative effects area.

Summary of effects

Alternatives 2 and 3 would generally have a beneficial effect on turkeys due to increased foraging habitat and security areas.

Mountain Lion (*Felis concolor*) *Species of special interest*

Mountain lions are generally elusive, solitary animals that prefer remote areas. Because there is a lack of good habitat information specific to mountain lions in the Black Hills, it has been assumed that lion habitat capability trends would be similar to that of deer, their primary prey (USDA Forest Service [2]). Approximately 40 to 50 breeding adults are currently estimated to occupy the Black Hills area (USDA Forest Service [4]). A South Dakota Department of Game, Fish and Parks and South Dakota State University study of mountain lion population size and structure in the Black Hills is currently under way. There is a mountain lion hunting season in the Wyoming part of the forest. This species has been recorded in the project area.

Direct effects

No direct effects are anticipated.

Indirect effects

Under Alternative 1, deer habitat would probably decrease over time as foraging areas become forested. Decreased use of the area by deer would also decrease its suitability for mountain lions.

Alternatives 2 and 3 may cause a short-term increase in mountain lion hunting success due to loss of cover for prey in treated areas. Over time, the reduction in pine overstory in these stands would result in understory growth and an increase in horizontal screening cover, which would benefit deer. Prescribed burning would also increase screening cover by stimulating growth of understory vegetation. Improvement of habitat for deer would indirectly benefit mountain lions. Road restrictions proposed under Alternatives 2 and 3 would reduce disturbance of lions and their prey.

Cumulative effects

Road construction, increased human presence, and some types of timber harvest have probably had a negative effect on mountain lions in the Black Hills over time. Conversely, timber harvest that has improved forage conditions for lion prey species has mostly likely had a beneficial effect. Because Alternatives 2 and 3 would reduce open road density and increase forage, they would reduce negative cumulative effects and add to positive ones.

Summary of effects

Alternatives 2 and 3 would generally have a beneficial effect on mountain lions.

Mule Deer (*Odocoileus hemionus*) *Big game; species of special interest*

Mule deer occur in many habitat types. Habitat suitability depends on the presence of food and cover plant species and their arrangement across the landscape (Higgins et al. 2000). In the Black

Hills, mule deer populations have increased substantially since 1997 despite a decrease in 2001 due to lower production and increased hunting harvest. The Wyoming Game and Fish Department estimated the 2001 post-hunting season Black Hills mule deer population at 20,333 animals. The population was expected to grow to 20,781 in 2002 (Sandrini 2001b). This species occurs in the project area.

Direct effects

High open road density under Alternative 1 would continue to facilitate road-hunting. Deer may be temporarily displaced during harvest and other activities proposed under Alternatives 2 and 3; conversely, deer are frequently seen feeding on *Usnia* lichens in felled treetops in active harvest units, so there may be a temporary increase in forage as units are cut.

Indirect effects

Alternative 1 would allow dense stands to become denser and possibly stagnate. Existing cover would remain. Foraging habitat would decrease over time in the absence of management or natural disturbances. Security areas would continue to be scarce due to high open road density.

Timber harvest and prescribed fire proposed under Alternatives 2 and 3 would benefit mule deer by increasing browse and forage production (Pase 1957, Alexander 1987, Uresk and Severson 1989). Important browse species such as chokecherry and serviceberry are stimulated by disturbance. Horizontal (screening) cover could be temporarily lost where timber harvest occurs, but regeneration of pine stands would result in an overall improvement of screening cover within a few years. Deer would be more vulnerable to hunters and other predators while screening cover grows. Reduction of open road density and closure of Management Area 4.1 to motorized vehicles under Alternatives 2 and 3 would provide additional security areas during hunting seasons. Alternative 2 proposes the most prescribed burning and road restrictions and thus would have the greatest benefit.

Cumulative effects

Forest management activities that have opened conifer stands have probably improved preferred habitat over time, while roading has decreased security. Actions proposed under Alternatives 2 and 3 would add to the effects of harvest and act against the effects of roading.

Summary of effects

Alternatives 2 and 3 would have an overall beneficial effect on this species.

Ovenbird (*Seiurus aurocapillus*) *Represents species associated with hardwood habitats*

Optimal habitat for ovenbirds is open, mature deciduous forest with little understory. In the Black Hills, this species is found in mature hardwood forest and mixed pine/hardwood communities with little slash or brush. Ovenbirds feed mainly on invertebrates and are found throughout the Black Hills in moderate to high abundance, evidently most numerous at low to middle elevations in the northern Hills and Bearlodge Mountains. Density of this species is greatest in aspen stands (Panjabi 2001).

Cement project area contains 1,173 acres of aspen or mixed aspen/birch habitat. Structure of these stands is diverse (p. 51). Aspen is present as a minor component of many pine stands. Ovenbirds have not been recorded in the project area.

Direct effects

No direct effects are expected as a result of Alternative 1. Because this species nests on the ground, activities associated with Alternatives 2 and 3 could result in a loss of nests. Few activities would take place in suitable nesting habitat, so the likelihood of direct effects is low.

Indirect effects
Under Alternative 1, pine would continue to overtake decadent aspen stands, decreasing ovenbird habitat. Rejuvenation of hardwood habitats would depend on natural disturbances.

Alternatives 2 and 3 would have a beneficial effect on ovenbird habitat in the stands proposed for hardwood enhancement. Increases in insect populations in thinned and burned areas may provide additional forage. Alternative 2 proposes the most prescribed burning and would be likely to have the greatest benefit.

Cumulative effects
The long-term trend in the Black Hills has been a loss of hardwood communities to pine stands. Alternatives 2 and 3 would retain pine cover in most areas but would offset the trend slightly by setting back succession in some of the harvested stands.

Summary of effects
Alternatives 2 and 3 would have an overall beneficial effect on this species. Alternative 1 could have adverse effects on ovenbirds in the long term.

Rocky Mountain Elk *(Cervus elaphus)* *Big game; species of special interest*

Elk occupy a wide variety of habitats. 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 mix of brushy and grassy areas, water sources, and dense forest cover. Grasses and forbs dominate the summer diet. No reliable population estimate is available for the Black Hills, but evidence indicates elk numbers are increasing.

Direct effects
Under Alternatives 2 and 3, elk may be temporarily displaced during harvest and other proposed activities. High open road density under Alternative 1 would continue to facilitate road-hunting.

Indirect effects
Preferred habitat would increase under Alternatives 2 and 3. Some cover would be lost, but harvest and burning would increase high-quality forage such as chokecherry and serviceberry. Reduction of open road density and closure of Management Area 4.1 to motorized vehicles under the action alternatives would provide additional security areas. Screening cover could be temporarily lost where timber harvest occurs. Alternative 2 proposes the most prescribed burning and road restrictions and thus would have the greatest benefit

Cumulative effects
Forest management activities that have opened conifer stands have probably improved preferred habitat over time, while roading has decreased security. Actions proposed under Alternatives 2 and 3 would add to the effects of harvest and act against the effects of roading.

Summary of effects
Alternatives 2 and 3 would have an overall beneficial effect on elk.

White-tailed Deer *(Odocoileus virginianus)* *Big game, species of special interest*

White-tailed deer occupy a wide variety of habitats and are extremely adaptable, making them the most widespread deer or elk species in North America. In the Black Hills, white-tailed deer inhabit a variety of forest types and structural stages and migrate between distinct summer and winter ranges. Aspen and birch stands are prominent factors in this species' selection of home ranges and use of sites within these ranges (Stefanich 1995). Aspen stands are commonly used

during fawning (Kennedy 1992). During winter, deer move to winter ranges that include lower-elevation forests with cover and browse, and open habitats adjacent to wooded draws.

The Black Hills white-tailed deer population has generally increased since 1997, except for a decrease in 2001 due to drought and a localized outbreak of epizootic hemorrhagic disease. The post-hunting season population was estimated at 24,229 animals in 2001 and was expected to grow to 28,150 in 2002 (Sandrini 2001a). This species occurs in the project area.

Direct effects

See "Direct effects" for mule deer (p. 87).

Indirect effects

Timber harvest and prescribed fire proposed under Alternatives 2 and 3 would benefit white-tailed deer by increasing browse and forage production (Pase 1957, Alexander 1987, Uresk and Severson 1989). Important browse species such as chokecherry and serviceberry are stimulated by disturbance. Screening cover could be temporarily lost where timber harvest occurs, but regeneration of pine stands would result in an overall improvement of screening cover within a few years. Deer would be more vulnerable to hunters and other predators while screening cover grows. Reduction of open road density under Alternatives 2 and 3 would provide additional security areas during hunting seasons. Alternative 2 proposes the most prescribed burning and road restrictions and thus would have the greatest benefit.

See also "Indirect effects" for mule deer (p. 87).

Cumulative effects

Forest management activities that have opened conifer stands have probably improved preferred habitat over time, while roading has decreased security. Actions proposed under Alternatives 2 and 3 would add to the effects of harvest and act against the effects of roading.

Summary of effects

Alternatives 2 and 3 would have an overall beneficial effect on this species.

Habitat Effectiveness

Habitat effectiveness is an area's capability to support elk or deer based on amount and spatial distribution of forage, cover, and open roads. Revised Forest Plan guidelines (to be treated as standards) 4.1-3201 and 5.1-3201 designate minimum acceptable values for habitat effectiveness. The ARC/HABCAP model was used to calculate habitat effectiveness for deer and elk.

Tables 10 and 11 display overall habitat values by Management Area (p. 3). Individual forage, cover, and distribution values are documented in the project file.

Deer and elk habitat effectiveness values (percent of optimum) – Management Area 4.1				
Species & season	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Minimum**
Deer, summer	41	56	48	41
Deer, winter	37	50	42	35
Elk, summer	42	57	48	39
Elk, winter	38	51	43	36

Table 10. Deer and elk habitat effectiveness values, Management Area 4.1.

Deer and elk habitat effectiveness values (percent of optimum) – Management Area 5.1				
Species & season	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Minimum**
Deer, summer	48	58	57	40
Deer, winter	38	44	43	35
Elk, summer	49	57	57	43
Elk, winter	40	46	46	34

Table 11. Deer and elk habitat effectiveness values, Management Area 5.1.

As shown above, habitat effectiveness values are currently at or above the minimum guideline. Alternative 1 would maintain the existing situation. Alternatives 2 and 3 would increase values for both species in both winter and summer. Increases would be greater under Alternative 2 because that alternative includes more road restrictions.

The ARC/HABCAP model is based solely on cover type, overstory canopy cover, and roads. It does not take into account cover afforded by topography or by understory grasses, forbs, shrubs, and trees. These factors contribute substantially to actual habitat effectiveness in the project area. The model also assumes that areas in proximity to roads have no habitat value. Distance from roads has not, however, been found to be significant in discriminating deer use sites from random sites in any season in the northern Black Hills (Stefanich 1995). In an on-going study in the southern Black Hills, Rumble et al. (in press) found more elk use than expected occurred in the areas rated as poor habitat by the HABCAP model. Elk used areas considered to be poor habitat due to proximity of roads at the same rate expected for random use. Rumble suggests that modification may be needed of the coefficients used in the model for juxtaposition of forage and cover, and of buffers that determine ineffective habitat near roads.

Cumulative Effects on Wildlife Habitat

Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47. The cumulative effects area is comprised of the 7th level watersheds that overlap the project area, as illustrated in Figure 9 (p. 49).

Diversity of Vegetation. Past actions have combined to increase continuity but decrease diversity of pine forest and occurrence of large-diameter snags. Alternative 1 would cause no further loss of snags, except possibly to firewood cutters. This alternative would, over time, add to the cumulative loss of foraging habitat, but would help counteract the cumulative loss of dense, mature forest. Alternative 2 would counteract losses of foraging areas where openings are created or prescribed fire takes place.

Alternative 3 would counteract it to a lesser extent. Both action alternatives would add to cumulative effects of recent management by decreasing acreage of mature, dense forest and increasing younger, more open forest.

Designing harvest to leave trees somewhat clumped rather than perfectly spaced would increase diversity of stand structure (mitigation p. 35). Though very few structural stage 4C stands would be treated, both action alternatives would continue the trend away from fairly dense stands of older, large-diameter, possibly decadent or declining conifers. Historical distribution of such stands is not clear, but there are very few in the cumulative effects analysis area now. Open stands with mainly large trees would increase due to retention of all trees over 20" in diameter, but rapid regeneration of these stands may prevent replication of historical stands maintained by frequent, low-intensity fire.

Late succession forest (structural stage 5) and large-diameter snags would not be further decreased by any of the alternatives, except where snags are cut for safety reasons.

Threatened and Endangered Species. See p. 59.

Sensitive Species. See individual species accounts, pp. 66 through 82.

Management Indicator Species. See individual species accounts, pp. 85 through 89.

Habitat Effectiveness. Deer and elk habitat effectiveness across the cumulative effects area has probably decreased over time as roads have been built and foraging areas have become forested. Both action alternatives would increase habitat effectiveness by closing roads and creating forage, decreasing overall cumulative effects.

3.1.3 Sensitive Plants

Summary of Effects

- Alternative 1 would have no immediate effect on sensitive or other unusual plants. Alternatives 2 and 3 would avoid all known populations of these species and the habitat where they are likely to be found.

Botanical surveys were conducted for this project in 2002.

No Federally listed plant species occur in the Black Hills. One plant species on the Forest Service Region 2 sensitive list has been documented in the project area, and habitat exists for 11 others. A complete list of sensitive plant species in Forest Service Region 2 can be found on page 5 of Appendix G, Phase 1 Amendment Environmental Assessment (USDA Forest Service [4]). Two plant species listed by the State of Wyoming and three Species of Interest are known to occur. The latter designation indicates that the species does not appear on a State or Regional list but has been identified by botanists working in the area as being locally rare or in need of more study. Table 12 displays species known to occur or with suitable habitat in the project area.

Regionally sensitive plants, State-listed plants, and species of interest known to occur or with suitable habitat in the project area					
Common name	**Known to occur in project area**	**Suitable habitat in project area**	**R2 sensitive**	**State-listed**	**Species of interest**
American trailplant		x	x		
Bloodroot		x	x		
Blue columbine	x	x		x	
Drops of gold	x	x			x
Dwarf scouring-rush		x	x		
Fairy barf	x	x			x
Foxtail sedge	x	x	x		
Greene's mountain ash	x	x			x
Large round-leaf orchid		x	x		
Long-stalk sedge		x	x		
Marsh muhly		x	x		
Northern arnica		x	x		
Rattlesnake fern	x	x		x	
Trailing clubmoss		x	x		
Treelike clubmoss		x	x		

Table 12. Sensitive and other unusual plants known to occur or potentially occurring in the project area

Effects on Region 2 Sensitive Plants

All Region 2 sensitive plant species potentially occurring in the Black Hills were considered in the botany biological evaluation (BE) for the Cement project. Based on available information, species with habitat preferences differing from types present in the project area were dropped from analysis in the risk assessment. A complete list of Region 2 sensitive plant species that may occur in the Black Hills is attached to the BE in the project record.

Surveys focused on habitat with high potential to harbor sensitive plant species. In the project area, high-potential sensitive plant habitat consists of moist birch and birch/aspen stands and areas where surface water is present. High-quality sites have little to no disturbance from logging or livestock and few noxious weeds. High canopy cover is typical, as is greater than average microsite moisture.

One Region 2 sensitive plant species is known to occur in the project area. Four separate populations of foxtail sedge *(Carex alopecoidea)* have been documented. None of these populations exists inside treatment units proposed under any alternative.

Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47. The cumulative effects area is comprised of the 7th level watersheds that overlap the project area, as illustrated in Figure 9 (p. 49).

Foxtail sedge *(Carex alopecoidea).*

This species is known from 20 sites in the Black Hills, all in the vicinity of upper Sand Creek and the northern Bearlodge Mountains. Four populations are known to exist in the project area, all in moist to saturated meadows dominated by graminoids and/or willows. The species is generally found in wet meadows, swamps, spring areas, and willow-sedge communities along stream banks.

Direct and indirect effects

No treatments are proposed in known or potential habitat and none of the alternatives would directly affect the species. Protection of moist soils and riparian areas during timber harvest and road work would take place in accordance with Best Management Practices and Forest Service Manual 2509.25. Indirect effects could potentially include increased water yield and riparian area size and thus increased habitat, but actual effects on water yield are likely to be insubstantial (p. 102). Ground disturbance due to logging, prescribed fire, and road work proposed under Alternatives 2 and 3 could contribute to the spread of invasive species; these species, including noxious weeds, have the potential to out-compete desired plants. Additionally, herbicides used to help control weeds could have negative effects on sensitive plants. Mitigation regarding noxious weeds (p. 29) would reduce indirect effects of weed encroachment to negligible.

Cumulative effects

Soil disturbance, introduction of invasive species, and changes in microsite moisture and hydrologic regimes can negatively affect sensitive plant populations. Riparian areas in the Black Hills have been modified over the last 120 years by livestock grazing, road construction, fire suppression, water diversion, and near-extirpation of beaver. These changes have decreased suitability of many areas as habitat for sensitive plant species. The no action alternative would allow forest cover to continue to increase in density and encroach on open areas, though the contribution to overall cumulative effects would be negligible.

Alternatives 2 and 3 could add to cumulative effects on foxtail sedge if noxious weeds become established on soil disturbed during proposed activities. Mitigation (p. 29) is designed to minimize the amount of soil disturbance, the length of time that soil is bare, and weed infestation. The overall cumulative effect of riparian area modification would be influenced very little; while proposed actions would reduce forest density somewhat, effects of this change on water yield and groundwater recharge are likely to be immeasurable and transient (p. 102). Other factors influencing riparian area characteristics would not be affected by this project.

Determination

Risk of adverse effects is low because no foxtail sedge populations exist in proposed treatment areas, BMPs and WCPs would be observed, little potential habitat exists, and all areas of potential habitat were surveyed specifically for this species. As a result, this project may adversely affect individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.

Effects on other sensitive species for which habitat exists in the project area

The following species have not been documented in the project area, but suitable habitat is known to exist.

- American trailplant *(Adenocaulon bicolor)*
- Bloodroot *(Sanguinaria canadensis)*
- Cottongrass bulrush *(Scirpus cyperinus)*
- Dwarf scouring-rush *(Equisetum scirpoides)*
- Large round-leaf orchid *(Platanthera orbiculata)*

- Long-stalk sedge *(Carex pedunculata)*
- Marsh muhly *(Muhlenbergia glomerata)*
- Northern arnica *(Arnica lonchophylla)*
- Trailing clubmoss *(Lycopodium complanatum)*
- Treelike clubmoss (*Lycopodium dendroideum)*

In the Black Hills, these species are found in moist areas, either riparian communities or moist forested communities with a birch or spruce component. Although the Cement area has moist birch stands (but no spruce) and a few riparian areas, none of the above species were found. Analysis focused on potential effects on habitat with which these species are associated.

Direct and indirect effects

Under Alternative 1, there would be no direct impacts on these species. This alternative would maintain sensitive species habitat and protect biodiversity in the short term. In the longer term, this alternative could have indirect effects on these species due to succession from hardwoods to pine that can occur in the absence of logging, fire, or other disturbance. In the project area, however, pine seedlings were rarely observed in hardwood stands despite up to 20% canopy cover of mature pine, indicating that regeneration and encroachment are not taking place. Successional pathways of birch sites are not well understood in the Black Hills (Marriott et al. 1999), and these stands could be moving from pine to birch rather than vice versa.

Alternatives 2 and 3: The project area was surveyed for high-potential sensitive plant habitat, none of which is known to occur in proposed treatment units. Proposed road construction is not located in high-potential sensitive plant habitat. There would be no direct effects on these species or their moist forested or riparian meadow habitats.

Potential indirect effects of Alternatives 2 and 3 include an increase in noxious weed infestation (see discussion under foxtail sedge, above) and increased accessibility of treatment units to livestock, which could result in soil disturbance and weed infestation. Other effects could potentially include increased water yield and occurrence of moist sites, but actual effects on water yield and groundwater are likely to be insubstantial and transient (p. 102). Though fire is a natural event, effects on sensitive plant species are generally not known. Therefore, high-potential sensitive plant habitat and known sensitive plant sites are not included in proposed prescribed burns. Proposed road construction could create corridors for dispersal of noxious weeds, though proposed mitigation would minimize this effect. Road closure and decommissioning would be likely to have a beneficial effect on sensitive plants and their habitat through reduction of disturbance.

Cumulative effects

Implementation of Alternative 1 could contribute to cumulative effects on these sensitive plant species and the moist forested and riparian meadow communities with which they are associated. Suppression of fire has resulted in more continuous forest cover, increasing the danger of large fires and possibly reducing water available to other species and systems. Fire may be emulated by logging in some ways (such as a reduction in fuel loading), but fire contributes to nutrient cycling in ways logging does not. Given the continued suppression of wildfire, a lack of logging or fuel treatments may continue to increase the risk of especially intense wildfires that could negatively affect sensitive plant habitat in ways not necessarily expected under the historic fire regime. Additionally, the natural processes of succession could add to cumulative effects by reducing the community types that are habitat for sensitive plants. Lack of disturbance, however, may maintain sensitive microsite conditions.

Implementation of Alternative 2 or 3 could contribute to soil disturbance and the spread of invasive species.

Some birch and aspen areas have been modified by direct and indirect effects of logging and livestock grazing. Physical barriers, including slope, soil type, and lack of livestock forage have probably protected many of these areas from disturbance. With site-specific design criteria and mitigation (p. 32), the action alternatives would not add to cumulative effects on these species.

The cumulative effects discussion on p. 94 regarding riparian and meadow areas also applies to these species.

Determination
Implementation of Alternative 1 would cause no direct or indirect effects on sensitive plant species or their habitat. Under Alternatives 2 and 3, the probability of negative direct effects on sensitive plants and their habitat is low because no known populations or high-potential habitat is found in treatment areas. All alternatives may adversely impact individuals, but none is likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide.

Autumn coralroot *(Corallorhiza odontorhiza)*
The single confirmed historic occurrence of this species in the Black Hills took place in 1971 in Lawrence County, South Dakota. An exact location has not been determined from this record, and the species has not been located again despite attempts in the vicinity of the previous record and surveys in other parts of the Black Hills. Although surveys are on-going, autumn coralroot is currently not considered to be present in the Black Hills and was not evaluated in the risk assessment for this project.

State-listed Species

State-listed species found in proposed treatment areas include blue columbine *(Aquilegia brevistyla)* and rattlesnake fern *(Botrychium virginianum)*. These species were found in a drainage in an area proposed for mechanical fuel treatment and low-complexity prescribed burn. The fuel treatments would take place in spots on the hillside where fuel concentrations exist and would not affect the drainage or habitat (p. 32).

A limited number of blue columbine and rattlesnake ferns were also located in areas not proposed for treatment. Proposed activities are unlikely to have direct or indirect effects on these individuals.

The Wyoming Diversity Database (2002) includes records of the following species within the project area: slim-leaf witchgrass *(Dichanthelium linearifolium)*, rosy sedge *(Carex rosea)*, kidney-leaf white violet *(Viola renifolia* var. *brainerdii)*, and hairy wild rye *(Elymus villosus)*. These species were not observed during surveys for this project.

Species of Interest

One occurrence of drops of gold *(Disporum hookeri)* is located in the same drainage as the blue columbine and rattlesnake fern. Prior to the 2002 field season, this species had not been reported in the Black Hills, Wyoming, or the Rocky Mountain Region of the Forest Service (Colorado, Nebraska, and most of Wyoming and South Dakota). It is currently unranked. There are seven other occurrences of this species in the project area (outside treatment units), nine in the Sand Creek area immediately north of Cement, and three on

Northern Hills Ranger District just to the east. The species is common in the Pacific Northwest (Larson 2000), and in the Black Hills was only found in birch and birch/aspen stands of high quality. As mentioned above, the fuel treatments would take place in spots on the hillside where fuel concentrations exist and would not affect the drainage or habitat where this species exists (p. 32).

Other species of interest observed in the project area but outside proposed treatment units include fairy barf *(Icmadophila ericetorum)* and Greene's mountain ash *(Sorbus scopulina)* individuals. Proposed activities are unlikely to have direct or indirect impacts on these species.

3.1.4 Rangeland

The project area includes portions of Idol, Willow Springs, and Stearns Park grazing allotments. Alternative 1 would have no effect on range resources. Forested areas, generally considered secondary range, would be affected by the actions proposed under Alternatives 2 and 3. Forage production would increase where canopy cover is reduced by vegetation treatments, which could increase livestock use of secondary range.

Timber harvest activities may involve disturbance to cattle and possible disruption of grazing management systems during harvest. Deferment of cattle grazing in some prescribed burn areas could temporarily change grazing patterns and reduce forage until vegetation is established. Road restrictions could close off routes that are used for trailing cattle, though mitigation and design criteria (p. 31) would minimize this effect. These effects are more likely to occur under Alternative 2, which includes more burning and road restrictions. Both action alternatives could result in small-scale changes to grazing around Guidinger Spring.

Cumulative Effects on Rangeland

Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47. The cumulative effects area is comprised of the 7th level watersheds that overlap the project area, as illustrated in Figure 9 (p. 49).

Meadow acreage has most likely decreased over the years as open areas became overgrown with pine, though timber harvest opens stands and increases forage temporarily. Proposed actions would increase forage temporarily in harvested and burned stands, but would not permanently convert any areas to meadow.

3.1.5 Noxious Weeds

Past road construction, logging, livestock grazing, recreational use, motor vehicle use and other ground-disturbing activities have aided the introduction and spread of noxious weeds in the Cement project area. The most problematic noxious weeds in the area are common tansy, leafy spurge, and spotted knapweed. An abundance of

common tansy can be found on FSR 803.1 and FSR 802.1. A small infestation of leafy spurge has been found in T50N, R61W, southwest section 1. An infestation of spotted knapweed exists on road U725 in T50N, R60W, east section 5. These infestations are being treated and monitored on a yearly basis. It is critical that these areas are protected from future ground-disturbing activities to prevent spread of these noxious weeds. Timber harvest and minor road reconstruction would take place in the vicinity of leafy spurge and common tansy infestations as part of the action alternatives. Various strategies (p. 29) would be used to prevent spread of infestations. Under Alternative 2, U725 would be closed, reducing the potential for spread of the infestation of spotted knapweed.

The action alternatives propose road construction/reconstruction and log skidding in various areas, which would expose mineral soil to noxious weed seeds. The effect of any increase in noxious weeds would be competition with, and limited displacement of, native forb and grass communities. New infestations also would slightly reduce forage and browse production. Under Alternative 1, on- and off-road vehicle use would continue to aid the spread of noxious weeds. Closure of roads and Management Area 4.1 to motorized vehicles under the action alternatives would help minimize new infestations in these areas.

Under the action alternatives, scarification and seeding of disturbed areas with approved seed mixtures (required under timber sale contracts) would minimize opportunities for spread of noxious weeds. The impacts from the spread of noxious weeds would be minor with the action alternatives.

Cumulative Effects on Noxious Weeds

Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47. The cumulative effects area is comprised of the 7th level watersheds that overlap the project area, as illustrated in Figure 9 (p. 49).

Noxious weeds arrived in the Black Hills via contaminated hay, livestock, vehicles, and many other vectors. Ground disturbed by timber harvest, roads, fire, livestock grazing, development, and mining is often colonized by noxious weeds. Proposed actions would disturb ground through timber harvest, road work, and prescribed burning, and could add to cumulative effects. Protective measures (p. 29) are designed to minimize the potential for noxious weed spread.

3.2 Physical Consequences

3.2.1 Soil and Water

Summary of Effects on Soil and Water

- Overall watershed condition would improve under Alternatives 2 and 3 due to road closures and improvements and restoration of the riparian area at Guidinger Spring.
- Under the action alternatives, project design and mitigation measures would prevent substantial or significant effects on soils, streamflow regime, water quality, channel morphology, floodplains, riparian ecosystems, and wetlands. Negative effects caused by existing conditions would continue to occur under the no action alternative.

The Cement project area drains into Cold Springs Creek, which flows northward as a tributary of Sand Creek, which in turn flows into Redwater Creek and then the Belle Fourche River. Seventh-level watersheds in the project area are shown in Table 13 and displayed in Figure 9 (p. 49).

Project Area 7th-level Watersheds		
Watershed name	Watershed number	Approximate acres
Rattlesnake	10120203020205	9,450
Surprise	10120203020303	5,600
Williams	10120203020302	7,150

Table 13. Project area watersheds

Existing watershed conditions

Natural Watershed Characteristics

The average annual precipitation for this area is about 18 to 19 inches. A little more than half of this total occurs during the summer. Landforms include broad ridgetops and narrow valleys with moderately sloping to very steep sideslopes.

Soils are formed from sedimentary rock, valley-filling alluvial fans, igneous material, and remnants of calcareous sandstone, limestone, and soft shale. Major soil mapping units include Citadel, Lail, Vanocker, Grizzly, and Cordestan. All except Cordestan have high erosion hazard potential. Some soils have a high potential for landslide activity, and some are susceptible to compaction during wet conditions.

There is very little surface water in the project area. The main channels are intermittent drainages. Almost all tributaries are dry, grassy or timbered draws that route water only during infrequent and intense runoff events. Few of these draws exhibit evidence of recent flow. Most of these tributaries contain neither a defined channel nor channel scour exposing gravel or sandy substrate. The only known perennial flow is near Guidinger Spring and in a small tributary of Surprise Gulch parallel to NFSR 803.1C.

Water yield at the outlet of the project area is not in the form of surface water. Under normal flow conditions, all water draining from the area is subsurface in nature. Only very large flood events would connect drainages in the project area to perennial streams outside the project area. Under these circumstances, culverts that are plugged or too small for the amount of water could contribute sediment to downstream waters. Drainage crossings are displayed on Map AQ4 in the project file.

Floodplains are most affected by roads and their location relative to drainages and stream channels. Some road crossings constrict floodplains and could constrain the movement of large woody debris and sediment in the rare event of high flow. Where stream channels exist, road/channel proximity could affect the physical channel dynamics of the surface drainage system. Potentially affected locations are displayed on Map AQ1 in the project file.

Most drainages appear stable and well vegetated. Exceptions include parts of the channel near Guidinger Spring, where road U725 is contributing sediment and cattle grazing may be causing bank sloughing.

Most of the riparian ecosystems in the project area are associated with springs. Some drainage bottoms contain plants associated with riparian conditions, but these areas are separated by open, dry meadows and are not continuous. An existing unclassified road and livestock grazing have damaged the riparian area at Guidinger Spring.

There are nine small wetlands in the project area, five of which are impoundments (Table 14).

Project Area Wetlands		
Location	Approximate acres	Remarks
Pole Cabin Gulch	1.17	Surface water present throughout the year; created by beaver
Williams Gulch	0.21	Surface water present for brief periods during the growing season
Williams Gulch	0.18	Surface water present during most of the growing season
Straight Lake	0.20	Impoundment
Bear Lake	0.18	Impoundment
North of Surprise Gulch	0.10	Impoundment
Calvert-Sackett Draw	0.35	Impoundment
Calvert-Sackett Draw	0.19	Surface water present during most of the growing season
Calvert-Sackett Draw	0.16	Impoundment

Table 14. Project area wetlands

Constructed Watershed Features

A full inventory of existing conditions of roads in the project area was conducted in 2001 and 2002. Specific problems were noted with parts of NFSR 803.1C and NFSR 868.1 (effects on surface or subsurface hydrology) and U725 and U763 above Guidinger Spring (contributing sediment to the creek in this draw).

The road system has the greatest potential to generate surface erosion at ditch relief culverts, where water intercepted or collected into the ditch system is released onto the

hillside. One example of surface erosion from a ditch relief culvert exists on NFSR 804.1 (Rattlesnake Canyon) about half a mile east of the intersection with 875.2 (Wagon Canyon). Other roads with surface erosion problems are described in the project engineer's field notes in the project file.

Many roads in the project area are on soils that have potential for severe erosion (Map AQ3 in the project file). There is increased potential for erosion from cutslopes and fillslopes on roads in these locations, but severe erosion has not been observed. No road segments within the project area have been identified as having existing road-related failures (mass movement).

As an overall system, roads generate greater runoff and lead to lower infiltration rates. This can lead to increased sediment delivery to streams, higher peak flows, and accelerated timing of peak flows. The increased runoff volumes associated with high road density can also hasten surface erosion.

Most of the springs in the area have some water development associated with them, generally for livestock watering. Some springs are not fenced and are vulnerable to overuse by livestock, especially during dry years. Concentrated livestock use near allotment and pasture fences has created areas of bare, compacted earth.

Direct and Indirect Effects

Soil Erosion, Compaction, Heating, and Nutrient Loss

Under the no action alternative, existing soil erosion concerns associated with roads would persist. Ruts, gullies, and areas of standing water would continue to exist. Conditions may worsen without effective closures and decommissioning of damaged roadways. Conversely, without vegetation management activities, soil productivity and soil nutrients may improve over time. Stand-replacing fire risk would, however, increase over time, and erosion, soil productivity, and soil nutrients could be severely impacted in the event of a major fire.

Neither action alternative would have significant effects on soils. Mitigation and Best Management Practices would prevent or reduce effects on soil productivity and soil nutrients. Most of the harvest and fuels activities are proposed on soils with erosive characteristics, but sites where activities might contribute to erosion would be stabilized and maintained with erosion control measures in accordance with Revised Forest Plan standards, state BMPs (Wyoming Department of Environmental Quality 1997), and Watershed Conservation Practices (FSH 2509.25). Additional mitigation measures would be employed to reduce effects on the soil resource (p. 34). While some small-scale ground disturbance may occur during road decommissioning, these roads would no longer be sources of soil erosion after they revegetate. Decommissioning roads would result in a long-term beneficial effect.

Mass Movement

Landslides are not expected to occur under any alternative. Mass failure analysis of the area (located in the project file) indicates that the proposed activities would not contribute to existing landslides or slumps. Care would be exercised on steep slopes to reduce the chance of creating new mass failure sites (p. 34).

Streamflow Regime

Under the no action alternative, water flow volumes (on the rare occasions when flow occurs) would remain effectively unchanged over the short term. Existing roads would continue to support the potential for increased water yield and delivery from roadways. Potential peak flows would remain at a higher level than they would be without a road network, and the timing of those flows would continue to be accelerated.

Timber harvest and other vegetation management proposed under the action alternatives are not expected to increase flow volume. Regeneration and accelerated growth of remaining vegetation would balance the water equation for the area. Decommissioned roads would no longer contribute to higher runoff volumes or accelerated water delivery.

Water Quality

Under the no action alternative, existing roads would continue to contribute sediment to the drainage network. Where surface water is present, current water temperature and dissolved oxygen conditions would generally persist.

With implementation of mitigation measures and BMPs, the action alternatives would have no significant effects on water quality. Streams, springs and some ephemeral draws would be buffered from activities using streamside management zones and vegetation buffers. Disturbed sites would be seeded to prevent harmful runoff and sedimentation. Road decommissioning, disturbed area rehabilitation, and stream crossing improvements may contribute to short-term sediment increases in the drainage network, but would result in a long-term decrease. Neither action alternative is expected to have an effect on dissolved oxygen, pH, or water purity.

Channel Morphology

No new effects on channel morphology would take place under the no action alternative. The few stream channels that exist and are unstable would gradually stabilize without further disturbance. Existing road/stream crossings that affect channel morphology would continue to do so. Stream channels would continue to adjust to the increased water yield, sediment loads, elevated peak flows, and accelerated peak flow timing created by the current road system.

Increases in peak flow and subsequent changes in stream morphology would not be expected to result from the timber harvest or fuel treatments proposed under either action alternative. Proposed activities would not be expected to significantly alter stream channel dynamics. Decommissioning of roads would reduce higher runoff volumes and accelerated water delivery caused by the road network; these reductions would result in a more stable flow regime and reduced risk of significant channel readjustment following flood events.

Floodplains

The no action alternative would cause no new effects on floodplains. The action alternatives would have no significant effects on floodplains. No new roads would be built in floodplains, and effects from harvest activities would be mitigated (p. 34). Some roads located in floodplains would be maintained, reconstructed, or decommissioned. This would generally improve the condition of the floodplains.

Riparian Ecosystems

The no action alternative would cause no new effects on riparian ecosystems. Existing impacts from roads and past harvest activities would persist, and conditions around Guidinger Spring may improve or worsen depending on livestock use and vehicle traffic. Neither action alternative is expected to have any significant effects. Designation of protected streamcourses and use of appropriate design criteria would mitigate impacts from harvest activities. Road decommissioning and riparian restoration activities may result in short-term impacts, but long-term benefits of enhanced riparian conditions would be expected.

Wetlands

There would be no effects on the few wetlands in the area under any alternative. No activities are planned in wetlands. Activities planned in T51N, R60W, section 32 (just south of FSR 802.1) would avoid nearby small wetlands.

Cumulative Effects

The cumulative effects area for hydrology and soils is the 7th-level watersheds shown in Figure 9 on p. 49. Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47.

The no action alternative would not add to cumulative effects or cause cumulative effects to become significant.

The action alternatives are not expected to result in significant cumulative effects. Currently less than 15% of the soils in the area are disturbed (Nelson 2002); through the application of BMPs, total soil disturbance would remain under 15%. Proposed activities would be dispersed across the landscape and would take place over a period of several years, resulting in effects that would be well distributed both spatially and temporally.

Soils in the area have not been notably eroded or displaced by past activities. Streamflows, water quality, and channel morphology have seen little effects from timber harvest. BMPs are effective at preventing unacceptable watershed effects (Macy 1997, USDA Forest Service [8]). Proposed harvest activities conducted with BMPs would maintain or improve water yields and water quality in the analysis area.

Proposed road work would not result in significant cumulative effects. Road work would cause short-term effects on soils; bare earth would be exposed until revegetation has occurred. Long-term beneficial watershed effects would be expected from road maintenance and decommissioning. New road construction would take place on erosive soils, but the proposed construction areas are on ridgetops and potential watershed effects would be minimal with implementation of proper BMPs. This construction would result in a loss of productive soils of about 9 acres, or less than 0.05% of the total watershed area. Road decommissioning would return more acres to productivity than would be lost through road construction.

Disturbance to soils resulting from prescribed burning typically persists for no more than one season. Revegetation and freeze/thaw cycles break up small areas of bare

earth or hydrophobic soils. Mechanical fuel treatments disturb little soil since they are usually conducted using machines that drive over the slash they create.

Some private land units in the analysis area appear to have near 15% soil disturbance due to cattle grazing. On each watershed as a whole, however, grazing appears to have caused less than 15% disturbance. Most grazing occurs in open valley bottoms, so timber and fuel treatments do not occur on the same land units as heavy grazing, reducing the potential for significant cumulative effects.

Off-road vehicle traffic contributes to the level of disturbance in the area. Traffic of this type can increase the amount of bare, displaced soil and exposes soil to erosive weather conditions. Level of use has not been quantified but does not appear to currently be causing noticeable soil problems. Soil and watershed effects of off-road vehicle use would be monitored (Appendix C).

3.2.2 Transportation System

The transportation system is the subject of Issue 3. Issues are described on page 11.

A road analysis was completed for this project in 2002 (USDA Forest Service [9]) using direction in FS-643 (USDA Forest Service [10]). The final report from that analysis is contained in the project file.

There are almost 100 miles of classified (Forest Service system) roads in the project area on public land and on private land where permanent easement has been granted. There are also 33 miles of unclassified roads (generally unplanned roads not part of the Forest Service maintained road system). Density of all roads is currently 4.4 miles of road per square mile of land. Density of open roads is 3.57 miles per square mile. Table 15 shows existing travel management status of roads by classification.

Road Classification and Travel Management	Road Miles / % of total
Classified Roads	
Open Yearlong	71.57 (54%)
Open Seasonally	7.52 (6%)
Closed Yearlong	19.83 (15%)
Unclassified Roads	
Open Yearlong	24.82 (19%)
Open Seasonally	1.50 (1%)
Closed Yearlong	6.19 (5%)
Total	131.43 miles

Table 15. Existing road classification and travel management

Snowmobile trails run on 6.71 miles of system road. Most roads are currently open at least in summer to allow a variety of uses. Some other roads are closed with gates,

berms, or rocks, but a large percentage of the closures are not effective due to vandalism, poor design, or connections to open roads.

Alternatives 2 and 3 include road construction and reconstruction to accommodate planned harvest of timber stands. Slightly over 3.6 miles of new road would be constructed to reach currently inaccessible stands. About 6.5 miles of unclassified roads needed for future management would be added to the National Forest road system. All other unclassified roads would be decommissioned. Proposed transportation system changes are shown in Table 16 below and on the alternative maps (Figure 5, p. 22, and Figure 7, p. 26).

Travel Management Comparison
Miles

	Alt. 1	Alt. 2	Alt. 3
New roads constructed	0	3.61	3.61
Unclassified roads converted to classified	0	7.09	7.09
Roads reconstructed	0	63.40	63.40
Roads open summer only	9.02	12.22	9.00
Roads open year-round	80.18	44.66	52.62
Roads closed year-round (gated)	25.40	32.92	55.12
Roads closed year-round (in storage*)	0.62	35.80	17.53
Classified roads decommissioned	0	2.94	2.94
Unclassified roads decommissioned	0	19.73	10.70

*Roads in storage are closed using berms, rocks, slash, or other physical barriers rather than gates. The road prism is not removed.

Table 16. Travel management comparison

To comply with Management Area 4.1 direction, Alternative 2 would institute an area closure between FSR 803.1 (Surprise Gulch) and FSR 866.1 (Idol Gulch) (see Figure 2, p. 5). Under Alternative 3, FSR 819.1 would remain open, but the area closure would otherwise apply in MA 4.1.

Table 17 displays the changes in road density following implementation of each alternative. Alternative 1 shows the existing condition.

Proposed Changes to Road Density
Miles of roads per square mile of land (system and non-system roads)

	Alt. 1	Alt. 2	Alt. 3
Roads open summer only	0.29	0.39	0.29
Roads open all year	3.29	1.42	1.67
Roads closed all year	0.83	2.19	2.31
Total road density	4.41	4.00	4.27

Table 17. Road density comparison

Cumulative Effects on the Transportation System

Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47. The cumulative effects area is comprised of the 7th level watersheds that overlap the project area, as illustrated in Figure 9 (p. 49).

Since the 1870s, over 130 miles of roads have been established in the project area. Some of these roads were constructed by the Forest Service for management access, and others resulted from mineral exploration and settlement access. These actions have combined to allow motorized access to within a quarter mile of almost every acre in the project area, facilitating management but decreasing overall opportunities for unroaded recreation and quality of some wildlife habitat. Due to topography there are still areas to which inadequate access exists for timber harvest. The action alternatives would construct roads to reach some of the remaining inaccessible areas. In this way, the action alternatives would add to the cumulative effects of other actions in reducing the number and size of unroaded areas. No significant cumulative effects are expected.

In recent decades, closure of some damaged or unneeded roads has taken place, with varying degrees of success. Alternative 2 would restrict motorized travel on many roads and decommission unneeded roads. Alternative 3 proposed these actions to a lesser extent. Further road closures may take place as timber sales close and maintenance costs increase. The action alternatives would result in a decrease in road density and would decrease the overall cumulative effects of roads (see pp. 90 and 99).

3.2.3 Fire Hazard and Fuel Loading

The Revised Forest Plan directs that all wildfires in the project area be suppressed. The suppression objective for Management Area 5.1 is less than 5 acres, while in Management Area 4.1 the objective is less than 10 acres. Records of fire activity in the project area show that 55 fires occurred between 1970 and 2001. Seven of these fires were at least one acre in size. The largest fire was six acres and was human-caused.

Fire suppression and absence of prescribed fire have altered the fire regime in the project area, dramatically changing potential fire size, frequency, intensity, severity, and landscape patterns. On about 42% of the project area, forest stands include a component of fairly dense, young pine regeneration. Dense crown closure and low crown base heights in these areas can increase the chance of a surface fire turning into a crown fire. On 55% of the area, forest stands consist mainly of open pine with an understory of grasses, shrubs, and forbs. Crown fires are less likely in these areas, though fires are likely to occur more often with moderate intensity. Areas of aspen and birch tend to occur on moist, north-facing slopes, and fire behavior in these areas is characterized by a low rate of spread and low fire line intensity.

A heavy snowstorm in November 2000 affected about 1,000 acres in the project area. Damage to trees added 15 to 30 tons of fuel per acre to the existing load.

Direct and Indirect Effects on Fire Hazard and Fuel Loading

Alternative 1 (no action) would allow surface and ladder fuels to continue to build up. Fuel models show that continued accumulation of these fuels would increase the rate at which a fire would spread, flame length, and the likelihood of a crown fire. The

potential risk for loss of wildlife and plant habitat and visual quality would increase over time, along with risk to public and firefighter safety.

Alternative 2 would mechanically treat fuels on 821 acres and burn fuels on 1,793 acres, including 858 acres of moderate complexity burns. Stands would be thinned to raise crown heights, remove some of the ladder fuels, and reduce the potential for crown fires (Pollet and Omi 2000). Some of the thinning treatments would be followed by low-intensity underburning to maintain the gap in ladder fuels. The fuel reduction benefits of thinning treatments last longer when followed by prescribed fire, especially when fire is repeated at five- to seven-year intervals (Fiedler et al. 2001). Fire would also stimulate production of browse and forbs while killing decadent, ground-covering common juniper (Crane 1982, USDA Forest Service [5]).

The objective of other thinning treatments is to open the canopy to allow better ventilation in the event of a surface fire, reducing scorch and mortality in residual trees. Resulting slash must be removed or chipped for this treatment to be effective.

Tree tops and other debris in stands damaged by snow would be treated mechanically, by hand, or with prescribed fire, depending on the volume of fuel and conditions such as slope. These treatments would reduce fireline intensities and potential for stand-replacing wildfire.

Alternative 3 would use prescribed fire on 1,019 acres, of which 84 acres would be moderate complexity burns. Broadcast burning treatments that would follow mechanical treatment under Alternative 2 are not included in Alternative 3. While mechanical treatment alone would reduce some of the ladder fuels that contribute to crown fire initiation, this effect would be of shorter duration than if used in conjunction with prescribed fire. Browse production would increase less, and fewer ecological benefits would be realized. More roads would remain open yearlong or seasonally and fewer roads would be closed with barriers as opposed to gates, allowing easier access for potential fire suppression and thus reducing initial attack response times. Conversely, more access would increase the potential for human-caused fires relative to Alternative 2.

Cumulative Effects on Fire Hazard and Fuel Loading

Past, current, and reasonably foreseeable future actions in the cumulative effects analysis area are described on page 47. The cumulative effects area is comprised of the 7th level watersheds that overlap the project area, as illustrated in Figure 9 (p. 49).

Fire hazard and fuel loading have changed considerably since pre-settlement times (USDA Forest Service [2]). Generally, suppression of fire over the last century resulted in a more continuous forest. Though timber harvest reduced fire hazard where dense stands were thinned, lack of low-intensity fires often resulted in a buildup of naturally occurring fuels. Current standards require reduction of excess fuels resulting from timber sales. Excess fuels outside timber sales have often been left in place due to lack of funding or emphasis, but the National Fire Plan (USDA Forest Service [7]) provides focus on treatment of these natural fuels. Development of private land continues to increase fire hazards and values at risk. The proposed actions would reduce fire hazards where timber harvest and fuel treatments take place, counteracting the cumulative effects of fire suppression in those areas.

3.3 Social Consequences

3.3.1 Recreation

A variety of dispersed motorized and non-motorized recreational activities take place in the Cement project area, including hunting, berry-picking, recreational driving, hiking, ATV and snowmobile riding, and visiting the Cement Ridge fire tower. There are no developed recreation facilities or hiking trails. A total of 7.61 miles of snowmobile trails exist, 6.71 miles of which are on roads. The snowmobile trails are maintained by the South Dakota State Snowmobile Association in cooperation with the Wyoming State Snowmobile Association. Some of the snowmobile trails cross private land under agreements that allow winter use only, and conflicts have arisen when ATV riders use the trails in summer, trespassing on private land.

Currently about 80 miles of road in the project area are open to motorized use year-round.

Direct and Indirect Effects

Under Alternative 1, recreational opportunities would remain unchanged. ATV use could increase due to the new State of Wyoming program or could become more concentrated in certain areas.

After implementation of Alternative 2, 45 miles of road would be open year-round for motorized use. Sixty-nine miles would be closed year-round. Roads not needed for long-term resource management and those causing unacceptable levels of resource damage would be decommissioned. Unclassified roads U725 and U763 would be decommissioned (see also Alternative 3, below). Plato Gulch (FSR 863.3A), currently open year-round, would be closed except in summer. Motorized travel in Management Area 4.1 (Figure 2, p. 5) would be prohibited, except for administrative uses such as fire suppression and timber harvest.

FSR 850.2, which drops steeply off the north end of Cement Ridge, would be narrowed to an ATV trail under both action alternatives. This rocky, narrow road is not suitable for passenger vehicles, would be difficult and expensive to improve, and is not needed for resource management. Maintaining it as a trail would retain a motorized recreation connection between Cement Ridge, the upper end of Pole Cabin Gulch, and the Tinton area.

Alternative 2 would have the greatest effect on drivers who have used these routes for many years. Hunters who have accessed favorite hunting grounds via these roads would need to walk further. The MA 4.1 Area Closure would increase walking distance both for hunting and retrieving game. Conversely, those hunters who prefer to walk would encounter fewer disturbances from motorized vehicles, reducing the potential for

conflicts between hunters. Those whose physical condition does not permit them to walk long distances would have access to less of the area, though many roads would still remain open.

These effects would depend on the effectiveness and enforcement of the closures. Lack of visible law enforcement or closure maintenance may encourage violations. The objective of site-specific design features (p. 31) is to increase effectiveness of closures.

Proposed timber harvest and fuel reduction activities could cause temporary disruptions to recreation. Roads used for log hauling would be busier than normal during harvest and follow-up activities. Prescribed burn areas would be temporarily closed for public safety reasons while activities are under way. These activities would change the appearance of parts of the project area (see Scenic Integrity, below).

Alternative 3 includes fewer road closures. Plato Gulch (FSR 863.3A) would remain open year-round. U725 and U763 would be added to the Forest Service road system and remain open year-round, though U725 would be re-routed to avoid the wet meadow. In Management Area 4.1, FSR 819.1 would remain open; off-road travel would be prohibited as required by Revised Forest Plan direction. Fifty-three miles of road would be open year-round and 73 miles would be closed year-round. There would be fewer effects on motorized use of the area. Disruption due to prescribed burning would occur in fewer areas.

Cumulative Effects on Recreation

The cumulative effects area for recreation is National Forest System land in the project area.

Construction and improvement of roads over the years has decreased opportunities for some types of non-motorized recreation, although roads also provide bike routes and easy access for non-motorized recreation. Road closure in recent years has had the opposite effect. The proposed actions would reduce cumulative effects on non-motorized recreation opportunities by closing additional roads. If effective, closure of Management Area 4.1 to all motorized use under Alternative 2 (and to off-road motorized use under Alternative 3) would greatly reduce the cumulative effects of roading on non-motorized recreation in this management area.

3.3.2 Minerals

There are no active mineral exploration activities in the project area. Mineral claims that exist to the north of the project area would not be affected by any of the proposed activities, including transportation system management. If closed claims become active again, they could be affected by proposed road closures.

3.3.3 Scenic Integrity

The landscape in the Cement project area generally appears natural. Visual evidence of timber harvest, recreational uses, and grazing is common but subtle. Suppression of wildland fires has resulted in a denser forest, which helps hide other activities (roads, vegetation management, mineral exploration and removal, vehicle access and movement) (USDA Forest Service [2]). Human alterations are generally not evident. The lookout tower structure on Cement Ridge is visible from major travel corridors, but is barely evident and is in character for a forested landscape. Most viewers probably do not perceive the extent of the vegetation management that has occurred since it is not readily discernable from adjacent areas.

The project area is visible in the background and on the skyline from Interstate 90, Wyoming State Highway 585, and Crook County Road 141. West sides of ridges, northwest-facing ridge noses, and ridgetops are visible from these travel corridors.

The area is characterized by rolling hills covered with ponderosa pine and mixed aspen/birch stands interrupted by meadows. During spring and fall, hardwoods present a flush of color that dominates the drainages within this landscape. Numerous rock formations in the area are the surface expressions of the limestone plateau. Human use is scattered throughout the area; most dispersed recreation occurs in the spring and fall during turkey, deer, and elk hunting seasons. Scenic integrity objectives in most of the project area are low to moderate. A small area with scenic integrity objective of high exists on Cement Ridge.

Direct and Indirect Effects

No direct effects would occur under Alternative 1. Existing conditions and natural processes of trees growing and regenerating would continue. Suppression of wildfires would continue to deny the natural role of fire in the landscape, and as a result ponderosa pine would continue to grow densely, reducing visible open space and moving the forest away from more open park-like stands.

Many of the harvest and fuel treatment units proposed under Alternatives 2 and 3 are adjacent to one another, in effect treating the area on a landscape basis. From a scenery standpoint this is generally a desired approach to treating an area, as it avoids creating a patchwork appearance on the landscape.

Generally the treatment units on the west-northwest sides of the ridges, ridge noses, and ridgetops would be the most visible. Most of the proposed treatment units in the eastern and central part of the project area are on these ridges. The majority of the treatment units that would be visible from major highways are commercial thins, shelterwood seedcuts, seedtree cuts, or overstory removals. Commercial thin treatment methods generally meet a moderate scenic integrity objective. Shelterwood seedcuts meet a moderate to low objective, while seedtree and overstory removal cuts generally meet a low objective when they are more than 10% larger than the existing natural openings or typical openings for this landscape. Because these treatments would mimic natural openings typical for this landscape (mitigation, p. 32), they would achieve a moderate scenic integrity objective.

These prescriptions would affect entire sides of ridges, primarily the northeast-facing landforms. Vegetation would change from dense stands with dark color and fine texture to open stands with a coarser texture. This change would be most evident when the ground is snow-covered. Seedcut, seedtree and overstory removal units would appear as large white linear forms with patches of dark vegetation and shadow. Mitigation and design criteria (p. 32, 35) would minimize the potential for these units to appear out of scale and character with natural vegetation patterns.

Leaving retention trees together in a clump can benefit the scenic resource. Leave-tree clumps help to shape the harvest units and mimic natural vegetative patterns similar to those found in the surrounding landscape. If only a seedling understory is left, the change would be visible to the average forest visitor from a middle ground because of the lack of vegetation, coarser texture, lighter colors and the possible formation of shadow lines between treated areas and adjacent stands of denser timber. As revegetation occurs, these units would have a finer texture and lighter green color than surrounding stands.

Prescribed fire would have an immediate effect on the landscape that would be evident in the form of fire-killed seedlings and saplings, red needles on lower branches of pole and mature trees, and some dead pole-size trees. The smaller trees killed by fire would be down and well into decomposition at the end of three years, thus meeting the scenic integrity objective of low to moderate when viewed in the foreground, depending upon the size of the burn unit. Pole-sized trees killed by fire generally remain standing for up to ten years and should meet the scenic integrity objective if the number of trees killed is at natural levels. Branches that are killed would have red needles for one to two years; after this point they would meet scenic integrity objectives and appear as a natural condition. Black scorch marks would be evident on the boles of trees but would fade over time, and after about three years would blend in and appear natural. When viewed as middleground and background, the majority of these effects would not be not evident. Overall appearance of the stands would be more park-like, with fewer young trees and a mature canopy. Hardwood shrubs stimulated by fire may provide additional visual diversity.

The proposed actions would meet a scenic integrity objective of moderate from middle ground and background viewing distances.

Mitigation listed on page 32 would minimize slash and ground disturbance seen from main travel routes and trails.

Cumulative Effects on Scenic Integrity

The cumulative effects analysis area for this resource is the project area, including both National Forest System lands and those under other ownership.

Past actions have resulted in a landscape of nearly continuous forest. Compared to much of the Black Hills, the project area has more visual variety provided by hardwood stands. Development of private land could alter the natural appearance of the landscape. Proposed actions would not cause significant cumulative effects to occur.

3.3.4 Heritage Resources

The project area includes two known Class I heritage sites (eligible to the National Register of Historic Places) that could be affected by proposed activities. Existing roads go through both sites and harvest is proposed adjacent to one of them. Plating the roads with filter cloth and gravel in the affected areas, timing road work in coordination with District archeologists, and avoiding harvest-related disturbance would prevent adverse effects on these sites (p. 28). Site-specific mitigation measures for these sites would be implemented as described in the Cement Project Area Heritage Resources report, located at the Bearlodge Ranger District office in Sundance, Wyoming. The State Historic Preservation Officer has concurred with the determination of No Effect.

Road closures proposed under Alternative 2 and to a lesser extent under Alternative 3 would reduce the potential for damage or looting of other heritage sites by decreasing motorized access.

Cumulative Effects on Heritage Resources

The cumulative effects analysis area for heritage resources is the project area, including both National Forest System lands and those under other ownership.

Many heritage resource sites have probably been lost over time to weathering, vandalism, unintentional damage, fire, and erosion. Sites on federal land continue to be at risk of destruction, and risk of vandalism and looting is likely to increase if human use of the area increases. Proposed road closures would reduce the cumulative effects of road construction, which provides easy access to heritage sites. Proposed actions would not affect known eligible or potentially eligible sites. Despite intensive surveys, there is always a chance that a heritage site was missed and could be damaged. If this were to happen, the project would add to cumulative effects. Protective measures (p. 28) would minimize the chances of extensive damage.

3.3.5 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. Between January of 2000 and March 2003, however, the average price was $157.40 per thousand. 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.

Economic analysis of Alternatives 2 and 3 using current stumpage rates indicates that costs would exceed revenue. The highest costs are associated with road construction and reconstruction, prescribed burning, manual fuel treatments, and precommercial thinning. Because Alternative 2 includes more prescribed burning than Alternative 3, benefit/cost ratio and present net value are lower. Low timber prices mean these

projects would cost more than the sale of commercial timber would bring in. If the same activities were proposed when timber sold for $228.00 per thousand, revenue would equal costs.

Various costs and benefits were not included in this analysis. Some of these, such as recreational activities, take place across the National 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 but 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 -$954,316.18 for Alternative 2 and -$665,339.26 for Alternative 3. Benefit/cost ratio is .60 for Alternative 2 and .69 for Alternative 3, indicating costs would exceed benefits.

Cumulative effects on economics

The cumulative effects analysis area for economics includes the counties overlapping the National Forest (USDA Forest Service [2]).

The Black Hills area economy was dominated by mining, timber harvest, and agriculture for many years. The region's economy is now well diversified (USDA Forest Service [2] p. III-473), 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.

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Not all team members served simultaneously.

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5 LIST OF AGENCIES AND PERSONS CONSULTED

The following agencies, organizations, tribal governments, and individuals were contacted during preparation of this environmental assessment.

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Black Hills Group Sierra Club
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Bureau of Land Management
Bush Ranches
Randall & Patricia Christensen
Crook County Commissioners
Crook County Land Use
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Wyoming State Forestry Division
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