DEAN PROJECT AREA

Final Supplemental Environmental Impact Statement

USDA Forest Service
Black Hills National Forest
Bearlodge Ranger District
Sundance, Wyoming

Commonly Used Acronyms and Abbreviations

ATV	All-Terrain Vehicle
BA	Basal Area
BCR	Bird Conservation Region
BF	Board Foot
BHNF	Black Hills National Forest
BLM	Bureau of Land Management
BMP	Best Management Practices
CAR	Community at Risk
CCF	Hundred Cubic Feet
CDA	Connected Disturbed Area
CEQ	Council on Environmental Quality
CF	Cubic Feet
CFR	Code of Federal Regulations
CMAI	Culmination of Mean Annual Increment
DBH	Diameter Breast Height
DEIS	Draft Environmental Impact Statement
DSEIS	Draft SEIS
EA	Environmental Analysis
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FS	Forest Service
FSEIS	Final SEIS
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
GIS	Geographic Information System
HUC	Hydrologic Unit Code
ID Team	Interdisciplinary Team
MA	Management Area
MBF	Thousand Board Feet
MIS	Management Indicator Species
MMBF	Million Board Feet
MPB	Mountain Pine Beetle
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NFSR	National Forest System Road
NOA	Notice of Availability
NOI	Notice of Intent
NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
PFC	Proper Functioning Condition
POL	Products Other than Logs
R2	Forest Service Region 2 (Rocky Mountain)
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SEIS	Supplemental EIS
SHPO	State Historic Preservation Office
SIO	Scenic Integrity Objective
SMU	Soil Mapping Unit
SOLC	Species of Local Concern
SS	Structural stage
SVS	Stand Vegetation Simulator
T&E	Threatened and Endangered
TCP	Traditional Cultural Property
TFB	Thin from Below
TSI	Timber Stand Improvement
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
WCP	Watershed Conservation Pratice
WUI	Wildland-Urban Interface

Dean Project Area
Final Supplemental Environmental Impact Statement
Crook County, Wyoming

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Abstract: The Bearlodge Ranger District of the Black Hills National Forest has prepared a Final Supplemental Environmental Impact Statement (FSEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. The Bearlodge Ranger District proposes to implement multiple resource management actions within the Dean project area as guided by the Black Hills National Forest Land and Resource Management Plan (Forest Plan) as amended and as supported by the National Fire Plan, the President's Healthy Forest Initiative, and other national policy. The focus of the actions proposed is modification of stand structure across the planning area in order to reduce the potential for uncharacteristically intense wildfire behavior, reduce fuel loads, modify stand density to reduce risk of insect outbreaks, and to benefit wildlife. The District also proposes to manage motorized access and motorized off-road use, allow better maintenance of the road system, and reduce existing soil and water damage. The proposal includes modification of the Forest Plan through a non-significant Amendment to change the Management Area (MA) designation in part of the project area to better reflect its actual conditions. Four alternatives are considered in detail. Alternative A is the no action alternative. Alternative B accomplishes fuel and fire hazard reduction while also increasing late succession habitat. This would be accomplished primarily through limited commercial thinning in variable densities among stands to increase growth and provide diversity. It also has a non-motorized use emphasis, with ATV use limited to a designated trail system. Alternative C is the proposed and preferred action. Fuel and fire hazard reduction would be accomplished through both commercial and non-commercial thinning plus extensive use of prescribed fire and mechanical fuels reduction. Management Area emphasis would be changed in a portion of the project area to better reflect the actual conditions. Off-road motorized use would also be prohibited in the project area to protect wildlife, but main system routes currently open would remain open. Alternative D addresses fuel and fire hazard reduction issues by constructing a system of fuels breaks along main system routes and along all private property borders and through non-commercial vegetation treatments. A variety of wildlife treatments would also improve forage and goshawk post-fledging areas. Recreation and travel use would be guided by Forest Plan standards and guidelines. This FSEIS discloses the direct, indirect, and cumulative environmental impacts resulting from the proposed action and alternatives.

Summary

The Black Hills National Forest, Bearlodge Ranger District proposes to implement multiple resource management actions within the Dean project area as guided by the Black Hills National Forest Land and Resource Management Plan (Forest Plan) as amended and as supported by the National Fire Plan and the President's Healthy Forest Initiative. The Dean project area covers approximately 12,468 acres of National Forest System land and approximately 2,356 acres of interspersed private land within the Redwater Creek watershed directly north of Sundance, Wyoming (see Map 1). Resource management actions apply to National Forest System (NFS) lands only and do not include private lands.

The focus of the proposed actions is to modify stand structure across the planning area in order to reduce the potential for uncharacteristically intense wildfire behavior and to benefit wildlife. This action includes thinning the forest, removing conifers from stands of hardwoods such as aspen, bur oak, and birch, and expanding and/or creating meadows. This action is needed to reduce the density of pine stands on a maximum of 5,730 acres to decrease the potential for spreading crown fires, increase tree growth and vigor, and lessen the risk of insect infestation and disease. This would be done by using commercial harvest to thin out merchantable trees and using other methods to thin small, unmerchantable trees. The actions would provide wood fiber to local industry and would require construction of up to six miles of new specified roads. Fuel loads would be reduced by decreasing the volume and arrangement of both existing fuels and those resulting from other vegetation treatment activities. Fuel treatments could include lopping, chipping, crushing, piling and burning, and prescribed burning on up to 3,494 acres.

There have been substantial changes on the Black Hills since the 1997 Forest Plan Revision and resolution of subsequent appeals. These changes include effects of wildfires, storm damage from a blizzard that occurred in 2000, and expanding insect infestations. Further, the total amount of biomass (small and large trees plus woody fuels) is increasing on the Forest.

Locally and nationally, the public is demanding that actions be taken to reduce the potential for large-scale wildfires on public lands. The National Fire Plan is one of a number of national policy documents developed to address this issue. In the Dean project area, the proposed action was developed to aggressively manage vegetation to minimize the potential for large-scale wildfires and risk of insect outbreaks. The primary focus is the removal of vegetation and associated fuels, thus reducing the unnaturally high concentration of biomass in the Forest. Ultimately, the intent is to limit effects of a large-scale wildfire to the environment and to reduce the potential for loss of property or life due to large-scale wildfire.

Comments on the proposed action, potential concerns, and opportunities for managing the Dean project area were solicited from members of the public, other public agencies, adjacent property owners, and organizations. Methods used to request comments included publishing a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* on Wednesday November 24, 2004, local newspaper articles advertising the project on November 10, 2004, and a scoping letter mailed to approximately 108 interested parties soliciting comments.

Comments received during the scoping process were used to help define issues, develop alternatives and mitigation measures, and analyze effects. Through review and analysis of the scoping comments and input, the Dean project area Interdisciplinary Team (ID Team) identified three prevailing or key issues related to the proposed activities: (1) Wildlife, (2) Travel Management/Recreation, and (3) Fuels.

These issues led the ID Team to develop alternatives to the proposed action. The alternatives analyzed in detail in this EIS are summarized below.

Alternative A (No Action) – The National Environmental Policy Act (NEPA) requires study and use of the no action alternative as a basis for comparing the effects of the proposed action and other alternatives. This alternative assumes no implementation of any elements of the proposed action or other action alternatives. The no action alternative represents making no attempt to actively respond to the purpose of and need for action or the issues raised during scoping for this project. For example, there would be no effort to modify existing vegetation or related fuels and habitat conditions in the project area. Actions such as ongoing Forest protection efforts and recurring road maintenance on system roads would continue as directed by the Forest Plan.

Alternative B – This alternative proposes a variety of commercial and non-commercial vegetation treatments along with prescribed burning to respond to the purpose of and need for action. Alternative B focuses on maintaining and increasing late succession habitat while reducing fuels and insect infestation risk. Density of thinned stands would vary in order to increase diversity among stands, improve wildlife habitat, and decrease bug and wildfire risk. Other treatments would promote development of late succession habitat by thinning from below to increase growth, vigor, and tree size.

In order to further protect wildlife and other resources, off-road motorized travel would be prohibited in the analysis area except snowmobile use on designated snowmobile trails and in a 200-foot buffer along these trails. The Truck Trail (part of NFSR 830.1; see Map 12) would be open in summer and fall to all-terrain vehicles (ATVs) and other motorized vehicles 50 inches or less in width. Construction of up to six miles of new roads would be necessary to implement proposed treatments. These roads would be closed to motorized vehicles following use for management activities.

Alternative B was developed in response to the view expressed by some during scoping that the project area does not contain enough late successional forest. Commercial timber harvest would be applied on fewer acres than under Alternative C or D and would consist primarily of commercial thinning to reduce stand density, along with a few seed cuts to provide earlier vegetation structural stages for wildlife foraging habitat. This alternative emphasizes moving existing stands toward late succession stages, and the use of commercial thinning to address fire hazard and fuels reduction needs. This alternative addresses the desire on the part of individuals and groups that feel non-motorized recreational use and travel should be emphasized in the project area.

Alternative C (Proposed Action) – Alternative C is the proposed and preferred action. This alternative would aggressively treat forest vegetation to reduce the fire and fuels hazards that currently exist in the project area. This action was developed and refined in response to National direction developed to support efforts in reducing the potential for catastrophic wildfire in fire-adapted ecosystems (e.g., ponderosa pine). This alternative would modify stand structure across the planning area to reduce the potential for uncharacteristically intense wildfire behavior, reduce fuel loads, reduce the risk of large insect outbreaks, and to provide for diverse wildlife habitat. A variety of vegetation management tools, including commercial timber harvest, would be used to thin and open dense ponderosa pine stands in the project area to reduce the risk of insect outbreaks and crown fire hazard. By strategically locating mechanical fuel treatments and broadcast burning across the landscape, the continuity and density of fuels would be modified to reduce the risk of catastrophic wildfire while at the same time providing cover and structural diversity for the benefit of a variety of wildlife species. Patch cuts would also provide small openings across the planning area in order to provide forage for various wildlife species. Construction of up to six miles of new roads would be necessary to implement the proposed treatments. Harvest methods would include both ground-based and cable systems.

Off-road motorized travel would be prohibited in the project area, but main system routes currently open to vehicle traffic would remain open. Newly constructed roads would be closed to motorized vehicles following use for management activities.

A one-time, site-specific Forest Plan amendment would be required in order to change the Management Area (MA) designation in a portion of the project area from 5.4 (big game winter range emphasis) to 5.6 (forest products, recreation, and big game emphasis). The new designation would better reflect actual wildlife use of the project area.

Alternative D – This alternative emphasizes reduction of fuels and fire hazards by focusing treatments near private lands and along main travel routes. Alternative D was designed to address the purpose and need for fire and fuels reduction along with wildlife habitat improvement in accordance with Forest Plan standards and guidelines. Fuel reduction would be accomplished through both mechanical means and extensive broadcast burning. A system of fuel breaks would be constructed within ¼ mile of private property and along arterial roads. Patch cuts and reduction of encroaching pine would provide a variety of habitats for wildlife. Commercial timber would be a by-product of fuel breaks, patch cuts, and pine encroachment cuts.

Alternative D was developed in response to the view expressed by some during scoping that fire hazards and fuels reduction can be accomplished with limited or no use of commercial timber harvest. No new roads would be constructed, but existing roads would be maintained at a level appropriate to carry out fuel reduction objectives. Recreation and travel use would be guided by current Forest Plan standards and guidelines. Areas currently open to off-road motorized vehicles would remain open.

The public and decision maker can compare the alternatives based on specific measurement indicators developed for each issue. The table below provides a comparative display of the alternative effects and/or outputs relative to the key issues in the Dean project area.

Effects on Key Issues by Alternative				
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**
Fuel and Fire Hazard Reduction				
Issue Indicators				
Crown Fire Hazard – Active	433 acres	334 acres	138 acres	181 acres
Crown Fire Hazard – Passive	3,822 acres	3,241 acres	1,610 acres	1,621 acres
Crown Fire Hazard – Conditional	161 acres	62 acres	36 acres	101 acres
Fuel Breaks – Constructed	0	0	0	3,592 acres
Prescribed Burning	0	549 acres	2,764 acres	2,764 acres
Travel Management and Recreation				
Issue Indicators				
All Roads	102.62 miles	82.48 miles	83.78 miles	77.78 miles
Roads Open Year-Round	31.17 miles	30.13 miles	30.13 miles	29.93 miles
Percent of Project Area Open to Off-Road Motorized Use	81	0	0	81
ATV Trails	0	6.57 miles	0	0
Wildlife Habitat				
Issue Indicators				
Pine Structural Diversity				
Grass/forb Structural Stage	212 acres	299 acres	299 acres	274 acres
Seedling/sapling Structural Stage	68 acres	68 acres	1,789 acres	6 acres
Dense, Mature Forest	1,274 acres	660 acres	582 acres	782 acres
Late Succession Forest	382 acres	382 acres	382 acres	292 acres
Late Succession Enhancement Actions	0	1,013 acres	0	0
Spatial Distribution	See Maps 5-8, end of document			
Enhancement Actions in Aspen	0	69 acres	69 acres	69 acres
Enhancement Actions in Oak	0	55 acres	55 acres	55 acres
Enhancement Actions in Riparian	0	376 acres	376 acres	376 acres
Snag Density	No snags cut	No snags cut except where necessary for safety reasons		
Density of Open Roads (Miles per Square Mile), Winter	1.35	1.30	0.45	1.29
Disturbance of Security Habitats	Most open roads, no new off-road restrictions	Lower open road density, off-road motorized use restricted		No new off-road restrictions
Connected Disturbed Areas (contributing sediment to aquatic habitats)	6	5 (length of each remaining CDA would decrease)	5 (length of each remaining CDA would decrease)	4 (length of each remaining CDA would decrease)

The Dean project purpose and need statement provides the focus and scope of the proposal as related to national and Forest-level policy and direction. Given this purpose and need, the Responsible Official (Forest Supervisor) will review the proposed action, the issues identified during scoping, the alternatives, and the environmental consequences of implementing the proposal and alternatives disclosed in this EIS. This forms the basis for the Responsible Official to make the following determinations:

- Whether the proposed activities and alternatives address the issues, are responsive to National policy/guidance and direction in the Forest Plan, as amended, and meet the purpose of and need for action in the Dean project area;
- Whether the information in this analysis is sufficient to implement proposed activities;
- Which actions, if any, to approve; and
- Whether to amend the Forest Plan to change Management Area designation in part of the project area.

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1 PROPOSED ACTION AND PURPOSE OF AND NEED FOR ACTION

1.1 Document Structure

The Bearlodge Ranger District of the Black Hills National has prepared this Supplemental Environmental Impact Statement in compliance with the National Environmental Policy Act and other relevant federal and state laws and regulations. This FSEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into eight chapters:

Chapter 1. Proposed Action and Purpose of and Need for Action: The chapter includes information related to the background of the project proposal, the purpose of and need for the project, and a description of the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2. Alternatives: This chapter provides a more detailed description of the proposed action and alternative methods for achieving the stated purpose. These alternatives were developed based on key issues raised by public comments, by other agencies, and internally. Chapter 2 also provides a discussion of proposed design criteria, mitigation measures, and monitoring. Finally, this section includes summary tables displaying the activities planned by alternative and a comparison of the alternatives' response to the key issues.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. The analysis is organized by resource area. (Fire and Fuels, Recreation and Travel Use, Wildlife Habitat, Watershed and Soils, etc.)

Chapter 4. Index: The index provides page numbers by document topic.

Chapter 5. Bibliography: The bibliography provides a list of references supporting the documentation in the EIS.

Chapter 6. Glossary: The glossary provides a list of key words, acronyms and terminology used throughout the EIS.

Chapter 7. List of Preparers: Information on those who conducted the analysis documented in this EIS.

Chapter 8. List of Agencies, Organizations, and Persons to Whom the Statement is Sent: This chapter provides a list of those to whom the statement will be sent.

Appendices: The appendices provide more detailed information to support the documentation and analysis presented in the EIS.

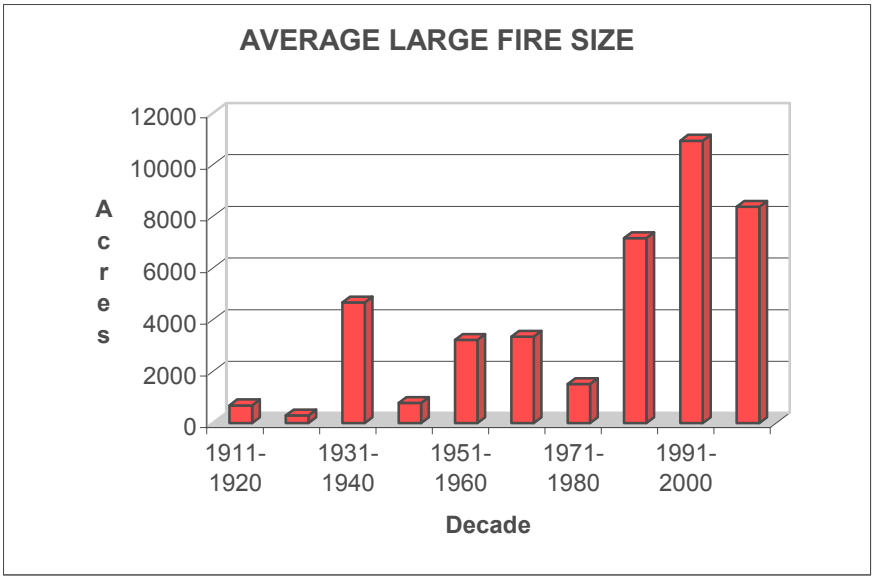
Additional documentation, including more detailed analyses of project-area resources, may be found in the Project File located at the Bearlodge Ranger District office in Sundance, Wyoming.

1.2 Background

The Black Hills National Forest has seen some eventful changes in the last decade. These include the amount of land affected by wildfires, storm damage from hail and heavy snow, and expanding insect infestations. Further, the total amount of biomass (small and commercial size trees) continues to increase. Ponderosa pine is the predominant tree species on the Forest and in the Dean project area, and the area is a classic fire-adapted ponderosa pine ecosystem. For decades the management emphasis in this area has been suppression of all wildfires, minimal prescribed burning, vegetation management for sustained growth and yield of timber, and providing wildlife habitat. Analysis of existing conditions indicates there is potential for high intensity, stand-replacing wildfires. These fires can have a significant impact on the environment, economy and people.

The development of continuous forest with few openings has facilitated the recent large, intense forest fires in the Black Hills. The number of fires has remained fairly constant over time at 65-130 starts per year and the number of wildfires escaping initial attack has also remained constant; however, these "escaped" fires have recently become larger and more difficult to control. Average size of fires over 300 acres in size has increased from less than 1,000 acres per fire in the early 1900s to over 8,000 acres per fire in recent years, as illustrated in the figure below.

Figure 1-1 Average Acreage of Large Fires in the Black Hills (1911 – 2000)



From 1900 to 1980, large fires (those greater than 300 acres) burned about 147,900 acres in the Black Hills. Since 1980 a dramatic increase in acreage burned has occurred. Wildfires that have occurred in the last 20 years, including but not limited to Jasper, Battle Creek, Little Elk, Roger's Shack, Elk Mountain II, Grizzly Gulch, Flagpole, Galena, and Westberry Trails, have burned approximately 238,500 acres.

Many people who live and work in the Black Hills have become increasingly concerned about the frequency and magnitude of wildfires. Issues such as drought, forest conditions that resist fire control, suppression response times, and risk and safety as related to people and property continue to be topics of discussion, concern, and debate locally. These issues have understandably been elevated to a higher level of concern with the local public considering the massive wildfires that occurred throughout the West recently, and certainly within the Black Hills. The prevailing public attitude, and that of local, state, and federal politicians, is that the Black Hills National Forest has not done enough to address fire and fuels risks on National Forest lands. This point of view is supported and amplified at the national level through a series of initiatives and streamlining of processes related to fuel and fire hazard reduction. The resounding message conveyed by the public during the public involvement phase of this project was the need for action regarding the critical fuels and fire hazards situation in this area. Recent large-scale wildfires, issues raised by the public, the current drought, and the high risk of crown fires in the Dean project area are compelling reasons to make fire and fuels hazards reduction a primary management goal in this area. Fire hazard reduction and minimizing the potential for large-scale wildfires has become the dominant management emphasis.

Locally and nationally, the public is demanding actions to reduce the potential for large-scale wildfires on public lands. The National Fire Plan and other initiatives were developed to address this issue. The administration advocates an aggressive approach to the problem, and this approach is supported by congressional mandate for collaboration and coordination between responsible agencies, Western governors and others in implementing efforts to reduce the risks associated with wildland fire across the landscape.

In an effort to address these issues in the Dean project area, the proposed action was developed to aggressively manage vegetation to minimize the potential for large-scale wildfires. Specifically, the primary focus is to reduce the potential for uncontrolled crown fire spread within the analysis area and to nearby private property by removing vegetation to reduce fuel loads and fuel continuity and reduce the unnaturally high concentration of biomass in the Forest.

The Dean project area is located on National Forest System lands 7.5 miles north of Sundance, Wyoming in the Bear Lodge Mountains (Map 1). Because of its proximity to Sundance, Gillette, and Newcastle, Wyoming, and several towns in western South Dakota, the project area is a popular recreation destination. The project area contains approximately 10 miles of snowmobile trails, which are open seasonally from December 15 to March 31 and are a popular draw to the area for winter recreation. In addition, the Rednose motorized vehicle closure area on the east side of the project area along Redwater Creek is a popular hunting destination.

Cook Lake, a developed recreation site surrounded by a non-motorized recreation management area, is located just to the west of the Dean project area. Cook Lake is one of the most popular recreation destinations in the Bear Lodge Mountains, offering RV and tent camping and hiking trails. It is a popular draw for ATV users for camping and access to Forest system routes and off-road opportunities in the area, especially on the nearby Truck Trail. The main travel routes within and near the project area include Wyoming Highway 24, Interstate Highway 90, Redwater Road, and Forest Service Road 830. These roads receive heavy hunter traffic in the spring and fall.

Travel and access needs are both linked to recreation use within the project area. The amount, location, and type of roads and trails as well as areas open and closed to off-road motorized use within the area directly affect recreation use.

Recreation use in the area continues to grow, as do conflicts between motorized and non-motorized users. Heavy use sometimes results in trash dumping, illegal fires, vandalism, and negative effects to natural resources, including erosion. Motorized travel restrictions can be difficult to enforce. There are opportunities to reduce conflicts among users, improve the effectiveness of travel management restrictions, and minimize negative effects.

Project History
The Dean project was initially analyzed and released for public comment in early 2005. On May 24, 2005, the acting Forest Supervisor signed a Record of Decision implementing Alternative C with modifications. An administrative appeal was filed and the Regional Forester reversed the decision based on insufficient documentation of compliance with amended Forest Plan direction regarding soils and watershed cumulative effects. This FSEIS reflects changes made in response to the appeal decision. This analysis also incorporates direction found in the Phase 2 Amendment to the Forest Plan, which was not in place at the time of the previous analysis and decision.

1.3 Management Direction

1.3.1 Forest Plan Direction

The Forest Plan, as amended, supported by the FEISs for the revision and the Phase 2 Amendment (USDA Forest Service 1997, 2005), is the Forest programmatic document required by the rules implementing the Forest and Rangeland Renewable Resources Act of 1974 (RPA) as amended by the National Forest Management Act of 1976 (NFMA). The purpose of the amended Forest Plan is to provide direction for the multiple use and sustained yield of goods and services from National Forest System lands in an environmentally sound manner. The amended Forest Plan provides overall goals and objectives (Chapter 1) as well as associated standards and guidelines (Chapter 2) for management.

The Phase 2 Amendment to the Forest Plan (USDA Forest Service 2005c) was approved October 31, 2005. The amendment provides additional direction related to species viability and management of risk of fire and insect infestation.

The Forest Plan, as amended, establishes 11 goals and associated objectives for multiple-use management of the Forest. Goals 1 through 4 and Goal 10 address natural resource objectives for multiple-use management of the Forest. Goals 3 and 5 through 9 provide socioeconomic emphasis for management of the Forest. **Goals and objectives, applicable to specific resource management issues needing resolution, provide the basic direction for defining the purpose and need and ultimately developing the proposed action (Alternative C).** Amended Forest Plan goals are discussed in Chapter 1 of the Forest Plan. Goals 1 through 4, 7 and 10 provide management emphasis and direction for the Dean project:

Goal 1. Protect basic soil, air, water, and cave resources.
Goal 2. Provide for a variety of life through management of biologically diverse ecosystems.
Goal 3. Provide for sustained commodity uses in an environmentally acceptable manner.
Goal 4. Provide for scenic quality, a range of recreational opportunities, and protection of heritage resources in response to the needs of the Black Hills National Forest visitors and local communities.

Goal 7. Emphasize cooperation with individuals, organizations, and other agencies while coordinating planning and project implementation.

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

Chapter 3 of the amended Forest Plan also sets management allocations for specific uses of land (Management Areas) within the Forest to meet multiple-use objectives. The Dean project area is currently assigned to MA 5.4, Big Game Winter Range emphasis. The Dean Project ID Team reviewed MA direction and confirmed that new information indicates that the lower elevations and south aspects on the east side of the project area currently provide appropriate and important big game winter range habitat and are generally used as such. The remainder of the project area, however, is primarily used by big game only during the spring, summer, and fall (calving and fawning areas). A change of this part of the project area to MA 5.6 would better reflect big game utilization and non-motorized recreation opportunities such as those provided by the existing Rednose walk-in hunting area.

1.3.2 Other Direction Specific to Fire and Fuels Management

As a result of the substantial increase in stand-replacing wildfire occurring across the West, a number of new and revised national initiatives and policies regarding fire and fuels management have been generated. The main focus of this direction is to reduce the probability and occurrence of stand-replacing wildfire in fire-adapted ecosystems, especially near private property. This national emphasis further supports and affirms the need to address amended Forest Plan goals and objectives regarding fuels and fire hazard reduction to minimize the potential for high intensity, stand-replacing wildfire in the Dean project area. Below is an overview of a number of key initiatives and policy statements that have evolved in recent years.

National Fire Plan—Managing the Impact of Wildfires on Communities and the Environment (September 2000). This plan is the result of an August 2000 directive by then-President Clinton to the Secretaries of USDA and USDI to develop a response to severe wildland fires, reduce fire impacts on rural communities, and ensure effective firefighting capacity in the future. The focus of this plan is the tactical undertaking of operational and implementation activities. A major feature of the plan is the federal and non-federal interagency cooperation in risk reduction planning and implementation.

Federal Wildland Fire Management Policy (January 2001). This is a review and update of the 1995 Federal Fire Policy. It provides the philosophical and policy foundation for federal interagency wildland fire management programs and activities, including those conducted under the National Fire Plan (such as hazardous fuel reduction). In summary, the policy states that "…federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability."

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment—10-year Comprehensive Strategy (August 2001) and Implementation Plan (May 2002). The strategy provides goals and guiding principles for implementation of the National Fire Plan. The plan establishes a collaborative, performance-based framework for

achieving these goals and reducing the risks of wildland fire across the landscape. The plan represents a unified national commitment endorsed by the Secretaries of USDA and USDI, governors, tribes, local officials, and others.

Restoring Fire-Adapted Ecosystems on Federal Lands—A Cohesive Fuel Treatment Strategy for Protecting People and Sustaining Natural Resources (August 2002). A strategy for USDA and USDI agencies that aligns resource and fire programs for the common purpose of reducing risks to human communities and to restore and maintain fire-adapted ecosystems. This provides a unified approach to meeting the goals of the "10-Year Comprehensive Strategy and Plan" of May 2002. Common priorities for fuel treatment are established that provide the ability to address fuel hazards and land health. Implementation of this framework would reduce risk and consequences of unwanted wildland fire to communities and ecosystems while simultaneously providing forest products and biomass energy production opportunities.

Healthy Forests, An Initiative for Wildfire Prevention and Stronger Communities (August 2002). Presidential direction to the USDA, USDI, and CEQ to improve processes needed to reduce the risk of catastrophic wildfires by restoring forest health. The "Healthy Forest Initiative" directs agencies to implement core components of the National Fire Plan's 10-year Comprehensive Strategy and Implementation Plan. As part of this initiative, the Forest Service and BLM have developed, jointly and separately, several new categorical exclusions and guidance to streamline environmental assessments and have taken other actions to facilitate more rapid analysis and decision-making for fuel hazard reductions and insect/disease problems.

National Fire Plan for the Rocky Mountain Region (October 2002). Provides guidance for implementation of the National Fire Plan with the goal of reducing the potential for severe, uncontrollable wildland fires through a sustained program of fuels treatment and increased fire management capabilities within the Rocky Mountain Region of the Forest Service.

Memorandum of Understanding for the Development of a Collaborative Fuels Treatment Program (January 2003). Process for the Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, National Association of State Foresters and National Association of Counties to collaborate on fuels treatment work within their respective jurisdictions to provide for community protection and enhance the health of forests and rangelands. This process is guided by the goals, performance measures and collaborative framework outlined in the 10-Year Comprehensive Strategy and Implementation Plan endorsed by these parties on May 23, 2002. Fuel treatments are to be coordinated across ownerships and jurisdictions and prioritized 1) in the wildland-urban interface and 2) outside the wildland-urban interface that are in Condition Classes Two and Three as defined in the 10-Year Plan.

1.4 Purpose Of and Need for Action

The purpose of and need for action in the Dean project area is to reduce the risk of uncharacteristically intense wildfire behavior and mountain pine beetle infestation and to improve terrestrial and aquatic habitats.

The Responsible Official for the Dean project has chosen to propose resource management actions that respond to amended Forest Plan goals 1, 2, 3, 4, 7, and 10, as well as the national emphasis on reducing the potential for stand-replacing wildfire. Associated with these goals are specific resource objectives. Certain of the objectives are key to defining the purpose and need and developing the proposed action. Objectives providing management emphasis for this project are summarized below. Note that other amended Forest Plan goals and objectives not mentioned below also provide guidance and are achieved to varying degrees depending on project accomplishment (see the Forest Plan as amended, Chapter 1).

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.*

Sedimentation has occurred in locations on some streams in the project area due to off-road motorized vehicle use and damaged or inadequate drainage structures on existing roads. This project provides opportunities to maintain and improve stream health by repairing, reconstructing, re-routing, or closing roads.

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

Use of motorized vehicles in wet areas is not a widespread problem in the Dean project area, but there are opportunities to improve wetland and riparian condition in the limited locations where damage has occurred.

Objective 108: *Manage for sustained or improved water flows.*

Perennial streams in the project area include Cow Creek and the North and Middle Forks of Redwater Creek. There are opportunities to sustain water flows through management of upland vegetation.

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

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

National Forest System lands in the project area include approximately 771 acres of aspen forest, 692 acres of paper birch, 933 acres of bur oak, and 51 acres of willow. Some aspen stands are declining due to competition with pine. An opportunity exists to remove pine from these stands to reduce competition and rejuvenate the aspen component.

Objective 203: *Manage 30 to 50 percent of each bur oak stand for 100-plus year old trees.*

The project area includes 933 acres of forest dominated by bur oak. Parts of some oak stands have stagnated as oak brush. An opportunity exists to favor tree-form oak and manage stands for older trees.

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

The project area includes 692 acres of forest dominated by paper birch, often with a hazelnut understory. An opportunity exists to conserve these stands.

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

The project area includes 208 acres of meadow. Meadows provide unique habitats not found elsewhere within the forested ecosystem. Many of these meadows are becoming overgrown by ponderosa pine and in some cases bur oak and aspen. Without treatment, meadow habitat will eventually disappear. There is a need to remove pine from meadows to increase and enhance this habitat.

Objective 211: *Within a management area in conifer forested portions of the Forest, provide an average of 3 hard snags greater than 9-inch dbh and 25 feet high per acre, well dispersed across the forest, 25 percent of which are greater than 14" dbh.*

Snag data in the project area are incomplete. Field visits suggest that there are numerous snags of various sizes distributed across the project area. There is a need to provide snags for associated species and ecological processes and an opportunity to do so by leaving existing snags, providing a range of forest structures, and through application of prescribed fire.

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

Visual reconnaissance indicates the majority of the project area's stands are contributing towards this objective. There is an opportunity to continue to provide down woody material, though objectives for reducing fuel loading may limit down woody material in some locations.

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

Riparian areas in the project area are associated with Cow Creek, Redwater Creek, Hemler Dam, Redwater Pond, and parts of intermittent streams. Some riparian areas have become overgrown with pine. There is an opportunity to improve riparian vegetation community conditions by removing pine. Enhanced hardwood vegetation could encourage beaver occupation, which would improve riparian conditions by raising the water table.

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

The project area provides habitat for game species such as deer, elk, and wild turkey. Fish-bearing streams or lakes in the project area include Cow Creek, Middle Fork of Redwater Creek, Redwater Pond, and Hemler Reservoir. Management practices that can adversely affect fish include livestock overgrazing in riparian zones, channelization, and sedimentation from roads or other ground disturbing activities. Moderate open road density and lack of forage in forested areas currently compromise habitat values in the project area for deer and elk. There is an opportunity to increase habitat values by closing roads and creating forage through timber cutting, prescribed fire, and other actions.

Hemler Reservoir and Redwater Pond are filling in due to sediment accumulation, reducing their water storage capacities. There is concern that further sedimentation, combined with drought conditions, would decrease water volumes and increase water temperature in the reservoir, negatively impacting the fish population. In addition, the spillway for Hemler dam was damaged by flooding in 1995, and additional damage to the spillway could undermine the entire structure and water impoundment. There is a need to clean out or dredge Hemler Reservoir and repair the spillway, and to dredge Redwater Pond to maintain and enhance habitat for waterfowl and a variety of other species.

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 R2 sensitive species and species of local concern (SOLC).*

The bald eagle is the only threatened, endangered, or proposed species known to use the general area. This species has been observed in the project area in winter. No other threatened, endangered, or proposed species or their critical habitats are known to exist in the project area. Six animal species and one plant species listed by the Rocky Mountain Region of the Forest Service as sensitive are documented in the project area. Habitats for other sensitive species, species of local concern, and management indicator species exist in the project area. There is a need to conserve or enhance habitats for these species and an opportunity to do so through thinning, fuel reduction, prescribed fire, and changes to the transportation system.

Objective 230: *Eradicate or limit spread (acres) of new introductions of non-native pests (insects, diseases, plants) to minimize ecosystem disruption.*
Objective 231: *Prevent new infestations and manage to reduce established noxious weed infestations. Treat at least 8,000 acres per year during the next ten years to limit noxious weed infestations.*

There are currently infestations of several non-native, invasive weed species in the project area. Ground-disturbing activities associated with the proposed activities may increase susceptibility to invasion and spread of noxious weeds. There is an opportunity to reduce the risk of introduction

and spread of noxious weeds through application of standard resource protection, mitigation, and monitoring measures designed to prevent, detect, and eliminate noxious weed infestations.

Objective 234: *Create or maintain a moderate-to-low crown-fire hazard adjacent to occurrences of R2 sensitive and species of local concern plants and botanical areas bordered by continuous, dense conifer stands where long-term persistence is at risk from a single high-intensity fire.*

Occurrences of one R2 sensitive plant species and one plant SOLC are found in the project area. The occurrences are found in wet drainages and are not at high risk from fire, but continued encroachment by pine would cause the risk to increase.

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

a. *Maintain or enhance habitat for ruffed grouse, beaver, song sparrow, grasshopper sparrow, white-tailed deer and brown creeper; as outlined in specific direction pertaining to aspen, other hardwoods, riparian areas, grasslands, spruce and ponderosa pine (e.g., Objectives 201, 205, 211, 239-LVD, 5.1-204).*
b. *Maintain habitat opportunities for black-backed woodpeckers across the Forest, as outlined in specific direction pertaining to conifer habitat, snags and recently burned habitat (e.g., Objectives 211, 11-03, 5.1-204, Standard 2301)*
c. *Maintain habitat for golden-crowned kinglets, as outlined in specific direction pertaining to spruce habitat (e.g., Objective 239-LVD).*
d. *Maintain or enhance habitat quality and connectivity for mountain suckers, as outlined in specific direction pertaining to aquatic resources (e.g., Objectives 103, 104, 215, Standards 1201, 1203, 1205, Guideline 1115).*

Habitat for ruffed grouse, beaver, song sparrow, grasshopper sparrow, white-tailed deer, brown creeper, black-backed woodpeckers, and golden-crowned kinglets exists in the project area. There are opportunities to maintain or enhance habitat for these species as described elsewhere in this section for the objectives listed above.

Management Area 5.4, Objective 206: *Manage for the following percentages of structural stages in ponderosa pine across the management area in a variety of sizes and shapes.*

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

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

This objective applies to MA 5.4 across the Forest. There is an opportunity in the Dean project area to contribute towards meeting this objective on a Forest-wide basis.

Management Area 5.6, Objective 204: *Manage for the following percentages of structural stages in ponderosa pine across the management area in a variety of sizes and shapes… (see figures listed for objective 5.4-206 above)*

This objective is included because part of the project area is proposed for reassignment to MA 5.6 under Alternative C. Objective 5.6-204 applies to MA 5.6 across the Forest. There is an opportunity in the Dean project area to contribute towards meeting this objective on a Forest-wide basis.

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

Objective 303: *Offer 838 million board feet (MMBF) of sawtimber and 21 million cubic feet (MMCF) of roundwood per decade [across the National Forest].*

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 (NFSRs) and two-track roads in support of long-term sustainable production of commodities [across the National Forest]. Road construction: 280 miles per decade; road reconstruction: 870 miles per decade; road obliteration: 140 miles per decade; and two-track obliteration: 270 miles per decade.*

There are about 73 miles of NFSRs and 30 miles of unclassified roads (two-tracks) on NFS lands in the project area. About 31 miles of roads are open to motorized vehicles year-round. Open road density is approximately 1.35 miles of roads per square mile of land.

The roads analysis process for the project area (Roads Analysis Report for the Dean project area, located in the project file) showed that there is a need for access to conduct management activities and allow motorized recreation, but there is also a need to reduce maintenance costs, sedimentation, disturbance of wildlife, and negative effects on non-motorized recreational opportunities. Thus, there is a need to improve some roads while closing or obliterating others.

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

Management Area 5.6, Goal 401: *Emphasize non-motorized recreational opportunities.*

This objective is included because part of the project area is proposed for reassignment to MA 5.6 under Alternative C. The part of the project area proposed for reassignment to MA 5.6 is mostly open to on- and off-road motorized travel at the present time. There is a need to reduce motorized use and increase opportunities for non-motorized recreation.

Management Area 5.4, Objective 207: *Manage for an open-road density of one mile of road per square mile or less for general public travel from December 15 through May 15.*

Winter open road density in the project area is currently about 1.35 miles of road per square mile of land. Although most of these roads are effectively closed by snow much of the winter, there is an opportunity to reduce open road density in winter.

Goal 7 – Emphasize cooperation with individuals, organizations and other agencies while coordinating planning and project implementation.

Objective 701: *Continue to cooperate with interested parties and organizations in the development of plans and projects.*
Objective 703: *Seek partnerships with other service providers…*
Objective 706: *Cooperate with federal, state, county, local and tribal governments, individuals, and organizations…*

There is a need to manage habitat for the benefit of big game and other species, and an opportunity to work with the Wyoming Game and Fish Department toward this end. There is a need to address the direction and guidance provided by the National Fire Plan, the 10-year Comprehensive Strategy, and the Healthy Forest Initiative. This project provides an opportunity to work with local officials and a variety of user groups and interested parties to address this national and regional direction, as well as amended Forest Plan goals, in an acceptable manner.

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

Objective 10-01: *Manage for 50- to 75- percent moderate-to-low fire hazard in the wildland-urban interface and reduce fire hazard within proximity of structures to current NFPA standards except in Management Area (MA) 1.1 Black Elk Wilderness, MA 2.2 Research Natural Areas, MA 3.1 Botanicial Areas, MA 4.2B Peter Norbeck Scenic Byway, and MA 5.4A Norbeck Wildlife Preserve. Manage the remainder of the Forest for 50 percent moderate-to-low except in MA 1.1 Black Elk Wilderness, MA 2.2 Research Natural Areas, MA 3.1 Botanical Areas, MA 3.7 Late-successional Forest Landscapes, MA 4.2 Peter Norbeck Scenic Byway, and MA 5.4A Norbeck Wildlife Preserve.*
Objective 10-04: *Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forest-wide Guideline 4110.*

There is as need to reduce the number of stands with high fire hazard to protect people, property, and resources. In the Dean project area, Fire Protection Assessment ratings of Risk, Hazard and Value are shown in **Table 3-6** and depicted in **Figure 3-7** (p. 3-37). Ninety-nine percent of the project area has a high hazard rating (high potential fireline intensities), but only a third is at high risk (higher probability of ignition). There are no high values in the area. Areas of high risk/high hazard are concentrated in the northern part of the project area. There is an opportunity to reduce fire hazard and fuel loading through vegetation management.

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

Mountain pine beetle incidence in the project area is currently at endemic levels, but infestation has killed numerous trees on and near Warren Peak approximately three miles southwest of the project area. Dense stands of ponderosa pine are at the highest risk of mortality by mountain pine beetle. Acres by risk class and year are shown on page 3-31 for the current condition and in 2025. There is an opportunity to decrease beetle risk in the project area through silvicultural treatments.

1.5 Proposed Action

1.5.1 Development of the Proposed Action

Development of the proposed action was strongly influenced by public involvement. Modifications to the initial proposal were made in terms of scale but not approach, and focused on meeting the purpose and need. Alternatives to the proposed action, as discussed in Chapter 2 of this EIS, were based on public input to provide different approaches to addressing the purpose and need. The intent was to provide a range of approaches and activities that the public and decision maker can compare and evaluate.

The initial proposed action was presented during the scoping period (see the Public Involvement and Scoping Section discussed later in Chapter 1). This proposal was based on the purpose of and need for action, which contained four elements: 1) reduce the potential for large-scale intense wildfire, 2) reduce fuel loads, 3) reduce risk of insect infestations, and 4) enhance wildlife habitat. The purpose and need has remained the same.

During the scoping period, feedback was received from the public both supporting and opposing the proposal. The public voiced concern about the risk of stand-replacing wildfire. Many who live and recreate in or near the area firmly support taking aggressive action to reduce fuels and wildfire hazard. The public is also very interested and concerned about opportunities available in the project area to recreate, including both motorized and non-motorized use. There is strong demand by the public for both types of use, which often have been and continue to be in conflict.

Strong public support was given to expanding thinning and fuels treatments, including some areas for treatment not covered initially. Of particular note was the desire on the part of some to increase vegetation treatment that would help reduce impacts of wildfire to private land. This included adding more thinning and fuels treatments in strategically located landscape fuelbreaks, and constructing more fuelbreaks immediately adjacent to private land and along the main arterial routes in the project area. This proposal was made part of Alternative D.

Motorized recreation users provided feedback advocating the desire for routes in the project area that would tie in with other areas on the Forest. In response, the ID Team proposed opening the Truck Trail to ATVs and other vehicles under 50” width from July 1 through December 15. This would provide a motorized route while protecting big game during calving and fawning seasons. System roads that are currently open would remain open to all motorized use. This proposal was included in Alternative B.

Scoping identified polarized opinions on the subject of off-road motorized travel. An advocate of this use expressed a desire for increasing the area open to ATVs and larger vehicles. Other forest users, agencies, and private property owners expressed a desire for more restrictions on motorized vehicles to reduce trespassing and wildlife disturbance. In response, the ID Team proposed an alternative that would maximize off-road travel, to the extent of the current condition (currently open to off-road motorized travel across the planning area with the exception of the Rednose walk-in hunting area), while reducing wildfire risk through prescribed burning, mechanical fuel treatments, and fuel breaks. This proposal was included in Alternative D.

A mountain-biking advocate expressed a desire for more non-motorized trails, including trails specifically for mountain biking to be created and maintained by users, that would connect existing trails such as the Sheepnose and Sundance trail systems to the Cook Lake recreational area. Additional analysis by the ID Team concluded that development of such a trail system was beyond the purpose and need of the Dean project, but could be analyzed in the future outside of the Dean project analysis.

The Wyoming Game and Fish Department expressed an interest in opportunities for expanding late successional forest, in part by thinning habitat structural stage (SS) 4C stands so that larger diameter trees can develop and eventually form late succession stands. In response to this, the ID Team added some of the recommended vegetation treatments to Alternative B.

During further evaluation of the existing conditions within the project area, the ID Team conducted additional detailed analyses that identified a need for soil and water resource protection projects within the project area. The soil and water resource protection measures were deemed appropriate for incorporation into all action alternatives.

The team identified an opportunity to improve wildlife riparian habitat by dredging and rehabilitating Hemler Reservoir and Redwater Pond. The team determined that these actions were needed as normal resource protection and enhancement measures and that incorporating these improvements would be compatible with the project's purpose and need. The reservoir rehabilitation actions are included in Alternative C, the proposed and preferred action.

In summary, regarding adjustments in the proposed action, the vegetative treatments are the same as initially proposed, but some new specified road construction was eliminated because of strong public scoping comments. The travel and recreation use approach is the same but some areas have changed in focus in response to public feedback.

1.5.2 Summary of Proposed Action

Below is a brief summary of Alternative C, the proposed action. This proposal and other alternatives are presented in more detail in Chapter 2.

Proposed activities include:

- Thinning ponderosa pine stands to reduce risk of fire and insect infestation
- Restoration of hardwood stands and meadows to enhance natural fuel breaks
- Low-density thinning of certain pine stands to create fuel breaks in strategic locations
- Piling, burning, and otherwise reducing the volume and continuity of fuels

- Enhancing wildlife habitat by creating forage and by closing certain roads and most off-road parts of the project area to motorized travel
- Reassigning parts of the project area from MA 5.4 to MA 5.6 to more accurately reflect their use by big game

Related activities include:

- Construction, reconstruction, and maintenance of roads for timber harvest and other activities
- Piling, burning, and otherwise reducing fuels created by vegetation treatments

1.6 Decision Framework

The Responsible Official will decide which actions, if any, to implement, and whether to amend the Forest Plan regarding Management Area. This decision will be based on:

- Whether the proposed activities and alternatives address the issues, are responsive to National policy/guidance and direction in the Forest Plan, as amended, and meet the purpose of and need for action in the Dean project area.
- Whether the information in this analysis is sufficient to implement proposed activities.

If an action alternative is selected, project implementation could begin in late 2006. Most actions would be accomplished within a decade. Certain actions (such as fuel break maintenance) could last longer.

1.7 Public Involvement and Scoping

Scoping is the process of obtaining public comments about proposed federal actions to determine the breadth of issues to be addressed.

Comments on the proposed action, potential concerns, and opportunities for managing the Dean project area were solicited from members of the public, other public agencies, tribal governments, adjacent property owners, interest groups, and Forest Service specialists. Various methods were used to request comments including:

- The Notice of Intent (NOI) to prepare an EIS was published in the *Federal Register* on Wednesday November 24, 2004. The NOI asked for public comment on the proposal through December 22, 2004.
- Local newspaper articles advertised the project on November 10, 2004. These articles introduced the project to the public readership by providing a description of the project area and an explanation of the proposal as well as soliciting comments on the project.
- A scoping letter was mailed to approximately 108 interested parties, including adjacent property owners on November 5, 2004. This letter included a description of the project area, an overview of the planning process, a general explanation of the proposed actions, and an invitation to comment.
- A Notice of Availability (NOA) of the original DEIS was published in the *Federal Register* on March 11, 2005. The NOA asked for public comment on the proposal through April 25, 2005. An amended NOA was published in the *Federal Register* on April 15, 2005, extending the comment period through May 2, 2005.

- A Record of Decision was signed May 24, 2005, by the Acting Forest Supervisor. An administrative appeal was filed and the Regional Forester reversed the decision.
- An NOA for the Draft Supplemental EIS was published in the *Federal Register* on February 24, 2006. The NOA asked for public comment on the proposal through April 11, 2006.
- Other information sharing, communication and interaction with interested parties, agencies, and individuals has occurred on a continuing basis during project planning.

1.8 Issues

Comments received during the scoping process were used to help define issues, develop alternatives and mitigation measures, and analyze effects. A total of 13 parties provided feedback via letters, faxes, public meeting transcripts, hand-delivery, or electronic mail during the formal scoping process. Through review and analysis of the scoping comments and input received, the Dean project area ID Team identified three prevailing or key issues related to the proposed activities. Comments received and the agency's responses to those comments are summarized in the Dean Project File located at the Bearlodge Ranger District office.

Key issues represent those that were important in development of alternatives and received the most public and internal specialist attention during the scoping period. In some cases they represent unresolved conflicts regarding the proposed action. Key issues are also characterized by the need to address broad-based internal or external resource management concerns, the need to meet national and Forest-level direction, and the desire to address the purpose of and need for action within the Dean project area. A brief description of the three key issues follows:

1.8.1 Fuel and Fire Hazard Reduction

Wildfire hazard and the need to reduce fuels are major public concerns in the Black Hills. These issues have become more prominent due to the large wildfires that have occurred in recent years throughout the West, including those in the Black Hills. The prevailing public attitude and that of local, state, and federal elected officials is that the Forest Service should do more to address fire and fuels risks on National Forest System lands. This point of view is supported and amplified at the national level through a series of initiatives and streamlining of processes related to fuel and fire hazard reduction.

Reduction of fuels and fire hazard is a major focus of the Dean project. The project area lies within a heavily forested, fire-adapted ponderosa pine ecosystem. Wildfire cannot be eliminated from this setting, but deliberate management of fuels and other vegetation can reduce the potential for uncharacteristically large, intense wildfires. Mountain pine beetle infestation has increased hazardous fuels in other areas of the Black Hills National Forest. Most commenting parties support decreasing the risk of beetle infestation to minimize economic loss and creation of fuels. Fuel and insect risk reduction activities can, however, reduce habitat values for some wildlife species.

Feedback received during the early stages of this project indicates that there is broad support in most public sectors for reducing fuels and fire hazard through practices such as prescribed burning and tree thinning. One commenting party expressed a belief that thinning has no effect on potential fire behavior.

The indicators listed below will be used in this document to measure fuel and fire hazard reduction in the project area. These indicators allow the public and decision maker to compare the effects of the alternatives. A comparison of alternatives is displayed in table format at the end of Chapter 2 (page 2-21). Also, a narrative description of the comparative differences in effects is presented briefly in the Comparison of Alternatives section in Chapter 2 and in more detail under the Fire and Fuels section in Chapter 3 of this EIS.

- Crown fire hazard – active (acres)
- Crown fire hazard – passive (acres)
- Crown fire hazard – conditional (acres)
- Fuel breaks – constructed along private land and main roads (acres)
- Prescribed burning (acres)

1.8.2 Travel Management and Recreation

Management of public land transportation systems and motorized recreation is a major issue across the nation. Public desires regarding management of these systems and opportunities for motorized recreation are diverse and often in conflict. Public response to the Dean project area proposed action reflected these strongly held, often divergent opinions.

Some members of the public and interest groups want motorized travel to be unrestricted, both on and off roads. Others accept some restrictions but express a desire for designated motorized-use areas and trail systems. Proposed restrictions could cause motorized recreation to be displaced to other areas. Some are concerned about effects on snowmobile use. Road closures could also affect access for resource management and fire suppression. Conversely, many express displeasure with resource damage, private land trespass, disturbance of wildlife, loss of solitude, and user conflicts associated with motorized recreation. Trails solely for non-motorized recreation are also desired.

The indicators listed below will be used in this document to measure response to the issue of travel and access for recreation purposes.

- Miles of roads open year-round
- Miles of roads and motorized trails
- Percent of project area open to motorized, off-road use

1.8.3 Wildlife and Fish Habitat

The project area includes both winter range and important fawning and calving habitat for big game. Proposed activities could improve or harm this habitat in various ways. Activities such as motorized recreation can disturb animals during sensitive periods. Habitat for a variety of species could be improved by enhancing hardwood stands, meadows, and riparian habitat, and by diversifying landscape-level structure of pine stands. A fish species native to the Black Hills and Bear Lodge Mountains is found in the project area. Conservation of habitat for some wildlife species can result in increased fuel loading or risk of mountain pine beetle infestation.

The indicators listed below will be used in this document to measure response to the issue of wildlife and fish habitat.

- Ponderosa pine structural stage diversity, spatial distribution, actions to enhance late succession (acres)
- Hardwood, meadow, and riparian communities (acres enhanced)
- Open road density (miles per square mile)
- Potential disturbance of security habitats
- Connected Disturbed Areas

2 ALTERNATIVES

2.1 INTRODUCTION

This chapter provides a detailed description of the proposed action, two action alternatives, and the no action alternative. Maps of each alternative considered in detail are located at the end of this document.

This chapter presents and compares the alternatives, both quantitatively and qualitatively. The intent is to provide the public and the decision maker a basis for a choice among management options when considering the environmental consequences (effects) of implementing each alternative, as disclosed in Chapter 3 of this EIS.

A brief overview is provided of alternatives considered by the ID Team and the decision maker but eliminated from detailed development and study. The last section of the chapter contains a tabular summary of effects relative to the key issues presented in Chapter 1.

2.2 ALTERNATIVES CONSIDERED IN DETAIL

This section describes proposed activities. All figures are approximate and may vary due to irregular stand structure, small inclusions of unloggable ground, etc. A proposed Forest Plan amendment is also described.

2.2.1 Alternative A - No Action

NEPA requires study and use of the no action alternative as a basis for comparing effects of the proposed action and other alternatives.

The no action alternative assumes that none of the elements of the proposed action and other action alternatives would take place in the Dean project area in the next 10 to 15 years. Under this alternative, no attempt would be made to actively respond to the purpose of and need for action or the issues raised during scoping. Vegetation and access management would not take place unless authorized by other decisions (see cumulative effects actions in Chapter 3, p. 3-1). Vegetation structure would change over time through growth, natural mortality, and events such as wildfires, storms, and insect and disease outbreaks. Existing access and travel management would persist until modified by future decisions. The Rednose walk-in hunting area would remain closed to motorized vehicles. Ongoing activities such as scheduled road maintenance, treatment of noxious weeds, livestock grazing, and fire suppression would continue.

2.2.2 Alternative B

Focus of Alternative B
Alternative B was developed to respond to the purpose of and need for action while emphasizing **late-successional forest and non-motorized recreation**. Proposed treatments are defined starting on page 2-3 and shown in Maps 11 and 12. Site-specific design criteria and mitigation measures required for implementation of this alternative are listed in the description of proposed activities below. Proposed monitoring is described at the end of the alternative description.

This alternative would use various types of thinning and prescribed fire to move stand conditions toward late succession while addressing fire hazard and fuel reduction needs. A limited amount of regeneration harvest (shelterwood seed cuts) would take place to provide forage. Prescribed fire would also be used to maintain natural fuel breaks by decreasing pine encroachment into meadows and hardwood stands. Other habitat enhancement treatments would include hardwood restoration, oak removal, patch cuts, and pine removal from riparian areas.

This alternative addresses the desire of some individuals and groups for emphasis of non-motorized recreation in the project area. Off-road motorized travel would be prohibited except on designated snowmobile trails and in a 200-foot buffer along these trails. These restrictions would further protect wildlife and other resources. The Truck Trail (see Map 12) would be open outside the snowmobile season to ATVs and other motorized vehicles no more than 50 inches wide.

Approximately six miles of new road construction would be necessary to implement proposed vegetation treatments, and 24 miles of unclassified roads (those not part of the permanent transportation system) would be decommissioned.

Detailed Description of Alternative B
Treatments proposed under Alternative B are summarized in **Table 2-1** and described in detail below. All figures are approximate.

Table 2-1. Proposed Activities – Alternative B

Treatment (acres)	**Alternative B**
Fuels & Vegetation Treatments (Commercial and Non-commercial Timber Harvest)	
Commercial Thinning	1,019
Commercial/POL Thinning	300
Shelterwood Seed Cut	745
Mature Stand Enhancement (Thin from Below) (Open Stands)	416
Mature Stand Enhancement (Thin from Below) (Dense Stands)	597
Patch Cuts	75
Pine Encroachment Removal (Hardwood Stands)	69
Pine Encroachment Removal (Riparian)	376
Total	3,597
Fuels & Vegetation Treatments (No Commercial Timber Harvest)	
Mechanical Fuel Reduction	653
Prescribed Fire	797
Oak Removal	55
Total	1,505
Timber Volume Removed	
Sawtimber (MBF)	8,344
Sawtimber (CCF)	16,688
Transportation System (miles)	
Road Construction	5.66
Road Reconstruction	9.84
Road Pre-use Maintenance or Use As Is	67.47
Roads Decommissioned (Unclassified Roads)	24.21

Proposed Vegetation Treatments

Commercially treated sites may be whole-tree yarded, depending on individual site characteristics. This would result in slash piles at log landings. Slash piles would generally be burned, but may also be chipped. Timber harvest would use both ground-based and cable yarding systems. Proposed post-sale treatments would take place as funding allows.

Commercial Thinning: Mature pines would be thinned on approximately 1,019 acres. Residual basal area would average 50 to 60 square feet per acre (about 30 feet between trees averaging 14 inches in diameter) but would vary among stands to increase patchiness and diversity on a landscape scale. Smaller, unhealthy, and poorly formed stems would be cut to increase growth of the remaining trees and reduce the risk of loss to pathogens. Another objective is to raise base canopy height (distance from ground level to the lowest branches), which decreases the chance that a fire burning on the ground will climb into the tree crowns.

Commercial Thinning/Products Other than Logs (POL) Thinning: This treatment would take place on 300 acres in pine stands with a mix of mature and smaller trees. For commercial

purposes, mature timber (sawtimber) is usually defined as trees over 9 inches in diameter. Products other than logs (POL) are made from trees 5 to 9 inches in diameter. Objectives of this treatment are the same as those listed for commercial thinning. Because of a limited market for smaller diameter wood products and wood chips, timber purchasers often opt not to buy the POL portion of a timber sale. Cutting of these smaller diameter trees is critical to meeting project objectives. Therefore, if a timber purchaser opts not to take POL, these trees would be cut using a service contract or other means.

Shelterwood Seed Cut: This treatment would take place on 745 acres. It would remove some of the mature trees to open the stand and allow young trees to regenerate and become established. Enough large trees would remain after treatment to provide a seed source and future large-diameter snags. Seed cuts would provide forage (grasses and forbs) until pine regeneration becomes established.

Mature Stand Enhancement (Thin from Below): Trees less than 10 inches in diameter would be cut in open and closed-canopy mature stands to increase growth and vigor of mature trees and move the stands toward late-successional conditions. In relatively open stands located on south aspects, this treatment would move forest conditions toward open, savannah-like late succession. In denser stands, located on mostly north-facing slopes, the treatment would move conditions toward closed-canopy late succession. This treatment would take place on 416 acres of open-canopy stands and 597 acres of closed-canopy stands. This treatment would produce minimal sawtimber volume per acre. Depending on site-specific factors such as access, topography, and proximity to other treatment units, it may or may not be feasible to accomplish this treatment as part of a standard timber sale. Appropriated funding or other means may be necessary for this treatment. This treatment would be followed by mechanical fuel reduction or prescribed fire (see below).

Hardwood Restoration: Encroaching pine would be removed from 69 acres of aspen to set back succession of these hardwood stands to pine. Treatments have been designed to avoid disturbance of sensitive plant habitat.

Oak Removal: The project area includes many areas of bur oak brush. In the northern Black Hills and Bear Lodge Mountains, bur oak often stagnates in a brush form. The objective of this treatment is to reduce competition and allow growth of larger oaks, increasing diversity in wildlife habitat. Larger trees would be selected for retention. Smaller oaks would be cut, and herbicide would be applied directly to the cut stumps to discourage sprouting. This treatment would take place on 55 acres.

Patch Cuts: Patch cuts, which are clear cuts less than 10 acres in size, would take place on a total of 75 acres. Patch cuts provide small openings with forage for various wildlife species.

Pine Removal from Riparian Areas: Encroaching pine would be removed from 376 acres of riparian areas to increase grass, forb, and shrub availability. All shrub and hardwood understory would be left in place, and large pine adjacent to stream banks would be left in place to provide bank stability. Mechanical disturbance of riparian vegetation and soils would be minimized. In addition, sensitive plant habitat would be avoided.

Mechanical Fuel Treatment: The objective of proposed fuel treatments is to reduce the amount and continuity of fuels across the landscape. Areas of dense forest and ladder fuels would be treated using mechanical means. This treatment would take place on 653 acres. It would also be used to dispose of activity fuels created during thinning in open-canopy stands on south-facing

slopes (see Mature Stand Enhancement treatment description above). Mechanical fuel treatment would also follow thinning in a few dense, closed-canopy stands located on north-facing slopes.

Prescribed Fire: Broadcast burning would be used to reduce fuels on 797 acres. These areas are generally less accessible than stands to be mechanically treated. The purpose of the treatment is to move the area toward Condition Class 1 (where fire regimes are within their historical range of variability) by consuming fuels on the ground and killing lower branches of some trees. This reduction of ladder fuels would decrease the chance of a wildfire reaching tree crowns. Prescribed fire would follow mature stand enhancement treatments (see treatment description above). Both low- and moderate-complexity burns are proposed. Fire lines and a detailed prescribed burn plan would be required for moderate complexity burns. A prescribed burn plan would be prepared for low-complexity burns, but constructed fire lines would 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 amended Forest Plan direction.

Design Criteria: Amended Forest Plan standards and guidelines, watershed conservation practices, best management practices, and other management requirements apply to these activities, would be followed, and are repeated here only if clarification is required. Design criteria specific to Alternative B vegetation management proposals include the following. Criteria listed starting on page 2-9 also apply.

1. If the purchaser of any timber resulting from this project opts not 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 or chipping of cut stems.

2. Existing pine regeneration would generally be protected in stands proposed for overstory removal harvest. Provisions related to felling, bucking, and whole tree yarding would be included in the timber sale contract. Skid trails within these stands would generally be at least 80 feet apart with locations approved by the sale administrator before commencement of logging. Landing locations would, where feasible, take advantage of existing openings or areas with no regeneration.

3. To increase the likelihood of successful conifer regeneration, stands proposed for seedcuts and patch cuts would be logged in the summer or early fall where feasible to maximize the site scarification provided by the skidding operation, provided there are no concerns related to riparian areas, noxious weeds, or sensitive plants. Cutting would be done in such a way that areas would be restocked with trees within five years after final harvest.

4. 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. Monitoring of the area for noxious weed infestations would continue during the timber sale. If new noxious weed infestations that could be spread by timber sale activities are found during implementation, actions to minimize spread would be taken.

6. 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.

7. If log hauling or movement of heavy equipment related to the proposed timber harvest were to cause damage to cattle guards, the timber purchaser would be responsible for repair.

8. Where existing conditions allow, treatments in forested areas adjacent to other ownership would blend into adjacent conditions rather than creating strong lines. A horizontal transition zone of 1.5 times the height of the overstory is suggested. This measure also applies to shelterwood seed cut harvests.

9. Where possible, log decks would be located at least 300 feet from NFSRs 831, 833, and 834.

10. To reduce effects of continuously even tree spacing on wildlife and scenery, commercial thin treatments would emphasize tree health and crown size over spacing. Residual trees in overstory removal and shelterwood seedcut units would be variably spaced.

11. To break up large openings and mimic natural stand structure, an uncut area two to eight acres in size would be left every 20 acres in shelterwood seed cuts proposed in sites 0106070003, 0106070008, 0106080006, and 0106080011. The Forest landscape architect would assist in determining the design and location of leave islands.

12. Layout and marking of timber sale units would comply with forest-wide marking guides in effect at the time of implementation.

13. Where treatments would be visible from Interstate 90, edges of treatment units would be feathered into untreated stands to mimic natural forest/opening edge typically found in this landscape. Affected stands are listed in the project file.

14. Skyline logging corridors would be less than 15 feet wide where possible to minimize visual effects of any soil displacement may occur.

15. Activity slash would be reduced to natural levels within 300 feet of NFSRs 831, 833, and 834 or where visible from these roads, whichever is less.

16. 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.

17. For units located on steep, erosive and unstable soils (see Dean Hydrology and Soils Report in the project file), low-impact harvest techniques such as skyline cable or tong-throwing equipment would be used to avoid heavy equipment traffic on steep, unstable soils. Low-impact fuel treatments such as hand-piling of slash must be used to avoid heavy equipment traffic on steep, unstable soils.

18. Timber sale units would be laid out to facilitate proposed road restrictions (for example, trees around proposed gates and other barriers would be left uncut to maintain obstructions and discourage driving around the gate or barrier).

19. Utility lines would be protected during prescribed burns.

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

21. Where possible, prescribed burns adjacent to NFSRs 831, 833, and 834 would be burned so that overstory trees visible from the road show as little scorch as possible.

22. Prescribed burns in some sites would take place all or partly on soils with severe erosion hazard. These burns would take place only when burn severity could be kept low. Sites are listed in the project file.

23. Spring prescribed burns would be conducted before May 1 to reduce negative effects on nesting turkeys.

24. Treatments removing pine from riparian areas would be laid out and conducted to result in as little disturbance to riparian vegetation and soils as possible while meeting treatment objectives.

Transportation System and Travel Management

Alternative B emphasizes non-motorized use of the project area. Off-road motorized travel would be prohibited across the project area except on designated trails and in a 200-foot buffer along existing snowmobile trails. This buffer would allow limited off-trail snowmobile use. In order to protect big game during calving and fawning seasons, the Truck Trail would be open to ATVs and other vehicles less than 50” wide only from July 1 through Dec. 15.

Approximately 24 miles of unclassified roads would be decommissioned (made impassable) as funding allows. Approximately six miles of new road would be constructed in order to access treatment units. Nearly 10 miles of road would be reconstructed, and about 67 miles would be

maintained (e.g., blading, cleaning of drainage structures) prior to use or used in their existing condition. Access to private land and for permitted special uses would not be changed.

Amended Forest Plan standards and guidelines, watershed conservation practices, best management practices, and other management requirements apply to these activities, would be followed, and are repeated here only if clarification is required. Design criteria specific to Alternative B road and travel management activities include the following. Criteria listed starting on page 2-9 also apply.

1. Dust control, if necessary, may be done with water, magnesium chloride, calcium chloride, or equivalent.

2. 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.

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

4. New road construction should be designed to limit cut and fill slopes where possible, particularly when located above steep slopes.

5. Construction of landings, roads, and tractor and skid trails would be avoided within 100 feet (or a distance equal to the mean height of mature dominant late-seral vegetation, whichever is more) of perennial seeps, springs, and wetlands. If this is not possible, crossings would be constructed and restored to prevent headcutting, gullying, erosion, and sediment transport to ephemeral or perennial channels.

6. Creation of large water collection points, such as road ditches or excessively large water bars, would be avoided, particularly up-gradient of existing rotational slumps and landslides. A greater frequency of smaller water bars than that recommended in FSH 2509.25 may be used. Temporary road cuts exceeding two feet would be avoided. If this is infeasible because of steep slopes, temporary roads would be recontoured.

7. Where feasible, existing haul roads would be reconstructed with rolling grades instead of ditches and culverts.

8. Culverts and fills would be added to the three stream crossings on NFSRs 833.1F, 843.2R, and 830.3A to facilitate log hauling and harvest operations. Fills would consist of clean, coarse material, in order to minimize the amount of sediment added to the stream channels. Within nine months after completion of harvest operations, the drainage structures and fills would be removed and disturbed sites adjacent to the stream revegetated to reduce the potential for flood-induced stream-crossing failure and sediment input.

9. Water bars and sediment barriers would be placed 10 to 20 feet below water bar outlets and culvert outlets on skid trails steeper than 15 percent.

10. Engineering staff would consult with a forest hydrologist and fisheries biologist on design of stream crossings. Fill slopes would be protected with riprap, gabions, prompt seeding, and/or other measures approved by the hydrologist, fisheries biologist, and soil scientist. Placement of structures would comply with federal and state laws regarding construction in and near waterways, including placement of fill and measures to control sedimentation.

11. NFSR 831.2G would be decommissioned. Rock gabions located in the channel would be removed replaced with log drop structures that will preserve channel gradient for a time. As they eventually fail, and the channel slowly returns to natural gradient, the road/stream crossing would be effectively closed and the artificial waterfall eliminated. The road surface leading uphill and south from the crossing would be ripped with heavy equipment. Waterbars would be placed at short intervals (less than 50 feet) and revegetation measures would follow earthwork. The gate would be removed and boulders placed at the intersection of 831.2G and 831.1 to prevent vehicles from attempting to cross the stream while it returns to a more natural gradient.

12. 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.

13. Sensitive plant populations would be avoided during all proposed activities. Engineering staff would consult with a qualified botanist on specific location of the new road proposed northeast of Hemler Reservoir.

14. Timber sale roads would be seeded after construction but before timber harvest if any part of the gap between construction and harvest would occur between April and October. This may be accomplished under the road contract. If necessary, seeding would again occur after use of the road is complete. Seeding may be delayed until after completion of harvest if the gap between construction and harvest would be of short duration and hydrology, soils, engineering, and noxious weed specialists determine after field review that a delay would be acceptable.

15. Construction of new specified and temporary roads would be avoided on slopes over 35 percent.

16. Construction of the new road tentatively designated 831.21 (T53N, R62W, sections 30 and 31) would avoid the steep, erosive section of the slope if possible. Road layout would be conducted with input from a qualified hydrologist or soil scientist. If the section cannot be avoided, soil stabilization measures such as erosion matting and seeding would be used on the cut and fill slopes.

17. New roads tentatively designated NFSRs 832.2B1, 803.2H2, and 831.1K1 cross slopes with steep, unstable sections. Alignment of these roads would be altered to avoid these steep, unstable sections and reduce the chance of road failure and transport of material to downslope locations.

Watershed Projects

The district hydrologist identified several areas of disturbed soils in the project area that are contributing sediment to streams. All action alternatives would address these connected disturbed areas (CDAs).

- NFSR 831.1K, ford of Middle Redwater Creek: The road would be stabilized and closed year-round.
- NFSR 831.1M, ford of Middle Redwater Creek: The road would be stabilized and gravel added where necessary. The closure gate would be moved to the side of the creek nearer the junction with NFSR 831.1.
- NFSR 831.2G, ford of Middle Redwater Creek: This short, steep section of road would be decommissioned. Other roads provide access to the areas reached by 831.2G.
- NFSRs 833.1B and 833.1C, crossings of North Redwater Creek (Madison Branch): Culverts were previously removed from NFSRs 833.1B and 833.1C, and the fill left behind is entering the creek. These roads would be used to access timber harvest units. Prior to use, culverts would be reinstalled. Following harvest, the culverts would be removed, fill stabilized, and roads closed year-round.
- NFSR 843.2A, crossing of intermittent drainage: During periods of high runoff, flow is diverted from the main channel onto this road and NFSR 843.1. Drainage features would be repaired.
- NFSR 830.3A, crossing of South Fork of Spring Creek: Springs and wet areas exist in the roadbed. This road would be closed under all action alternatives.
- Hemler Dam spillway: See below.

Restoration of Hemler Reservoir and Redwater Pond: Flooding in 1995 damaged the Hemler Reservoir spillway. An eight- to ten-foot-deep gully was created in the spillway approximately 200 feet downstream from the dam. The spillway would be repaired to prevent migration of the gully upstream, where it could threaten the dam.

Dredging of both impoundments is proposed to remove accumulated sediment and increase water-holding capacity. Redwater Pond would be dredged first and allowed to stabilize for approximately one year prior to work on Hemler Reservoir. At that time, the Hemler Reservoir population of finescale dace would be moved to Redwater Pond in cooperation with the Wyoming Game and Fish Department. Dredging would be limited to the parts of Hemler Reservoir closer to the dam, with the

shallower, upstream third of the impoundment left in its existing state. This would perpetuate shallow-water habitat while increasing overall storage capacity. Finescale dace would be returned to the reservoir after it stabilizes.

Design Criteria Applicable to All Activities

Amended Forest Plan standards and guidelines, watershed conservation practices, best management practices, and other management requirements apply to these activities, would be followed, and are repeated here only if clarification is required. Design criteria applicable to all activities proposed under Alternative B include the following.

1. If previously unknown heritage resources are discovered during project activities, project staff would stop ground-disturbing actions at the site and notify the district archeologist before activities are resumed.

2. Leaders of project activities described in this EIS would review heritage maps and implement mitigation measures for sites listed in the heritage resources file.

3. Known heritage sites would be protected. Heritage sites would be avoided during all proposed activities. Specific locations are described in the heritage resources file.

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

5. Contracts and permits issued as part of this project would include measures to limit 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 NFS and private lands. Known areas meeting these criteria would be identified by District staff before completion of any timber sale contract associated with this project.

6. Where ground-disturbing activities would occur in areas infested with weeds, weeds would be treated before project implementation, when feasible, to reduce future spread and establishment of noxious weeds.

7. 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.

8. Disturbed soil would be revegetated in a manner that optimizes plant establishment for that specific site. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and placement of weed-free mulch as necessary. Revegetation would be initiated as soon as possible, generally not to exceed 6 months, after termination of ground-disturbing activities. All disturbed soils would be revegetated with native species when available using seed mixtures that are free of noxious weeds. On areas needing the immediate establishment of vegetation, non-native, non-aggressive annuals, non-aggressive perennials, or sterile perennials may be used until native perennials become established. These species can be used to prevent the spread of noxious weeds and prevent erosion. Only weed-free mulch would be used.

9. Native vegetation would be retained to the maximum extent possible during proposed activities.

10. Where pine removal from meadow treatments overlap suitable sensitive plant habitat, a qualified botanist would be involved with layout to ensure ground disturbance does not exceed acceptable limits. Logs would not be skidded through hardwood communities. Treatment would be conducted only if ground reconnaissance verifies that hardwood communities would not be damaged.

11. Treatments proposed near known sensitive plant populations would be excluded from the area around the populations as mapped in the Dean Botany Biological Evaluation.

12. Any skid trails, temporary roads, and landings in high-potential sensitive plant habitat would be designated in consultation with a qualified botanist. Any moist forested or riparian meadow communities outside of treatment units would be avoided unless approved by a qualified botanist for entry.

13. All documented land snail colony locations would be protected with a buffer of no disturbance adequate to protect the colony and the microclimate of the area. Buffer size would be determined on a case-by-case basis depending on the size of the colony, the potential for adjacent areas to provide snail habitat, and the potential for negative effects to that specific colony. Colony locations are listed in the project file.

14. Disturbance of any newly discovered colonies of land snails would be avoided. The district wildlife biologist would determine a buffer area around newly discovered colonies based on site-specific conditions.

15. Snags would be cut only for safety reasons and when necessary for construction of roads, skid trails, firelines, and log landings.

16. While any projects resulting from this analysis are taking place, all gates that would normally be closed during big game firearm hunting seasons would be kept closed during these seasons and one week before the seasons except to allow administrative traffic to pass. Gates would be closed again immediately after traffic passes.

17. Visual screening would be retained along 20 percent of the length of NFSRs 831, 833, and 834 and along 20 percent of the perimeter of existing and created openings. Vegetation would be cleared at the minimum width (6 feet from the shoulder). The maintenance clearing specifications "top of cut to bottom of toe" would be dropped in order to reduce loss of screening. Exceptions would be clearing for construction and clearing to maintain or create a safe sight distance.

18. Some proposed activities would take place on soils identified by the Crook County Soil Survey as having a potential for severe erosion. Sites are listed in the Dean Hydrology and Soils Report in the project file. The following special provisions, intended to minimize the amount of exposed bare soil, off-site transport, and soil displacement, would apply: (1) heavy equipment would avoid streams and swales except to cross at designated points, build crossings, or conduct restoration, unless protected by at least one foot of packed snow or two inches of frozen soil; (2) on slopes over 30 percent, 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; (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.

19. Managers of vegetation treatment projects would consult with District range managers to ensure alteration of natural barriers does not allow livestock to circumvent fences.

20. Small wetlands located in or immediately adjacent to certain sites would be excluded from areas to be burned and protected from disturbance. Sites are listed in the project file.

Monitoring Applicable to All Activities

Bearlodge Ranger District would monitor implementation of the selected alternative. At least one ID Team meeting and field review would occur before the advertisement of any commercial timber sale to ensure that the objectives in this EIS are carried through the layout phase of the timber sale. The ID Team would monitor the project area during and after 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 the timber sale is closed. All ID Team field reviews would be documented and a final monitoring report completed after project implementation.

The timber sale administrator or other contract administrators would complete some of the project implementation monitoring. Other resource specialists would be involved in monitoring of specific mitigation measures relating to their particular resource area. Specific monitoring requirements are listed below.

- Foresters would monitor conifer regeneration in shelterwood seedcuts and patch clearcuts one, three, and five years after harvest to assess stocking and need for site preparation or planting.

- The district archeologist would monitor known heritage sites eligible or potentially eligible to the National Register of Historic Places before and after project implementation.

- Prescribed fire managers would establish photo points in prescribed burn units to compare pre- and post-treatment conditions and document fire behavior during implementation.
- Fuels staff would evaluate effectiveness of fuel treatments in reducing fuel loading.
- Fire managers would evaluate burned areas to establish a timeline for maintenance burning.
- Fire and range managers would monitor regrowth of forage after prescribed burns in meadows to determine the need for temporary modification of the livestock grazing system.
- Project managers would monitor revegetation of disturbed and burned areas to determine need for additional measures and noxious weed control.
- Timber and wildlife staff would sample snag densities before and after timber harvest to determine effectiveness of snag protection measures and need for snag creation.
- Silviculture and wildlife staff would monitor oak release treatments to determine effectiveness in increasing structural diversity and tree diameter.
- Wildlife staff would monitor known snail colonies to determine effectiveness of protective measures and need for any further measures.
- Wildlife staff would monitor known and suspected goshawk nests for nesting activity to determine the need for timing restrictions (amended Forest Plan standard 3111).
- Engineering and hydrology/soils specialists would monitor effectiveness of erosion control measures (seeding, water bars, etc.) one and three years following installation.
- Hydrology/soils staff would monitor soil compaction at a sample of timber sale landings and harvest units.
- Travel managers and wildlife staff would monitor a sample of road and area closures for effectiveness.
- Timber sale administrators and hydrology/soils specialists would monitor application and effectiveness of Best Management Practices.
- The district planning team would monitor timber sale layout to evaluate project implementation and assumptions used in the planning process.
- The district planning team would monitor timber sale implementation following sale closure.
- Results of actions proposed to repair connected disturbed areas along NFSRs 831.2G, 831.1K, 831.1M, and 843.2A would be monitored. Rehabilitated stream crossings would be checked for revegetation success after one year and additional measures would be implemented if revegetation is determined to be unsuccessful. Closure measures would be monitored for effectiveness. Additional measures should be implemented if vehicles continue to access and negatively affect these sites.

2.2.3 Alternative C – Proposed and Preferred Action

Focus of Alternative C

Alternative C would aggressively treat forest vegetation to **reduce fire and fuel hazards** that currently exist in the project area. This alternative addresses national direction on reducing the potential of stand-replacing wildfire in fire-adapted ecosystems. Proposed treatments are defined starting on page 2-3 and shown in Maps 13 and 14 at the end of this document. Site-specific design criteria required for implementation of this alternative are listed in the description of proposed activities, below. Proposed monitoring is described at the end of the alternative description.

This alternative would modify stand structure across the planning area to reduce the potential for uncharacteristically intense wildfire behavior, reduce fuel loads, reduce the risk of large insect outbreaks, and provide for diverse wildlife habitat. A variety of vegetation management tools, including commercial timber harvest, would be used to thin and open dense ponderosa pine stands and reduce the risk of insect outbreaks and crown fire hazard. By strategically locating mechanical fuel treatments and broadcast burning across the landscape, the continuity and density of fuels would be modified to reduce the risk of stand-replacing wildfire. At the same time, it would also provide cover and structural diversity for the benefit of a variety of wildlife species. Patch cuts would also provide small openings across the planning area in order to provide forage for various wildlife species and to improve the balance of vegetation structural stages in goshawk post-fledging habitat.

Construction of up to six miles of new road would be necessary to implement proposed treatments. Harvest methods would include both ground-based and cable yarding systems. Off-road motorized travel would be prohibited in the project area, but main system routes currently open to vehicle traffic would remain open.

A one-time, site-specific Forest Plan amendment would be required in order to change Management Area designation in a portion of the project area from 5.4 (big game winter range emphasis) to 5.6 (forest products, recreation, and big game emphasis). MA 5.4 would encompass approximately 5,868 acres of NFS lands and MA 5.6 would cover 6,587 acres (Map 3). This would better reflect the actual wildlife use and capability of the project area. Deer and elk use the lower, south-facing parts of the project area as winter range but generally avoid the higher elevations due to snow depth. These areas are, however, heavily used during the spring, summer, and fall, especially as fawning and calving habitat.

Detailed Description of Alternative C

Treatments proposed under Alternative C are summarized in **Table 2-2** and described in detail below. Proposed post-sale treatments would take place as funding allows. Figures are approximate.

Table 2-2. Proposed Activities - Alternative C

Treatment (acres)	**Alternative C**
Fuels & Vegetation Treatments (Commercial and Non-commercial Timber Harvest)	
Commercial Thinning	1,464
Commercial/POL Thinning	405
Commercial/POL Thinning /Overstory Removal	78
Shelterwood Seed Cut	940
Overstory Removal	328
Shelterwood Seed Cut/Overstory Removal	1,105
Patch Cuts	75
Pine Encroachment Removal (Hardwood Stands)	69
Pine Encroachment Removal (Riparian)	376
Total	4,840
Fuels & Vegetation Treatments (No Commercial Timber Harvest)	
Mechanical Fuel Reduction	207
Prescribed Fire	2,764
Precommercial Thinning	647
Oak Removal	55
Total[1]	3,673
Timber Volume Removed	
Sawtimber (MBF)	16,463
Sawtimber (CCF)	32,926
Transportation System (miles)	
Road Construction	5.66
Road Reconstruction	9.84
Road Pre-use Maintenance or Use As Is	67.47
Roads Decommissioned (Unclassified Roads)	23.45

[1]Some treatments overlap, so the actual total area treated would be 7,467 acres.

Proposed Vegetation Treatments

Commercially treated sites may be whole-tree yarded, depending on individual site characteristics. This would result in slash piles at log landings. Slash piles would generally be burned, but may also be chipped. Timber harvest would use both ground-based and cable yarding systems.

Commercial Thinning: See treatment description under Alternative B (p. 2-3). This treatment would take place on approximately 1,464 acres.

Commercial Thinning/POL Thinning: See treatment description under Alternative B (p. 2-3). This treatment would take place on approximately 405 acres.

Commercial Thinning/POL Thinning/Overstory Removal: This treatment would take place in one approximately 78-acre stand. Forest conditions are variable in this stand, and all three treatment types are appropriate in different areas for reduction of fuels and risk of insect infestation.

Precommercial Thinning: Pine saplings would be thinned to improve growth on approximately 647 acres. This treatment would reduce stand density through retention of the best-formed, healthiest trees. Primary goals of this treatment are to improve growth, preclude stand stagnation, and reduce continuity of fuels. Resulting slash that exceeds amended Forest Plan guidelines would be piled, chipped, or removed to reduce fire danger and pathogen habitat.

Patch Cuts: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 75 acres.

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. This treatment would take place on approximately 328 acres.

Shelterwood Seed Cut/Overstory Removal: This treatment would take place on approximately 1,105 acres in mature stands with patches of pine regeneration. Where there is sufficient regeneration, an overstory removal harvest would take place. This treatment would retain enough large trees to provide a seed source and future large-diameter snags.

Shelterwood Seed Cut: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 940 acres.

Mechanical Fuel Treatment: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 207 acres.

Prescribed Fire: See treatment description under Alternative B (p. 2-5). This treatment would take place on approximately 2,764 acres. Many stands proposed for commercial thinning would be burned following treatment to reduce fuel loading and prune lower branches on trees. Prescribed fire would also be applied following many shelterwood seed cuts and in the unregenerated areas of some seed cut/overstory removals. The purpose of burning these stands would be to reduce surface fuels, diversify stand structure, and increase stand resistance to wildfire by slowing development of ladder fuels.

Logging Slash: See treatment description under Alternative B (p. 2-5).

Hardwood Restoration: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 69 acres.

Oak Removal: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 55 acres.

Pine Removal from Riparian Areas: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 376 acres.

Design Criteria: Amended Forest Plan standards and guidelines, watershed conservation practices, best management practices, and other management requirements apply to these activities, would be followed, and are repeated here only if clarification is required. Design criteria specific to Alternative C vegetation management proposals include those listed starting on pages 2-5 and 2-9.

Transportation System and Travel Management

Alternative C emphasizes non-motorized use of the project area. Off-road motorized travel would be prohibited across the project area except on designated trails and in a 200-foot buffer along existing snowmobile trails. This buffer would allow limited off-trail snowmobile use. Main system roads currently open to vehicle traffic would remain open.

Approximately 24 miles of unclassified roads would be decommissioned (made impassable) as funding allows. Approximately six miles of new road would be constructed in order to access treatment units. Nearly 10 miles of road would be reconstructed, and about 67 miles would be maintained (e.g., blading, cleaning of drainage structures) prior to use or used in their existing condition. Access to private land and for permitted special uses would not be changed.

Design criteria specific to Alternative C road and travel management activities include those listed starting on pages 2-7 and 2-9.

Watershed Projects

See treatment description of projects proposed under Alternative B (page 2-8).

Monitoring Applicable to All Activities

See page 2-10.

2.2.4 Alternative D

Focus of Alternative D
Alternative D would respond to the purpose and need by focusing **fuel reduction treatments near private lands and in other strategic locations**. This alternative also includes treatments to enhance nonpine habitats to improve both wildlife habitat and spatial arrangement of fuels. Treatments would be accomplished through mechanical means and extensive broadcast burning.

Proposed treatments are defined starting on page 10 and shown in Maps 15 and 16 at the end of this document. Site-specific design criteria required for implementation of this alternative are listed in the description of proposed activities. Proposed monitoring is described at the end of the alternative description.

Commercial timber would be produced in some locations as a by-product of fuel break construction and as a result of patch cuts and pine encroachment treatments. Alternative D was developed in response to the view expressed by some during scoping that fuel treatments are most effective when applied in strategic locations.

Most of the project area would remain open to off-road motorized travel. Off-road motorized travel would continue to be restricted in the Rednose walk-in hunting area. No new roads would be constructed, and about 24 miles of unclassified roads would be decommissioned.

Detailed Description of Alternative D

Treatments proposed under Alternative D are summarized in **Table 2-3** and described in detail below.

Table 2-3. Proposed Activities - Alternative D

Treatment (acres)	**Alternative D**
Fuels & Vegetation Treatments (Commercial and Non-commercial Timber Harvest)	
Fuel Breaks	2,337
Patch Cuts	75
Pine Encroachment Removal (Hardwood Stands)	69
Pine Encroachment Removal (Riparian)	376
Total	2,857
Fuels & Vegetation Treatments (No Commercial Timber Harvest)	
Mechanical Fuel Reduction	207
Prescribed Fire	2,764
Precommercial Thinning	353
Oak Removal	55
Total[1]	3,379
Timber Volume Removed	
Sawtimber (MBF)	18,290
Sawtimber (CCF)	36,580
Transportation System (miles)	
Road Construction	0
Road Reconstruction	7.70
Road Pre-use Maintenance or Use As Is	69.52
Roads Decommissioned (Unclassified Roads)	24.12

[1]Some treatments overlap, so the actual total area treated would be 4,960 acres.

Proposed Vegetation Treatments

Commercially treated sites may be whole-tree yarded, depending on individual site characteristics. This would result in slash piles at log landings. Slash piles would generally be burned, but may also be chipped. Timber harvest would use both ground-based and cable yarding systems. Proposed post-sale treatments would take place as funding allows.

Fuel Break Construction: Fuel breaks would be constructed by reducing density in mature pine stands on approximately 2,337 acres. Fuel breaks up to one-quarter mile wide would be placed around all private property and along main roads. Residual basal area would average 20 to 40 square feet per acre and would vary within stands to provide habitat diversity and visual variety. Another objective of the treatment is to raise base canopy height, which would decrease the chance of a ground fire transitioning to the tree crowns.

Precommercial Thinning: See treatment description under Alternative C (p. 2-14). This treatment would take place on approximately 353 acres.

Mechanical Fuel Treatment: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 207 acres.

Prescribed Fire: See treatment description under Alternative B (p. 2-5). This treatment would take place on approximately 2,764 acres. It would follow fuel break construction in some locations to reduce fuel loading.

Logging Slash: See treatment description under Alternative B (p. 2-5).

Hardwood Restoration: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 69 acres.

Oak Removal: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 55 acres.

Patch Cuts: See treatment description under Alternative B (p. 2-4). This treatment would take place on approximately 75 acres.

Pine Removal from Riparian Areas: See treatment description under Alternative B (p. 2-3). This treatment would take place on approximately 376 acres.

Design Criteria: Amended Forest Plan standards and guidelines, watershed conservation practices, best management practices, and other management requirements apply to these activities, would be followed, and are repeated here only if clarification is required. Design criteria specific to Alternative D vegetation management proposals include those listed starting on pages 2-5 (items 1, 3-9, 12-23) and 2-9.

Transportation System and Travel Management

Alternative D emphasizes motorized use of the project area. Off-road travel by motorized vehicles, including snowmobiles, would be permitted across the project area except where currently prohibited. Most system roads currently open would remain open.

No new road construction would take place. Approximately 24 miles of unclassified roads would be decommissioned (made impassable) as funding allows. About eight miles of road would be reconstructed, and nearly 70 miles would be maintained (e.g., blading, cleaning of drainage structures) prior to use or used in their existing condition. Access to private land and for permitted special uses would not be changed.

Design criteria specific to Alternative D road and travel management activities include those listed starting on pages 2-7 (items 1-3, 5-13) and 2-9.

Watershed Projects

See treatment description of projects proposed under Alternative B (p. 2-8).

Monitoring Applicable to All Activities

See page 2-10.

2.2.5 Treatment Timing (All Action Alternatives)

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

Alternatives B, C, and D would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in 16 U.S.C. 1604(m2), and include the following:

- Precommercial thinning
- POL thinning
- Commercial thinning
- Patch cuts
- Pine encroachment cutting
- Fuel break construction
- Fuel treatments.

These treatments are proposed to meet the amended Forest Plan multiple-use objectives stated in Chapter 1.

2.3 ALTERNATIVES CONSIDERED but ELIMINATED FROM DETAILED STUDY

A wide range of alternatives, using different approaches to address the purpose and need, are presented in this EIS. Following are brief descriptions of alternatives the ID Team did not consider in detail and the reasons for eliminating them from detailed analysis.

No logging/no road construction/close more areas to ATVs.
A comment was received suggesting that no timber harvest or other vegetation treatment take place, along with no road construction and closure of the area to ATVs. The request for no timber harvest is represented by the no action alternative. Alternative B proposes timber harvest on fewer acres. The request for no road construction is represented by the no action alternative and Alternative D. Limits on ATVs are proposed under Alternatives B and C. All aspects of this alternative are represented by other alternatives studied in detail.

Designate all stands of structural stage 4C as MA 3.7. The intent of Management Area (MA) 3.7 (late successional forest landscapes) is to manage a landscape-sized area featuring stands with late-successional forest structure. Designating all structural stage 4C stands as MA 3.7 would not meet the intent of this management area because 4C stands are intermixed with openings and other forest stands in a variety of conditions. MA allocation was determined during Forest Plan revision; in the absence of a clear reason for a change of this magnitude, the responsible official elected not to fully analyze this alternative. The emphasis of this alternative is to increase late-succession habitat; this is represented by Alternative B, which was designed to increase late-succession habitat in the project area by thinning from below to increase growth, vigor, and tree size.

Change MA 5.4 to 4.1. A commenting party suggested changing all MA 5.4 to 4.1 (limited motorized use and forest products emphasis). The Forest Plan as amended assigned a management emphasis to each part of the National Forest. This designation can be changed at the project level if another designation is found to be more appropriate. MA 4.1 was assigned to areas suitable for non-motorized recreation and production of timber, forage, visual quality, and a diversity of wildlife (USDA Forest Service 1997). "Motorized road travel is limited to designated routes. Designated routes will vary over time based on the need to do vegetative management. Generally the road system will be closed to motorized travel" (amended Forest Plan guideline 4.1-9102). Off-road motorized travel is prohibited (standard 4.1-9101). MA 5.4 in the Dean project area includes NFSRs 833.1, 831.1, and 843.1, which are heavily used for recreational and other purposes and would not be appropriate to close. Closure of the project area to all off-road motorized vehicle use is proposed under Alternatives B and C. Designation of the project area as MA 5.4 and/or 5.6 is appropriate given wildlife use patterns. Designation as MA 4.1 would remove this emphasis and steer management of the area toward commodity production. For these reasons, the responsible official decided not to analyze this alternative in detail.

No treatment of structural stage 4B and 4C stands. Treatment of some 4B and 4C (mature with moderate to high density) stands is necessary to achieve the primary goals of this project (reduction of fire and insect infestation risk). The commenting party gave no specific reasons why study of this alternative should be considered or is appropriate for the Dean project area. The responsible official is unaware of project-specific reasons or issues that would justify study of this alternative in detail and has elected not to do so. Alternative B may address this request by focusing on retention and development of late-successional forest.

No harvest of trees over 10 inches diameter at breast height (DBH). Sawtimber usually consists of trees over 9 inches DBH. Limiting harvest of sawtimber to trees between 9 and 10 inches DBH would almost certainly make any resulting timber sale unprofitable for potential purchasers and/or physically impossible to implement. Most stands in the project area include a mix of trees of various diameters. The cost of mobilizing logging equipment and construction or maintenance of access to cut only the scattered trees between 9 and 10 inches would outweigh the value of the extracted trees in most situations. Moreover, cutting only these trees would not accomplish the objectives of taking action in the project area. Objectives focus on making a sizable reduction in fire hazard and mountain pine beetle risk. Silviculture and fuel specialists proposed the actions described in Alternatives B, C, and D to achieve these ends. Selecting scattered trees across the project area strictly based on their diameter, regardless of overall stand conditions, would not accomplish objectives or compose a coherent approach to landscape-level forest management.

Cutting only trees less than 10 inches DBH is proposed under Alternative B in specific stands ("mature stand enhancement" treatments). Stands were selected for this treatment based on existing conditions and potential for development of late-succession characteristics. It is expected that output of commercial timber from these treatments would be no more than 1,000 board feet per acre. If there are no complicating factors such as lack of access or adverse skidding, this level might be marginally profitable for a purchaser on a unit-by-unit basis. Profitability would increase if the units were offered with other, more productive timber sale units. By themselves, it is likely that these treatments would need to be completed via a service contract, which would depend on unpredictable levels of appropriated funding.

Cutting only trees under 9 inches DBH is proposed under all action alternatives in stands where precommercial and POL thinning are desired to reduce fire hazard and increase growth. There is

a limited market for material of this size. Due to the lack of market, small trees are usually cut under service contracts rather than sold as part of commercial timber sales.

Only close or decommission roads. A commenting party suggested an alternative that would only close or decommission roads. Because this alternative would not address hazardous fuels or risk of mountain pine beetle infestation or provide wood products, the responsible official chose not to analyze it in detail.

Decommission the maximum number of roads. The roads analysis report considered road decommissioning as one possible treatment for roads. Each action alternative includes a component of road decommissioning. Other roads would not be decommissioned because they support current or future access needs.

Enhanced level of motorized access. A commenting party requested an alternative with more motorized access than the proposed action. This is represented by Alternatives A and D, which would leave most of the area open to off-road motorized vehicles.

2.4 COMPARISON OF ALTERNATIVES

This section presents a brief comparison of the four alternatives analyzed in detail in this EIS. A comparative overview of proposed activities is provided in **Table 2-4**. Alternatives are compared in **Table 2-5** and **Figure 2-1** in terms of effects on the key issues described in Chapter 1. Environmental consequences are described further in Chapter 3 of this EIS and also in the resource specialists' reports held in the project file.

Table 2-4. Summary of Proposed Activities

Treatment (acres)	**A**	**B**	**C**	**D**
Fuels & Vegetation Treatment (Commercial and Non-commercial Timber Harvest)				
Commercial Thinning	0	1,019	1,464	0
Commercial/POL Thinning	0	300	405	0
Commercial/POL Thinning/Overstory Removal	0	0	78	0
Shelterwood Seed Cut	0	745	940	0
Shelterwood Seed Cut/Overstory Removal	0	0	1,105	0
Overstory Removal	0	0	328	0
Mature Stand Enhancement (Open Stands)	0	416	0	0
Mature Stand Enhancement (Dense Stands)	0	597	0	0
Patch Cuts	0	75	75	75
Pine Encroachment Removal (Hardwood Stands)	0	69	69	69
Pine Encroachment Removal (Riparian)	0	376	376	376
Fuel Breaks	0	0	0	2,337
Fuels & Vegetation Treatment (No Commercial Timber Harvest)				
Mechanical Fuel Reduction	0	653	207	207
Prescribed Fire	0	797	2,764	2,764
Oak Removal	0	55	55	55
Precommercial Thinning	0	0	647	353
Total	0	1,505	3,673	3,379
Total Area Treated	0	5,102	7,467	4,960
Volume Removed				
Sawtimber (MBF)	0	8,344	16,463	18,290
Sawtimber (CCF)	0	16,688	32,926	36,580
Transportation System (miles)				
Road Construction	0	5.66	5.66	0
Road Reconstruction	0	9.84	9.84	7.70
Road Pre-use Maintenance or Use As Is	0	67.47	67.47	69.52
Roads Decommissioned (Unclassified Roads)	0	24.21	23.45	24.12
Forest Plan Amendments Required	None	None	Manage-ment Area	None

Table 2-5. Response to Key Issues by Alternative

Effects on Key Issues by Alternative				
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**
Fuel and Fire Hazard Reduction				
Issue Indicators				
Crown Fire Hazard – Active	433 acres	334 acres	138 acres	181 acres
Crown Fire Hazard – Passive	3,822 acres	3,241 acres	1,610 acres	1,621 acres
Crown Fire Hazard – Conditional	161 acres	62 acres	36 acres	101 acres
Fuel Breaks – Constructed	0	0	0	3,592 acres
Prescribed Burning	0	549 acres	2,764 acres	2,764 acres
Travel Management and Recreation				
Issue Indicators				
All Roads	102.62 miles	82.48 miles	83.78 miles	77.78 miles
Roads Open Year-Round	31.17 miles	30.13 miles	30.13 miles	29.93 miles
Percent of Project Area Open to Off-Road Motorized Use	81	0	0	81
ATV Trails	0	6.57 miles	0	0
Wildlife Habitat				
Issue Indicators				
Pine Structural Diversity				
Grass/forb Structural Stage	212 acres	299 acres	299 acres	274 acres
Seedling/sapling Structural Stage	68 acres	68 acres	1,789 acres	6 acres
Dense, Mature Forest	1,274 acres	660 acres	582 acres	782 acres
Late Succession Forest	382 acres	382 acres	382 acres	382 acres
Late Succession Enhancement Actions	0	1,013 acres	0	0
Spatial Distribution	See Maps 5-8, end of document			
Enhancement Actions in Aspen	0	69 acres	69 acres	69 acres
Enhancement Actions in Oak	0	55 acres	55 acres	55 acres
Enhancement Actions in Riparian	0	376 acres	376 acres	376 acres
Snag Density	No snags cut	No snags cut except where necessary for safety reasons		
Density of Open Roads (Miles per Square Mile), Winter	1.35	1.30	0.45	1.29
Disturbance of Security Habitats	Most open roads, no new off-road restrictions	Lower open road density, off-road motorized use restricted		No new off-road restrictions
Connected Disturbed Areas (contributing sediment to aquatic habitats)	6	5 (length of each remaining CDA would decrease)	5 (length of each remaining CDA would decrease)	4 (length of each remaining CDA would decrease)

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This section describes the affected environment and discloses estimated effects of the proposed action and each alternative. It 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 amended Forest Plan standards, guidelines and objectives
- Compliance with federal and state laws and regulations

Chapter 3 of the Forest Plan FEIS and the Phase 2 Amendment FEIS discuss the short and long term effects, irreversible and irretrievable commitment of resources, and adverse environmental effects associated with implementing management practices in the Black Hills forest environment. This EIS is tiered to Chapter 3 of the Forest Plan FEIS and Phase 2 Amendment FEIS to avoid repetition and to allow this description to focus on the site-specific effects that would result from implementation of the proposed action and alternatives.

3.2 Past, Present, and Reasonably Foreseeable Future Activities

A number of activities have already occurred, are occurring, or are planned in the project area. Past activities have contributed to the current condition of resources as described in this chapter. Ongoing and future activities may contribute to effects on resources that would also be affected by the proposed project. The need to include these activities in the cumulative effects section of each individual resource analysis depends on the extent of the cumulative effects analysis area and the duration of effects on each resource. Future activities described in this section are not part of the decision to be made for this EIS. Most have already been approved by other decisions or would require separate environmental analysis and public involvement. Activities are described below.

3.2.1 Past Activities

Black Hills forests have been subject to extensive human activities since the 1870s. Humans have altered vegetation structure, composition, and patterns by harvesting timber, suppressing fire, introducing exotic species, causing wildfires, nearly extirpating beaver, and grazing domestic livestock. As a result, more of the landscape is forested, though the trees are generally smaller

(Parrish et al. 1996). The water table is likely to be lower in drainages now than when there were numerous beaver dams, contributing to changes in plant communities.

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

Timber sales that have taken place completely or partly within the project area since 1990 include Puma and Rednose. Post-sale activities such as precommercial thinning and fuel treatment have also taken place.

Nearly 100 miles of road have been developed in the project area on both public and private land. Private land has also been subject to timber harvest, livestock grazing, water diversions, and a limited amount of development. The extent of each type of past activity is listed below.

Fuel Treatment

Broadcast burning took place in parts of the Puma timber sale in the northern part of the analysis area in 2002 and 2003. A separate project, the Puma South Slope burning, successfully burned about 300 acres in spring and fall. In spring 2003, this project continued and resulted in an escaped fire that burned 475 acres, including about 30 acres of private land. About 50 acres of this fire exhibited passive crown fire behavior, with patches or groups of pine being consumed. Surface fire took place in the rest of the burn, with little effect on tree canopy.

Puma and Rednose timber sales included mechanical harvesting, with most of the logging slash being brought to and disposed of at log landings. These actions reduced potential fuel loading in treated areas. Many landing sites have been used two or three times in the last 80 years. Slash piles at landings have been burned and resulting ash spread and mixed with soil, followed by seeding. Despite this repeated disturbance, most landing sites are difficult to locate between periods of use.

Grazing

Livestock grazing has occurred here for over a century. The majority of grazing has been by cattle, with some sheep. The Farrall Allotment was created in the 1950s, but pasture fences were not constructed until much later. A deferred rotation grazing system was initiated in 1990. Grazing permittees have recently used electric fence to determine a good location for a permanent fence to fully implement a rotation of two pastures on the north end of the allotment.

Until 1973, the Redwater Allotment was a small part of the much larger Peaks Allotment and was grazed season-long. The 1973 Allotment Management Plan implemented a two-pasture rotation system, which was increased to three in 1994.

A riparian fence was constructed in 2005 along the north side of North Redwater Creek. This fence allows improved control over timing and intensity of cattle use of the riparian area.

Mining

Gravel mining took place in recent years at the Bearlodge Pit, which occupies about seven acres.

Noxious Weeds

Herbicide application has occurred in various locations, mainly along roads and at other areas of soil disturbance.

Private Land In and Around the Project Area

Livestock grazing, haying, livestock water developments, and limited timber harvest have occurred on private lands. Site-specific data are not available.

Roads and Travel Management

Most roads in the project area have been in place for several decades. Puma timber sale included construction of about three miles of road in the project area, and Rednose included about one mile of road construction. A number of roads were gated during the 1990s to reduce disturbance of wildlife.

The cumulative effects area for the motorized recreation analysis only is NFS lands in the Bear Lodge Mountains. Several area closures have been implemented on these lands since the 1980s, including Wood Canyon, Cook Lake, Rednose, and Sundance. Together these closures affect approximately 12,484 acres, or 15 percent of the NFS lands in the Bear Lodge Mountains.

Timber Harvest

The Puma and Rednose timber sales were cut between the mid-1990s and 2004. Together these sales produced 11,300,000 board feet of sawtimber from 2,993 acres. Puma extended outside the Dean project area boundary. Two units of the Sundance timber sale overlap a small part of the southern end of the Dean project area. Commercial harvest in this sale was completed in 2004.

Timber Stand Improvement

Precommercial thinning took place in many locations following previous timber sales.

3.2.2 Ongoing Activities

A variety of activities are ongoing in the project area. Post-sale activities related to the Puma and Rednose timber sale are currently active on public land in the project area. The Truck Trail Fuel Break project is currently under way on the southwestern boundary of the project area. Timber harvest is not known to be taking place on other ownerships. Livestock grazing occurs on National Forest System and private lands. No mining operations are currently active. Fire suppression takes place as needed. Maintenance of roads and electric utility lines continues. Water is diverted in various locations to livestock watering tanks. Development of private land is currently minimal. The extent of each type of ongoing activity is listed below.

Fuel Treatment

The ongoing Truck Trail Fuel Break project, which runs the length of the western boundary of the entire Dean project area, is changing the fuel complex adjacent to one of the original development roads into the Bear Lodge Mountains. The Truck Trail Project will substantially reduce canopy closure and therefore canopy bulk density on both sides of the Bearlodge Truck Trail (NFSR 830.1). It will affect approximately 485 acres. About half this acreage is inside the Dean project area. The project will produce about one million board feet of sawtimber. In addition, part of the Truck Trail project was designated in January 2006 as a free-use public firewood area. Firewood cutting is restricted to piles resulting from the fuel reduction project.

Grazing

Table 3-1 lists the current season of grazing use and numbers for allotments on public lands in the project area.

Table 3-1. Current Grazing Terms and Numbers

Allotment	Term	Numbers
Farrall (North Unit)	6/11 to 10/15	188 cow/calf pairs
Farrall (South Unit)	6/11 to 10/7	75 cow/calf pairs
Farrall (Table Mountain)	6/11 to 10/15	13 cow/calf pairs
Farrall Riparian*	Varies	Varies
Redwater	6/11 to 10/7	168 cow/calf pairs

*The Farrall Riparian pasture is used by permittees from both the Farrall and Redwater Allotments, usually at the end of the season for gathering.

Mining

The Bearlodge Gravel Pit is inactive. Bureau of Land Management records show two mining claims, neither of which is active.

Noxious Weeds

Noxious weed treatment and inventory are ongoing.

Private Land In and Around the Project Area

Private land uses appear to be similar to past uses (see above), with the addition of limited subdivision and development in some areas.

Recreation

The project area receives the most recreational use during big game hunting seasons; there is also occasional use for trail riding, sightseeing, driving, mountain biking, hiking, ATV riding, and berry picking. Some off-road use of motorized vehicles occurs along the Truck Trail (NFSR 830.1) as evidenced by disturbed soil at "hill-climb" locations.

Special Use Permits

Several activities take place under special use permit within the project area. Two outfitter-guides have permits that together cover almost all of the project area. Other special uses in the project area include a ditch bill easement and a cultivation permit.

Timber Harvest

See "Fuel Treatment", above.

Timber Stand Improvement

There are no ongoing timber stand improvement projects.

3.2.3 Reasonably Foreseeable Future Activities

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

Fuel Treatment

Landing piles will be burned and sites seeded in the Rednose timber sale area.

Grazing

Management plans for the Farrall and Redwater Allotments are currently being revised. A Draft EIS for this project (North Zone Range 2006) is expected to be published in spring 2006. Proposed actions include adaptive management of range resources, meaning an emphasis on modifying grazing systems as need based on results of monitoring. An expected action is construction of a fence to separate two pastures in the Redwater Allotment to allow better control of grazing timing and intensity. This fence will replace temporary electric fences used in recent years to achieve the same ends.

Mining

No mining has been proposed at this time.

Noxious Weeds

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

Private Land In and Around the Project Area

No foreseeable changes to private land uses from current uses are anticipated.

Recreation

Future recreational use is expected to be similar to current uses. If trends elsewhere are an indication, increased use of ATVs is a possibility. Potential effects of the ongoing Black Hills National Forest travel management planning effort are not currently foreseeable.

Timber Harvest

No additional timber harvests are proposed at this time. Removal of non-commercial pine encroaching on meadows and hardwood stands will take place on about 30 acres in the Rednose timber sale area.

3.3 PHYSICAL ENVIRONMENT

This section describes the affected environment and environmental consequences for each resource of the physical environment (watershed, geology, and soils, transportation, and minerals).

3.3.1 WATERSHED, GEOLOGY, and SOILS

Affected Environment

The Dean analysis area encompasses approximately 12,450 acres of Forest Service land with an additional 2,356 acres of private land holdings. The drainage channels in the area drain into the North and Middle Forks of Redwater Creek. They flow east and combine with Sand Creek to become the Redwater River near Beulah, Wyoming.

The four Hydrologic Unit Code (HUC) 7 watersheds in the area include the following (Map 2):

- Middle Fork Redwater (101-202-0301-0103), 8,121 acres
- North Redwater (101-202-0301-0101), 8,373 acres
- Skunk Peak (101-202-0301-0102), 6,832 acres
- A small portion of Sandstone Mountain (101-202-0304-0103), total 7,933 acres

Waterbodies in the Middle Fork Redwater watershed include Middle Fork of Redwater Creek, Cow Creek, and Hemler Reservoir. North Redwater Creek, Onemile Creek, and Twomile Creek are in the North Redwater watershed. The Skunk Peak watershed contains Sawmill Spring, the North and South Forks of Spring Creek and a downstream, off-Forest portion of North Redwater Creek near the town of Farrall. The Sandstone Mountain watershed contains only a small portion of Table Mountain located on National Forest System Lands. For the cumulative effects analysis, the entire watershed area will be considered. This area includes a total of about 31,260 acres, including private land.

Regulatory Framework and Analysis Methods

The Forest Plan, Phase 2 Amendment, Forest Service Manual and Handbook direction, and the Clean Water Act guide this analysis. Analysis of soil and water resources for the Dean area focuses on three indicators:

1. Planned activities on highly erosive or unstable soils.
2. Connected disturbed areas (CDAs), current and new.
3. Total percentage of activity acres, past and planned.

This analysis addresses the first indicator by comparing the number of new road miles constructed on highly erosive/unstable soils and the number of treatment units on highly erosive/unstable soils in each alternative. The second indicator will be analyzed by describing the number and extent of CDAs under each alternative. The third indicator will be analyzed by looking at the total percentage of National Forest System lands within the project area treated in the past and under each alternative.

Beneficial Uses

The State of Wyoming has assigned water quality standards for surface waters. Beneficial uses are associated with Redwater Creek downstream from the project area. These include Drinking Water, Game Fish, Non-game Fish, Fish Consumption, Other Aquatic Life, Recreation, Wildlife, Agriculture, Industry, and Scenic Value. Intermittent streams and drainages are included in the definition of surface waters of the state, and any intermittent stream segments with assigned beneficial uses will be managed to prevent impairment of those beneficial uses.

Protection of Wetlands

Executive Order 11990 directs all Federal agencies to avoid impacts to wetlands. The local regulatory source of protection for wetlands is found in Section 12 of the Wyoming Surface Water Quality Standards (Wyoming DEQ 2001).

Natural Watershed Characteristics

The natural characteristics of a watershed, such as annual precipitation, topography, soil types, geology, and vegetation cover contribute to the extent which ground disturbing activities can be expected to affect channel morphology, flow regime, water quality, and ultimately downstream beneficial uses.

Climate and Topography

Winter low temperatures in the project vicinity average in the upper teens. Summer highs average in the low 80s. Precipitation averages less than 20 inches per year, about half of which is in the form of snow. There is some potential for rain-on-snow events that may induce peak streamflow, leading to degraded stream channel conditions as well as damage to road drainage and stream crossing structures.

Total perennial channel length on National Forest System lands, determined using GIS, is approximately 11 miles. Middle Redwater Creek flows northeast and North Redwater Creek flows east out of the project area. Cow Creek is perennial along most of its length, and Onemile and Twomile Creeks have perennial sections as well. Other perennial reaches are associated with springs and are not generally connected to downstream surface waters. The remaining channels in the area are intermittent or ephemeral in nature.

Landtype associations (LTAs) in this area include "LTA 13, Gently Dipping Hogback" and "LTA 11, Sundance Lands" (USDA Forest Service 1996). These associations are characterized by ridges that are sometimes broad, sometimes narrow, with sideslopes generally 20 to 35 percent, and narrow valley bottoms less than 300 feet in width. Outcrops of shale, sandstone, and limestone comprise 10 to 20 percent of these areas. Maximum elevation at the headwaters is about 5,800 feet, and elevation at the lowest point in the Skunk Peak watershed is 3,760 feet.

Soils

During field survey and mapping, soil observations were recorded and typical soil profiles were described. The project area is characterized by ridges and steep sideslopes of generally 20 to 35 percent with narrow valley bottoms. Rock outcrops of sandstone and limestone comprise 10 to 20 percent of the area. The dominant geology of the area is sandstone and limestone of the Spearfish formation. The higher peaks are igneous intrusions.

Dominant soil series in the analysis area are located within soil mapping unit (SMU) 93, Lakoa-Butch, 10 to 60 percent slope; SMU 97, Larkson-Lakoa, 3 to 10 percent slope; SMU 98, Larkson-Lakoa, 10 to 60 percent slope; and SMU 155, Rock outcrop-Vanocker, 50 to 75 percent slope. Soils were described and mapped as part of the Crook County Soil Survey. SMU 93 and 98 are mapped in areas where active and relic landsides have occurred. Potential for mass movement in these soils is greater when unstable areas are disturbed. A portion of FDR 843.1 was recently reconstructed and realigned due to a landslide along North Redwater Creek. This landslide occurred in the spring following a wet winter, which provided a source of water that provided the extra weight to trigger the landslide. Several eroding hillslopes exist along North Redwater Creek, where the stream is cutting at the toe of the slope and loosely consolidated soils that have not stabilized are contributing sediment into the creek (Nusz 2003).

All potential harvest units on slopes greater 30% were examined in the field to assess the mass movement potential. Survey protocol are described in Appendix A of the soil report (Dean project file).

Soil characteristics that are of major concern relative to vegetation management include erosion hazard, soil compaction, stability hazard, and unsurfaced roads. Erosion hazard is the inherent susceptibility of a soil to erosive forces such as raindrop impact or water flow over the surface and is dependent on soil factors such as particle size distribution, organic matter content, soil structure, and the ability of the soil to hold and allow water to infiltrate into the soil.

The erosion hazard rating is driven by the soil erodibility factor, which is taken from the soil survey report and slope. Erosion hazard is listed as low to high for SMU 93, which has a slope range of 10 to 60 percent. Based on soil erosion interpretation, the slope breaks for the different classes are as follows: Low, 0 to 15 percent; Moderate, 16 to 35 percent; and High, slopes greater than 35 percent. SMU 93 has an erosion hazard rating ranging from low to high due to the wide range of slopes in which it was mapped in the survey area. Actual erosion hazard and appropriate mitigation measures that may be needed are determined during field review.

Forest-wide monitoring of soil compaction indicates that timber harvest and cattle grazing generally are not causing detrimental soil compaction (USDA Forest Service 2003e). Site-specific data were collected in two units of the Rednose timber sale area (within the Dean project area) in June 2004 (Tangenberg 2004). Detrimental soil disturbance (including compaction, displacement, burning, and erosion) was found on about one percent of the total area in cutting unit 9, which was harvested in 2002 using a forwarder system. Unit 11 was harvested with conventional hand/tractor operation in fall 1998. This unit had about four percent disturbance. These observations suggest that soil disturbance levels have remained below 15 percent, as required by amended Forest Plan standard 1103.

For the effects analysis, the areas and acreage covered by the proposed treatments were used for each alternative. Upon actual implementation of the units, the treatment area acreage is often less than that originally proposed and described in the NEPA document. This is due to implementation of design criteria, actual on-the-ground layout of the units, and variation of site conditions. For example, fewer acres may actually be treated within a unit due to avoidance of areas with steep slopes or erosive soil conditions. See Chapter 2 of this document for a complete description of treatments and design criteria by alternative.

Method of Analysis of Soil Effects

Amended Forest Plan standard 1108 states "Reduce resource damage and investment loss in areas that have mass movement potential. (a) Perform an on-site slope stability examination on slopes over 30% prior to design of roads or activities that remove most or all of the timber canopy for the following area and soils: (1) Lakoa, Larkson and Citadel soils found in the Bear Lodge Mountains". Since the Dean project area is in the Bear Lodge Mountains and includes Lakoa and Larkson soils, an on-site field review was conducted on slopes over 30 percent. A mass movement interpretation (soil report Appendix A, Dean project file) was used as guidance in making on-site determinations of mass movement potential based on field information such as slope, geology, and evidence of past movement. This information was recorded on soil field sheets that are part of the specialist's report. This on-site investigation meets the requirement of amended Forest Plan standard 1108.

Standard 1101 states: "When doing projects, analyze the cumulative effects of disturbance on long-term soil productivity". To determine the baseline of existing soil conditions, a soil health protocol was used. Ten different soil health criteria were evaluated and an overall soil health condition class rating was given. This assessment was done in conjunction with the slope stability investigation. This information provides the baseline of the existing soil condition that is used in determining cumulative soil effect. This meets the requirement for amended Forest Plan standard 1101 and provides documentation for cumulative effects analysis.

Existing Stream Conditions

Rivers and streams are complex and dynamic natural systems. The physical, chemical, and biological conditions that exist between their banks and across their floodplains are a result of all the natural and man-made characteristics within the watershed. Stream system dynamics can be understood best by subdividing it into three areas: streamflow regime, water quality, and stream channel morphology.

Streamflow Regime

Surface water occurs in the project area in the form of small perennial creeks, springs, impoundments, and beaver ponds. Middle and North Redwater Creeks are the main channels with perennial flow in this analysis area. Cow, Onemile, and Twomile Creeks are the other named perennial drainages. Most other main channels are ephemeral or intermittent drainages. Almost all tributaries (ephemeral reaches) are dry, grassy, and timbered draws that route water only during infrequent and intense run-off events. Most of these draws do not exhibit evidence of recent flow. They contain neither a defined channel nor channel scour exposing gravel or sand substrate.

Most damaging floods in the Black Hills are due to severe spring and summer thunderstorms. Snowmelt is not usually a substantial factor affecting runoff from these storms. Antecedent soil moisture is usually high during this period of intense precipitation events. Approximately 50 percent of the annual precipitation occurs in the months of April, May, and June.

Past harvest activities, wildfire events, fire-suppression activities, and natural vegetation growth have combined to produce the current vegetation characteristics across this analysis area. These characteristics dominate the "evaporation" component of the basic water balance equation (runoff equals precipitation minus evaporation (including evapotranspiration) minus groundwater recharge). For at least the past 25 years, the forest has been harvested using partial cut methods on selected forest stands. This method retains vegetation, encouraging faster growth and stronger

water uptake. Combined with aggressive fire suppression, the "evaporation" component for this analysis area, and indeed most of the Black Hills National Forest in general, has increased, resulting in decreasing runoff year after year.

Water Quality

Water quality refers to the physical, chemical, and biological composition of a given streamflow and how these components affect beneficial uses. The existing water quality of the drainages within the project area is a result of the natural characteristics of the watersheds along with effects of activities that have occurred on NFS and private lands.

Waterbodies in the analysis area that have been assigned beneficial uses are currently meeting those uses. Violations of water quality standards have not been detected in the analysis area. This includes Middle Redwater Creek, North Redwater Creek, Cow Creek, and Hemler Reservoir. Hemler Reservoir supports fish, including finescale dace, a Region 2 sensitive species (see p. 3-100).

Watershed Condition Class

Watershed classes were assigned to sixth-level watersheds during revision of the Black Hills Forest Plan (USDA Forest Service 1996). Determination of class was accomplished by comparing sensitivity and impact indices and monitoring information. Sensitivity and impact indices are explained in Appendix J of the 1996 Forest Plan FEIS. The table below presents watershed condition class information from the 1996 Forest Plan FEIS, Appendix J, and the corresponding HUC 7 watersheds from above.

Table 3-2. Dean Project Watershed Condition Classes

Sixth Level Watershed #	HUC 7 Watershed Names	Condition Class
(83-01)	Middle Redwater, North Redwater, Skunk Peak	II
(82-01)	Sandstone Mountain	I

Watershed Class definitions are from Appendix J of the Forest Plan FEIS (USDA Forest Service 1996a).

> *Condition Class I* – "are not currently of concern...these watersheds are in robust health. The stream network is in equilibrium and risks from human-caused deterioration are low."
> *Condition Class II* – "...are of moderate concern... [they] may have streams and soils in disequilibrium...Some upland restoration may be necessary."

Culverts along Onemile and Twomile Creeks on NFSR 843.1 are locations where water quality could be diminished by road failure or ditch input. Muddy fords along Middle Fork Redwater Creek (NFSRs 831.1, 831.1M, and 821.2G) influence water quality by providing direct sediment sources. Most of the remaining stream crossings in the project area only have the potential to influence water quality during localized, heavy rainstorm events. During such an event, road-stream crossings have the potential to adversely impact water quality.

Channel Morphology

Mass wasting of valley sideslopes has shaped the stream channel of the North Fork Redwater drainage. Numerous areas of old and some new earth slumps have been observed (Macy 1997, Nusz 2003). It appears that the stream is migrating back and forth across the valley bottom in response to flood events and mass movements. Stream undercutting of the slope toe can cause these mass movements. Several of the movements are characterized by large cutbanks. Some

have reestablished vegetation since the last major flood event, which occurred in 1995. Others are still bare and continue to erode and deposit sediment into North Redwater Creek.

Visual surveys of Cow Creek, Middle Redwater Creek, and North Redwater Creek have been conducted several times since 2002. Measurements taken in the analysis area focused on stream crossing structures and their influences on stream channels. Proper Functioning Condition (PFC) assessments were conducted on reaches of these waterbodies in July 2003. Follow-up surveys focusing on streambank alteration and residual stubble heights were conducted in August 2004. PFC assessments conducted in 2003 indicated that reaches on North Redwater Creek and Cow Creek are functioning properly. The reach along Middle Redwater Creek was determined to be "Functional – At Risk." During visual surveys in late August 2004, streambank alteration along the Middle Redwater Creek and Cow Creek reaches were about 30 percent and 80 percent, respectively. This alteration has been caused by hoof action of cows or big game. It is in excess of recommended alteration thresholds listed in FSH 2509.25, Chapter 10, Standard (3), design criteria (k). Undesirable changes to channel morphology may occur in these reaches following large flood events, given the degree of streambank alteration.

Channel morphology has been affected and continues to be affected by at least two fords on Middle Redwater Creek. The fords on NFSRs 831.2G and 831.1K have prevented headcuts in Middle Redwater Creek from migrating upstream. They have also contributed to bank cutting downstream of the fords, most likely during high-runoff events.

Along much of the perennial section of Middle Redwater Creek, valley bottom road NFSR 831.1 has influenced channel morphology. In some locations, the road is within 100 feet of the stream. Since NFSR 831.1 is within the Water Influence Zone (WIZ) of the stream, the road affects channel morphology through floodplain alteration and restriction.

Other locations where roads may affect channel morphology include the culverts along Onemile and Twomile Creeks on NFSR 843.1, which can constrict floodflows and cause scour pools at their outlets. Muddy fords along Middle Fork Redwater Creek (NFSRs 831.1, 831.1M, and 821.2G) influence stream channels by causing areas of wide, shallow stream channel. Most of the remaining stream crossings in the project area only have the potential to influence water quality during localized, heavy rainstorm events, when culverts can affect stream channel dynamics by constricting the floodplain, concentrating water flow, and changing stream gradient and flow velocities.

Floodplains

Floodplains in the analysis area are most affected by existing roads and their location with respect to drainages. The spillway of Hemler Dam, located in the floodplain of Middle Redwater Creek, was damaged by flooding in 1995 and could experience further degradation in another flood event. Additional damage to the spillway could undermine the entire dam structure. The gully is currently eight to ten feet deep, and is located 200 to 300 feet down the spillway from the dam. The gully would have to migrate upstream this additional distance before the integrity of the dam would be jeopardized, but the last major flooding event alone caused the gully to become 100 feet long.

Riparian Ecosystems

Most riparian ecosystems in the analysis area are associated with the perennial drainages of Middle Redwater Creek, North Redwater Creek, Cow Creek, Onemile Creek, and Twomile Creek. Some spring areas and ephemeral drainage bottoms contain plants associated with riparian areas. However, these areas are separated by open, dry meadows and are not continuous.

Wetlands

The National Wetlands Inventory (NWI) was used to initially delineate wetlands in the Dean area. There are additional wetlands associated with springs and perennial stream channels, although the NWI does not delineate them. Middle and North Redwater Creeks have riparian wetlands adjacent to the channel along much of their perennial reaches.

Constructed Watershed Features

Road Condition Inventory

Road condition inventory was conducted in summer 2002, winter 2003, and spring 2004. Areas of concern include:

- NFSRs 831.1K, 831.1M, and 831.2G cross Redwater Creek in T52N, R63W, Sec. 1 and T52N, R62W, Sec. 31. These three crossings are fords that contribute sediment and elevated water flows to the creek.
- NFSR 843.2A crosses an intermittent drainage in T53N, R62W, Sec. 17. Runoff is diverted out of the main channel, down ruts in the road, and onto NFSR 843.1. Water then returns to the main channel just outside the National Forest.
- A culvert was removed where NFSR 833.1F crosses North Redwater Creek (Madison Branch). Fill is eroding and needs revegetation.
- NFSR 830.3A is located in the drainage bottom of the South Fork of Spring Creek, T53N, R62W, Sec. 8 and 9. Springs and wet areas in the road surface are among the problems that should be addressed.

CDAs are high-runoff areas such as roads and other disturbed sites that discharge surface runoff into a stream or lake (USDA Forest Service 1999). CDAs may include bare or compacted soils, roads, severely burned areas, or mine spoils. When water and sediment from a disturbed area flows into a water body without sufficient delay by vegetated filter strips or sediment detention structures, it is connected to the water body. CDAs contribute sediment to streams or wetlands causing degradation of physical function, degraded water quality, and increased peak flows that may alter physical channel processes. Most roads that cross creeks will create a connected disturbed area. The CDAs listed above are the most damaging within this analysis area, and are the CDAs that will be tracked through the analysis process.

Range Improvements

Several fences and water developments exist in the analysis area. Most springs in the area have some water development associated with them. Pipes divert water from fenced and non-fenced springs into stock tanks. Fenced spring areas are protected from trampling and disturbance. Non-fenced springs remain vulnerable to overuse, particularly during dry years. Fences concentrate cattle onto paths, and areas of bare, compacted earth are found adjacent to several fences and stock tanks.

Stream Channel Improvements

A streambank stabilization project was competed in summer 2003 along Middle Redwater Creek, just downstream from the NFSR 831.2G stream crossing. Logs were tied to the bare bank using steel cable and a buried deadman in order to armor the bank and reduce erosion caused by the crossing.

DIRECT and INDIRECT EFFECTS

Soil Erosion, Compaction, Heating, Nutrient Loss, and Mass Movement

No Action (Alternative A)

No further effects on the soil resource beyond existing conditions would occur. Under the no action alternative, existing soil erosion concerns associated with roads would persist. Conditions may worsen without effective closures and decommissioning of damaged, unnecessary roadways. Without new compaction caused by ground-based harvest equipment and nutrient removal caused by harvest, soil productivity and soil nutrients would remain the same or improve over time. Active landslides along North Redwater Creek would continue to contribute sediment to the creek.

Wildfire: The no action alternative would allow stand-replacing fire risk to increase over time. Soil cohesion, productivity, and nutrients may be severely impacted in the event of a widespread stand-replacing fire event. Following a severe wildfire, soils on steep slopes above Middle and North Redwater Creeks and along the tributaries feeding them would have increased erosion hazards and debris flow potential during intense, short-duration thunderstorms. Storms of this type typically occur between about July 15 and September 15 in any given year. Soil productivity may suffer from burning of soil organic matter. Saturation-induced landsides and debris flows may occur more frequently in a severely burned landscape. Loss of vegetation combined with heavy precipitation may lead to increases in soil water content and reductions of soil cohesion.

Recovery from a large wildfire in this area may take a few years to several decades. Areas adjacent to the Dean project area that were burned by the Sundance Fire in 1938 are still missing many of their pre-fire vegetation characteristics. The Puma fire occurred recently in the northern part of the analysis area. While the overstory was killed in some locations, understory vegetation has come back in and is currently providing effective ground cover.

Alternatives B, C, and D

Timber harvest activities, including felling, skidding, decking, transporting of logs off-site, and slash disposal, can directly affect soil resources. Potential effects on soil resources include soil compaction, displacement, and furrowing. Soil erosion can occur when rainstorms occur on sites where the ground cover has been removed. Field review of past harvest units in the Dean project area occurring on the same soil types as proposed Dean units did not reveal any soil erosion. The understory contained an abundant mixture of grasses and forbs that provide cover to protect against soil erosion.

Loss of soil nutrients is a potential indirect effect of the action alternatives. The majority of soil nutrients are concentrated in the foliage, branches, and root systems of trees. Where whole-tree yarding is prescribed, some of the nutrients would be removed while some remain on-site in the roots. The method of mechanical logging that removes the fewest nutrients is the cut-to-length system, where each tree is mechanically processed along the skid trail and only the bole is

removed. Another advantage of the cut-to-length harvesting system is that forwarders are used as part of the system and provide full suspension of the logs, minimizing soil displacement and cover reduction. Yarding with grapple-skidders provides only one-end suspension and the skid trail is swept by the dragged tops, which may displace soil and uproot understory vegetation. Tractor-yarding with cables may not suspend the logs at all, and can lead to more furrowing and displacement than grapple skidders.

Forest-wide monitoring of soil compaction indicates that timber harvest is generally not causing detrimental compaction (USDA Forest Service 2003e). Site-specific data were collected in two units of the Rednose timber sale area (within the Dean project area) in June 2004. Detrimental disturbance (including compaction, displacement, burning, and erosion) was found on about one percent in cutting unit 9, which was harvested with a forwarder system in 2002. Unit 11 was harvested with conventional hand/tractor operation in fall 1998. This unit had about four percent disturbance. These observations suggest that soil disturbance levels have remained below 15 percent, as required by amended Forest Plan standard 1103. Also, the use of designated skid trails to protect advanced regeneration (page 2-5) would minimize the amount of detrimental disturbance in the unit to levels below 15 percent (Garland 1997). Based on the fact that proposed activities in the Dean project area would occur on soils similar to those sampled in the Rednose timber sale area, similar results would be expected.

As mentioned above, the soils with high erosion hazard are confined to slopes of at least 35 percent. The majority of proposed units are located on slopes less than 35 percent and do not possess the high erosion risk associated with steeper slopes. During field review of the proposed treatment units and previously harvested units in the analysis area, observations revealed an abundance of ground cover, which protects the soil from erosion. This was consistently observed both within the proposed units for the Dean project and within past harvested units containing the same soil types as the Dean project area. Using the design criteria listed in the Forest Plan as amended and Chapter 2, erosion rates would remain within acceptable levels. This is further supported by the Water Erosion Prediction Program (WEPP), a model that was used to estimate erosion for all action alternatives. As with any modeling, erosion and sedimentation values should be used as relative values for comparison purposes. The model supports field observations that soil erosion is within acceptable levels. The major factor in preventing soil erosion is the amount of ground cover, and the WEPP model is very sensitive to ground cover. As mentioned above, field observations consistently found that the disturbed sites have an abundance of ground cover. The model has found that once a disturbed area has reached 60 percent or more ground cover, soil erosion rates fall to pre-disturbance levels. The abundance of ground cover following past treatments provides effective protection and results in little to no soil erosion.

Cable harvest methods and non-mechanized fuel treatments would be used to minimize soil disturbance on steep terrain with high erosion hazard. Additional design criteria would be employed to reduce effects to the soil resource (page 2-6; amended Forest Plan standards 1102, 1104). With implementation of these measures, proposed timber harvest and fuel treatments would result in negligible soil erosion.

Alternatives B and C propose roughly one mile of new road construction (tentatively designated 831.21) with a portion of the proposed road located on a steep slope. To prevent adverse effects, road layout would avoid the steep, erosive areas. If these areas cannot be entirely avoided, soil stabilization measures such as erosion matting and seeding would be used on the cut and fill slopes (design criteria, page 2-8). Design of this road would avoid the steep, unstable sections, minimizing the chance of road failure and transport of material to downslope locations. With

proper design and implementation, construction of this road would result in minimal adverse effects on the soil resource.

While some ground disturbance would occur during road decommissioning, decommissioned roads would no longer be sources of soil erosion once the road surfaces have revegetated (one to two years). Successfully decommissioning roads would have a beneficial effect on soil disturbance.

Adherence to amended Forest Plan standards, BMPs, and site-specific design criteria would reduce adverse effects on soil productivity and soil nutrients. Slash or vegetation would be retained on all activity areas, aiding in the conservation of on-site moisture.

Prescribed burning would have little effect on erosion, productivity, or landslide risk in the Dean project area. Burning activities may create temporary effects such as small areas of bare mineral soil, vegetation removal and soil heating. After one to two years, however, ground cover vegetation in these areas generally recovers to its full potential. This type of recovery was evident in the Puma fire (2003), which currently has abundant ground cover including grasses and forbs. Burning retains nutrients on-site, and thereby maintains soil productivity. Bare areas that are exposed to erosion are receptive seedbeds, and vegetation usually occupies these sites within a year or two. Following prescribed burns, slopes are rarely steep enough and more importantly soils rarely bare enough to contribute to an increase of landslides events.

When vegetation such as tree cover is removed or dies on an unstable slope, root cohesion is reduced and soil water levels are increased. The net effect adversely affects slope stability, based on a study conducted in the Idaho batholith (Gray and Megahan 1981). The study recommended leaving as much residual timber in a stand as possible to maintain root strength and reduce water buildup. Factors influencing the stability of slopes include strength and structure of rock materials, bedding sequences, slope gradient, landform shape, soil depth and strength, and clay mineralogy. The influence of plant roots is most apparent where clearcutting or vegetation conversion has been done (Sidle 1985). Road building may cause mass movement by overloading or undercutting unstable slopes or by concentrating surface or subsurface water. Intensive slope stability surveys can be used to identify timber harvest sites within larger areas generally classified as unstable (Burroughs 1985). On-site soil and geomorphic investigations have been completed in the Dean project area, as well as on similar adjacent areas and soils.

Over 90 percent of the proposed timber harvesting would leave residual trees on the units, thus leaving intact active root systems that would provide stability. Field review of the area of concern for mass movement reveals the following: 1) the majority of the area is on less than 30 percent slope, 2) lack of hummocky topography in the area, and 3) the geologic formations in the area all add up to a low potential for mass movement.

Effects on soil resources would be similar under Alternatives B and C. Alternative D focuses on fuel reduction treatments and would disturb the least amount of ground. All three action alternatives are consistent with direction in the Forest Plan as amended.

Streamflow Regime

Changes in water yield can be discussed in terms of annual or peak flow increases. Because the greatest risk of channel degradation occurs during high flow periods, it is the increase in magnitude and duration of peakflows that concerns hydrologists the most.

No Action (Alternative A)

Since there would be no activities associated with the no action alternative, water flow volumes would remain dependent on precipitation variability. Existing vegetation structures would persist until the next management action or fire event. Until that time, vegetation growth may slightly diminish water yield.

Since there would be no decommissioning of existing roads or rehabilitation of CDAs, the current road system would continue to support increased water yield and delivery from roadways. The drainage network extension caused by the current road system would also persist. Peak flows would remain at a higher level than without a road network on the landscape, and the timing of those flows would continue to be accelerated. All road/stream crossings in the analysis area, including the CDAs on NFSRs 831.2G, 831.1K, 831.1M, 833.1F, 843.2A, and 830.3A, would remain unimproved.

Wildfire: Rilling, gully erosion, and sheet erosion would likely occur at increased rates following a severe wildfire. This would lead to inputs of sediment to the valley bottoms and stream channels of the area. Before a wildfire, vegetation provides protective ground cover and duff layers play an important role in infiltration, both factors in reducing overland flow. Following a wildfire, soils would be bare and susceptible to accelerated erosion and increased runoff rates. Loss of protective ground cover would lead to increases in peak flows, which in turn may create changes in channel morphology (bank erosion, downcutting, channel filling or damming).

The primary watershed responses to a large wildfire in the Dean project area would include: 1) an initial flush of ash that would deposit in Redwater Creek downstream from the analysis area; 2) gully and rill erosion in drainages and on steep slopes within the burn area, such as those around North and Middle Redwater Creeks; 3) debris flows and sediment deposition where stream gradients flatten or at tributary mouths; and 4) increases in peak flows. Elevated erosion, runoff, and stream flows would occur for several years after the wildfire until vegetation had recovered. Stream flow response to common rainfall events (with a recurrence interval of 10 years and duration of one hour) would increase as a result of fire impacts. Storms of high intensity and short duration (typical for this area) are of most concern. Peak flows may increase from 10 to 100 times their pre-fire volumes.

Valley-bottom roads and road crossings would be at increased risk following a large wildfire. Flood flows could exceed channel and culvert carrying capacities, leading to clogged culverts, possible failures of road fills, and gully formation on roadbeds.

Alternative B

Increases in flow volume resulting from timber harvest and vegetation management may occur. Regeneration and accelerated growth of remaining vegetation are likely to balance the water equation over time. Generally, runoff equals precipitation minus evaporation (including evapotranspiration) and groundwater recharge. In this equation, vegetation removal leads to a decrease in the "evaporation" component. Since the basic geology of the area would not be altered, the "groundwater recharge" component would remain unchanged. Runoff and water yield would continue to be dominated by variables in precipitation. Runoff may be increased above current levels. "[Stream]flow increase is seldom detectable until 25 percent of the basal area of a forested watershed is cut. Increased peak flows may not begin to affect streams until 40 percent of the basal area is cut" (USDA Forest Service 2001).

None of the proposed new road construction would add connected disturbed areas. The new construction of NFSR 831.1K1 would be disconnected from the ford at Middle Redwater Creek with rolling dips, waterbars, or ditch-relief culverts. CDAs would not be created while accessing stands 0705010004 and 0705010060. Decommissioning of NFSR 831.2G would remove one of the major CDAs in this project area. Roadwork at the fords on NFSRs 831.1K and 831.1M would reduce the length of CDAs at these points. Other CDAs at NFSRs 843.2A, 833.1F, and 830.3A would be eliminated or reduced in length through road reconstruction work under this alternative.

Other non-system roads that would be decommissioned through methods that disconnect them from the drainage network would no longer contribute to higher runoff volumes and accelerated water delivery.

Prescribed fire: Prescribed burning may cause the removal of forest vegetation as well as the thin duff layer that covers the forest floor. Duff removal is not expected to be widespread under any alternative, as burn intensities would not be high enough nor residence times long enough. Burning activities would, however, expose pockets of bare mineral soil. These pockets would generally be small enough and dispersed enough to prevent detrimental runoff and hillslope erosion from occurring. Attempts would be made to retain as much duff as possible on steep slopes in the analysis area (page 2-6). This would reduce harmful runoff and sedimentation (Robichaud 1996). If sediment runoff is mitigated, then nutrient loading downstream would also be mitigated. Nutrients are mobilized with sediment in runoff events and can contribute to changes within a stream in regard to pH, nitrates, and phosphates. With relative increases in water volume, however, increases in nutrients delivered to a stream generally fall within the natural range of variability (Pyne et al. 1996).

Prescribed burns proposed for this area may create the possibility of increased runoff and water flow volumes. These effects are, however, less likely to occur or be severe as a result of prescribed fire than stand-replacing wildfire. Prescribed burns would take place when weather, fuels, and moisture conditions would moderate fire severity, allowing reduction of fuels while maintaining ground cover and live overstory trees. Severe wildfires tend to kill all overstory trees and may leave little protective ground cover. If too much understory, overstory, and duff are removed during a fire, flow volumes draining from the area may increase to the point where streams carry volumes that exceed the current two-year flood flows. If this happens, and stream channels lack stabilizing streambank vegetation, channels could readjust their morphology to accommodate those volumes. Channels may also adjust their morphology to accommodate increases in sediment that may result from runoff after a fire. Changes occur when the carrying capacity of a stream remains static while the amount of sediment the stream is required to carry increases. Channels that alter their morphology may migrate laterally into existing stream banks and cause erosion of those banks. They may also migrate into road fills that are located within the floodplains of streams, such as NFSR 831.1 along Middle Redwater Creek.

Alternative C

This alternative proposes vegetation treatments on a broad scale. Many of the proposed treatments would occur in areas that have been treated in the recent past, including Rednose and Puma timber sale units.

None of the proposed new road construction would create CDAs. Construction of NFSR 831.1K1 would disconnect the ford at Middle Redwater Creek with rolling dips, waterbars, or ditch-relief culverts. Decommissioning of NFSR 831.2G would remove one of the major CDAs in this project area. Roadwork at the fords on NFSRs 831.1K and 831.1M would reduce the

length of CDAs at these points. Other CDAs at NFSRs 843.2A, 833.1F, and 830.3A would be improved through road reconstruction work under this alternative.

Other non-system roads that would be decommissioned through methods that disconnect them from the drainage network would no longer contribute to higher runoff volumes and accelerated water delivery.

Effects of prescribed fire would be similar to those described for Alternative B (page 3-18).

Alternative D

This alternative would focus treatment around private land and along major travel routes. Burning and mechanical fuel reduction treatments are included, but these activities would have minimal impact on the evaporation component of the runoff equation. Accelerated growth and water uptake by the remaining vegetation would likely balance any reductions made by this alternative.

There would be no new road construction under this alternative, and therefore no new CDAs would be created by roads. The concentration of activity along roads that are adjacent to riparian areas would require careful layout to ensure that skid trails and log landings do not create CDAs, which could add sediment or ash to stream channels. Decommissioning of NFSR 831.2G would remove one of the major CDAs in this project area. Roadwork at the fords on NFSRs 831.1K and 831.1M would reduce the length of CDAs at these points. Road reconstruction work would also improve CDAs on NFSRs 843.2A and 830.3A. The CDA on NFSR 833.1F would be rehabilitated through a watershed improvement project, which could include removing excess road fill and reestablishing vegetation on the streambanks.

Other non-system roads that would be decommissioned through methods that disconnect them from the drainage network would no longer contribute to higher runoff volumes and accelerated water delivery.

Effects of prescribed fire would be similar to those described for Alternative B (page 3-18).

Water Quality

Management activities have the potential to alter erosion processes and cause increases in sediment concentrations within the stream-bottom substrate. Timber harvest activities that remove forest canopy increase snowpack depths and melting rates (Megahan 1976), resulting in surface runoff. These same activities cause varying degrees of soil exposure, soil compaction, and surface runoff routing. Given the right conditions, this additional runoff and suspended sediment can be transported to stream channels. Increases in surface flow during runoff events results in a proportional increase in peak stream flow. As this peak discharge approaches magnitudes and durations beyond the normal flow regime, bank cutting, bedload movement, and mass slope failure can occur along and within the stream channel. These channel changes can result in changes with respect to sediment, temperature, and dissolved oxygen. Grazing activities can impact water quality by removing streamside vegetation. Cattle can also trample streambanks. These impacts can increase stream bank erosion, water temperature, and nutrient loading.

No Action (Alternative A)

Existing roads would continue to contribute sediment to the drainage network where CDAs exist. Since no new roads or skid trails would be built, there would be no new potential sources of

sediment. The current conditions of temperature, dissolved oxygen, and water purity would generally persist in surface water locations. Since they are usually disconnected due to an absence of surface water, water quality conditions in North Redwater and Middle Redwater Creeks would continue to have few, if any, effects on conditions in Redwater Creek downstream. Potential wildfire effects are described on page 3-18.

Alternative B

By implementing design criteria, including BMPs, water quality and beneficial uses in the Dean project area would not be negatively affected by proposed activities. Streams, springs, and some ephemeral draws would be buffered from activities with streamside management zones and vegetation buffers. Disturbed sites would be reseeded to prevent harmful runoff and sedimentation. CDA rehabilitation along NFSRs 831.2G, 831.1K, 831.1M, and 833.1F may contribute to one- to two-year sediment increases to the drainage network. Beyond this time period, sediment input would decrease relative to the existing condition. Stream crossing improvement activities could also generate increases in sediment lasting one to two years. Any required Army Corps of Engineers 404 permits (dredge and fill) would be obtained prior to implementation of relevant activities.

Alternative C

Water quality would not be affected by proposed vegetation treatments under Alternative C. BMPs and streamcourse protection measures would be applied as under Alternative B. CDA rehabilitation and stream crossing improvements would have effects as described for Alternative B. Any required Army Corps of Engineers 404 permits (dredge and fill) would be obtained prior to implementation of relevant activities.

Alternative D

Water quality would not be affected by proposed vegetation treatments under Alternative D. BMPs and stream course protection measures would be applied as under Alternative B. CDA rehabilitation and stream crossing improvements would have effects as described for Alternative B. Any required Army Corps of Engineers 404 permits (dredge and fill) would be obtained prior to implementation of relevant activities.

Channel Morphology

Equilibrium within a stream system is a result of the balance between streamflow, sediment input, and substrate/bank composition. Variation in any of these components results in a corresponding change in the others. Elevated peakflows increase stream energy. This energy is dissipated through bank cutting and bedload movement in areas that were previously stable. Conversely, elevated sediment volumes decrease stream energy. This is revealed through sediment deposition, which results in a widening of the channel and a decrease in bankfull depth. Changes in the amount or position of large woody debris in the channel will also increase or decrease streamflow energy at specific points. Woody debris can act as flow dissipaters that may cause deposition to occur or flow concentrators that may cause scouring of pools or banks. All of these factors may influence channel morphology if they are changed through some action or event.

No Action (Alternative A)

Since there would be no new activities associated with the no action alternative, there would be no new effects on stream morphology. Stream channels that are currently unstable would continue to gradually stabilize. Existing roads and road/stream crossings that affect channel morphology would continue to do so. Stream channels may still be adjusting to the increased

water yield, sediment loads, elevated peak flows, and accelerated peak flow timing caused by the current road system. Potential wildfire effects are described on page 3-18.

Action Alternatives

Similarities among the action alternatives allow them to be discussed together. Increases in flow volume may occur under all action alternatives and are slightly more likely under Alternative C, but due to the minor degree of increase, changes in stream morphology are not expected to result. Proposed activities are not expected to substantially change stream channel dynamics. Improvement of CDA conditions along NFSRs 831.2G, 831.1K, 831.1M, 833.1F, and 843.2A would reduce the 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

No Action (Alternative A)

There would be no new effects on floodplains since additional vegetation management or road building would not take place in this alternative. Roads currently affecting floodplains would continue to do so. Potential wildfire effects are described on page 3-18.

Action Alternatives

Similarities among action alternatives allow them to be discussed together with respect to floodplains. No new roads would be built in floodplains. Possible effects on floodplains from harvest activities, such as compaction/displacement of wet soils and location of slash piles, would be minimized through application of BMPs. Some roads currently located in floodplains would be maintained, reconstructed, stored, or decommissioned. This would generally improve the condition of floodplains in the planning area by reducing flow concentration along roads. It would also improve conditions by reducing compaction and soil displacement. Crossings that restrict floodplain width could be altered to pass bankfull flows without concentrating stream energy.

Hemler Dam would remain in the floodplain of Middle Redwater Creek. Reconstruction of the spillway would decrease the chance of dam failure following large flood events.

Riparian Ecosystems

No Action (Alternative A)

There would be no new impacts to riparian ecosystems under this alternative. Existing impacts resulting from roads, grazing, and past harvest activities would persist, and conditions around North and Middle Redwater Creeks may improve or worsen over time depending on management of grazing and off-road vehicle traffic.

Action Alternatives

Designation of protected streamcourses and employment of appropriate design criteria would prevent or mitigate impacts from harvest activities. No new roads would be built in riparian ecosystems. Road storage and associated riparian restoration activities may result in one- to two-year impacts to riparian ecosystems such as vegetation alteration or sediment production. Beyond this time frame, these actions are expected to improve composition of riparian vegetation communities. See pages 3-60 and 3-80 for more information on proposed activities and effects on riparian ecosystems.

Wetlands

No Action (Alternative A)

Wetlands are not expected to change under this alternative.

Action Alternatives

Wetlands in the project area would be protected through site-specific design criteria (pages 2-7, 2-10), BMPs, and timber sale contract provisions. Elimination of the CDA at NFSR 831.1M would benefit the wetlands associated Hemler Reservoir due to revegetation and repair of disturbed areas. Dredging of Hemler Reservoir and the beaver pond on Middle Redwater Creek would not take place in existing wetlands and would have no effect on these wetlands.

Cumulative Watershed Effects

The cumulative effects analysis area for watershed and soil resources in the Dean project is the four 7th-level watersheds that include the project area (Map 2).

No Action (Alternative A)

The no action alternative would in itself have no direct or indirect effects on soil and water resources, so it would make no incremental contribution to cumulative effects. Continuation of ongoing activities such as fire suppression would allow surface and ladder fuels to continue to accumulate over time, increasing the risk of a stand-replacing wildfire. A large stand-replacing wildfire would most likely include substantial soil and water effects, such as development of hydrophobic soils and increased runoff and sediment delivery (see page 3-18).

All Action Alternatives

Soil Disturbance and Mass Movement:

Studies on cumulative soil erosion have been conducted on forested land in northern California Rice (1991) estimated erosion from timber harvest and forest roads. Although the Dean project area differs in many ways from the study location, relevant conclusions can be drawn. Rice concluded that "…most erosion occurring on timber harvest areas was due to large mass wasting areas found on a small fraction of the harvest sites". Rice suggests that because only a relative few timber harvest or road sites accounted for most of the erosion, the identification of (and thus avoiding/mitigating) these sites would be a key to reducing erosion on a cumulative basis.

The current condition of the area is one of minor (less than 15 percent) soil disturbance. Through application of BMPs, total soil disturbance would remain under 15 percent after conclusion of proposed activities. Proposed activities would be spread out across the landscape and would occur over a period of several years, resulting in effects that are well distributed spatially and temporally. The action alternatives include timber harvest, fuel treatments, and associated activities. Commercial timber harvest and road construction could affect landslides. As described above in the direct and indirect effects section, design criteria for activities proposed in areas with slopes greater than 30 percent would minimize the risk of mass movement. Proposed treatments would leave a large percentage of the overstory trees intact, providing root systems that help bind the soil. Considering this partial-cut nature of past and proposed treatments, effects resulting from the proposed activities would result in a negligible potential for harvest related mass movement events. Other actions have combined to produce few areas of mass movement, and none of the action alternatives is likely to add to cumulative effects.

Roads would be constructed, maintained, reconstructed, stored, or decommissioned, resulting in one- to two-year effects on soils. Bare earth would be exposed after some of these activities until revegetation has occurred. Road construction conducted in accordance with BMPs would not contribute to cumulative effects after revegetation (one to two years). Harvest activities usually occur after reworked roads have stabilized. Cumulative effects from these activities are not of measurable scale. Within three years, beneficial watershed effects are expected from maintenance and decommissioning of roads. These beneficial effects include stabilization of exposed soil and revegetation of disturbed land. Stabilized and maintained roads are at lower risk of mass movement.

Cumulative effects for soil disturbance and mass movement were analyzed within the four 7th-level watersheds comprising the project area. The time horizon for effects analysis is five years, which is the time that effects have been observed to persist. Past actions in this area which have caused soil disturbance include the Rednose and Puma timber sales. Field observations suggest that about four percent of the project area harvested in 1998 still exhibits some evidence of disturbance. There was some road construction activity in those project areas but disturbed areas revegetated within two years and those effects are no longer noticeable. Livestock grazing has not measurably disturbed soil within the project area.

Vegetation management actions proposed in the Dean project area would take place on about 5,000 acres under Alternatives B and D and on about 7,500 acres under Alternative C within the 12,500 NFS acres in the project area. It is expected that measurable soil disturbance might occur on about 200 to 300 acres. Together with residual disturbance from prior actions this would be well under the 15 percent amended Forest Plan standard. Based on observations within the area it is expected that after five years evidence of disturbance from this project would have decreased to about two percent of the project area. By that time disturbance from prior actions would no longer be detectable.

Soil Heating:
Proposed prescribed burning would consist of low-intensity fires. Severe burning and soil heating are unlikely to occur in broadcast burns, but could result where fuels are concentrated, such as at log-landing piles. Depending on treatment type and yarding method, there are generally about one to two landings 800 to 2,000 square feet in size per 40 treated acres. Even at the high end, this effect would occur on less than one percent of the acreage of the activity areas. Furthermore, design criteria requiring scarification and seeding of burn pile sites would reduce the effects of severe burning and soil heating and would return the sites to production. Mechanical treatments that open the forest canopy can allow sunlight to heat exposed soil. Because most understory vegetation remains after timber harvest and tree regeneration is rapid, heating effects due to canopy reduction are likely to be minimal and temporary. This was observed on past timber sales in the project area that are on the same soil types where actions are proposed under the Dean project. Prescribed burning disturbances to soils and the watershed typically do not persist for more than one season. Revegetation and freeze/thaw cycles break up small areas of bare earth or hydrophobic soils created by prescribed burning. Vehicles that conduct mechanical fuel treatments usually drive over the slash they create, causing little soil disturbance.

Soil Compaction:
Soil compaction can occur any time vehicles travel across the soil surface. The degree of effects can vary depending on conditions and the number of trips made over an area. For example, vehicles traveling on dry soil have less effect than vehicles traveling on wet soils. Also, vehicles

on slash versus bare ground will have fewer impacts. One trip will have less impact than two trips over the same area. The majority of compaction occurs when the skidding is done since the logs are lifted off the ground and the weight is shifted to the rear tires of the skidders. The design criteria of designated skid trails in the majority of the proposed treatment units would limit the extent of compaction to the main skid trails in each unit. Forest sampling of soil compaction on past harvest units has shown that the design criteria used have prevented excessive compaction from occurring. In the Dean project area, sites that have been previously harvested have minimal or no residual impacts for soil compaction. Site visits to units within the project area generally showed no residual impacts. With the implementation of BMPs, minimal soil compaction impacts are anticipated; those that occur would diminish rapidly. Therefore, the action alternatives may add to cumulative soil compaction effects from previous timber harvest, but any addition would be limited in scope and of short duration.

Grazing continues on National Forest System lands and private lands within the Dean project area. Most grazing occurs in grassy valley bottoms. Therefore, most timber harvest and fuel treatments would not occur on primary range, and effects would not be cumulative. One exception is proposed riparian enhancement treatments involving pine removal. Adherence to amended Forest Plan standards and guidelines, BMPs, and WCPs would prevent compaction and other damage to riparian soils. Therefore, this action would not add to cumulative effects.

Soil Erosion:

Other activities in the cumulative effects analysis area have combined to result in only limited soil erosion. Monitoring and field observations have shown that understory vegetation is providing sufficient ground cover and is meeting the regional guidelines for ground cover following disturbance. Since the Dean project would include similar treatments on the same soil types, it is expected that soil erosion would be minimal. Proposed activities would be implemented using BMPs and other site-specific design criteria and thus would have a negligible additive effect on cumulative soil erosion. One- to two-year increase in soil erosion due to road construction and reconstruction could occur (reduced by design criteria, pages 2-5, 2-7, 2-9). Alternatives B and C would reduce the potential for OHV use to add to cumulative soil erosion. Under Alternative D, continued or increased OHV use may add to cumulative soil erosion.

Soil Nutrients:

Timber harvest and/or fuel treatments would occur in all the action alternatives. None of the proposed treatments would occur on soils with low organic matter that would need special design criteria. The majority of treatments are leaving enough residual material in the stand to prevent any addition to cumulative effects on soil nutrients.

Regeneration Hazard:

Problems obtaining sufficient regeneration have rarely been encountered in this area or in the northern and central Black Hills in general. Field review of past harvest in the Dean project area has shown regeneration meets all NFMA and amended Forest Plan requirements. Past activities have had no discernable effect on potential for regeneration, and the proposed activities are also unlikely to result in any regeneration problems.

Streamflows, Water Quality, and Channel Morphology

Streamflows, water quality, and channel morphology have seen few changes over the last planning cycle. Vegetation treatments conducted using BMPs do not result in unacceptable watershed effects (USDA Forest Service 2003e). Proposed harvest and fuel reduction activities would be spread out over five to 12 years. Since past activities have not caused unacceptable

water quality violations or impairments of beneficial uses, proposed activities are also not expected to cause those violations and would generally not add to cumulative effects. There is a small chance that channel morphology may change slightly in response to possible water yield increases under Alternative C. However, elimination of CDAs may offset water yield increases by decreasing the efficiency of water delivery from the road network to the stream network. Any water yield increases that do occur are expected to be small, possibly immeasurable, and are unlikely to have a noticeable effect on channel morphology.

Roads and the road network have affected water flows in the analysis area. New road construction and road decommissioning, conducted using standard BMPs, would not add to cumulative effects on streamflow, water quality, or channel morphology.

Floodplains, Wetlands, and Riparian Ecosystems

Recent timber harvest and stand improvement activities have not occurred in floodplains, wetlands, or riparian areas and have had no effects on these features. Recent prescribed burns and the Puma wildfire occurred in uplands and resulted in no discernable effects on these features. Past road construction constricted some floodplains. Roads and off-road vehicle use have affected riparian areas and wetlands at damaged drainage crossings such as where NFSR 831.1K crosses Middle Redwater Creek. Overutilization by livestock has occurred in some riparian locations. Recent fence construction has alleviated this problem in the North Redwater drainage along NFSR 843.1. Ongoing revision of grazing allotment management plans is also expected to improve riparian condition.

Proposed actions would generally subtract from or have no influence on cumulative effects on floodplains, wetlands, and riparian areas. Repair of damaged road crossings would improve floodplain and riparian conditions. Decommissioning of other roads would also decrease cumulative effects. Riparian enhancement treatments, conducted in accordance with BMPs and other design criteria, would not add to cumulative effects. Restrictions on off-road motorized vehicle use under Alternatives B and C would act against cumulative effects of unregulated use.

As demonstrated above and with implementation of amended Forest Plan standards, BMPs, and design criteria listed in Chapter 2, none of the alternatives would have irretrievable or irreversible effects on soil or water resources.

3.3.2 TRANSPORTATION

Affected Environment

The transportation system was inventoried and reviewed in 2002. Timber harvest proposed in the project area would use existing transportation facilities with improvements and would require both new construction and reconstruction. Haul alternatives and road management decisions were major concerns in transportation planning.

Table 3-3. Existing Transportation System

Classification	Miles
Federal Highway	0.0
County Road	1.0
Arterial System Road	0.0

Classification	Miles
Collector System Road	16.0
Local System Road	56.15
Sub-total (System Roads)	**73.15**
Unclassified Road on NFS Lands	29.47
Total (All Roads)	**102.62**

As displayed in **Table 3-3**, there are currently 102.62 miles of road in the Dean project area. This total includes system (classified, permanent) and non-system (unclassified) roads regardless of closure status. Current density of all roads, both open and closed, is 4.43 miles per square mile of land. Density of open roads is 1.35 miles per square mile.

Unclassified roads not needed for management of the area would be decommissioned as funding becomes available and the opportunity arises. Closure methods may consist of ripping, seeding, water barring, slashing, removal, gating or blocking with stumps, large rock, or logs, and/or recontouring. Type of closure would be determined at the time of closure based on site-specific factors.

The area is currently considered open for motorized travel except in the Rednose Walk-in Hunting Area. Individual roads are closed year-round to protect wildlife habitat and prevent damage to soft roadbeds.

Travel Orders

Currently there is one special travel order in effect within the project area. This order closes the Rednose Walk-in Hunting Area to motorized vehicles.

Rights-Of-Ways

Under all action alternatives, the Forest Service would need to acquire right-of-way on a 250- to 350-foot section of NFSR 831.2A in T53N, R62W, SE quarter of NE quarter of section 32. Right-of-way acquisition would also be necessary under Alternatives B and C to reach Table Mountain.

Environmental Consequences

No Action (Alternative A)

Alternative A would have no direct, indirect, or cumulative effects on the present condition because no additional roads would be constructed or reconstructed within the area. Regularly scheduled maintenance would continue. Existing roads with BMP violations would be addressed during maintenance as funding allows.

Direct and Indirect Effects – Alternatives B, C, and D

Alternatives B and C would require approximately 9.84 miles of road reconstruction, 5.66 miles of new construction, and 0.76 mile of "construction" resulting from converting an unclassified road to a classified road. Alternative D includes no new construction but does include the 0.76-mile of conversion. Road construction and reconstruction may have the following effects.

1. Improved vehicle access to the area
2. One- to two-year increase in soil erosion due to road construction and reconstruction (reduced by amended Forest Plan standards, BMPs, and design criteria (Chapter 2)

3. Increased road maintenance needs and costs
4. Increased impacts on wildlife
5. Increased dust during log haul through private land along NFSRs 830, 831, 832, 833, and 843 (reduced by design criteria, page 2-7)
6. Stabilization of currently unstable road surfaces through improvement of drainage and/or application of gravel

Road closures may affect motorized recreational activities such as hunting, driving for pleasure, and sightseeing.

Cumulative Effects – Alternatives B, C, and D

Past activities have resulted in an extensive road network in the analysis area. Alternatives B and C would add to the authorized road network. All action alternatives would, however, result in a cumulative decrease in road density through decommissioning of unauthorized roads. All action alternatives would also continue the trend of open road density reduction through road closures. Area closures proposed under Alternative B and C may increase effectiveness of road closures. If effective, these closures would decrease overall road maintenance costs and may preclude the need for future reconstruction.

3.3.3 MINERALS

Affected Environment

Minerals can be divided into three categories on National Forest System lands: locatable, leaseable, and saleable. Locatable minerals are those such as gold, copper, and silver and other metals, which can be claimed under mining laws. A person or company files a mining claim and must get approval from the Forest Service before conducting any ground-disturbing activities. The most recent Bureau of Land Management report on active mining claims in the project area shows two claims. No plans have been filed regarding either claim. Leasable minerals include deposits such as oil, gas, and coal. Leases are awarded at the discretion of the government. There are no mineral leases in the project area, and the potential for leasable minerals to occur is low. Saleable minerals include materials such as sand, gravel, and building stone. The project area contains deposits of saleable minerals. The Bearlodge Gravel Pit, located on National Forest System land in the project area, is inactive at this time.

Environmental Consequences

None of the alternatives would have direct, indirect, or cumulative effects on the mineral resource or mining claimants. No road closures are planned in the vicinity of the mineral claims, so no effects to these claims would occur.

3.4 BIOLOGICAL ENVIRONMENT

This section describes the affected environment and environmental consequences of each alternative on the biological environment (Forest Resources, Fire and Fuels, Range, Noxious and Invasive Weeds, Wildlife Habitat, and Rare Plants).

3.4.1 FOREST RESOURCES

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

Stand Structure

Silvicultural activities during the past 15 to 20 years have created three general stand structures in ponderosa pine. Intermediate thinning and preparation cuts produced the current single-storied stands comprised of mature sawtimber. Shelterwood seed cut treatments have regenerated into two-storied stands of a mature sawtimber overstory with abundant sapling and pole-sized regeneration. This sub-canopy is often not continuous but occurs in dense patches and stringers, creating an intra-stand mosaic of both single and two-storied stand conditions. The third stand condition occurs when most of the mature trees are pine but many smaller stems of other tree species exist. Quaking aspen and paper birch make up a substantial part of the stems per acre in this condition and are usually represented in all canopy layers.

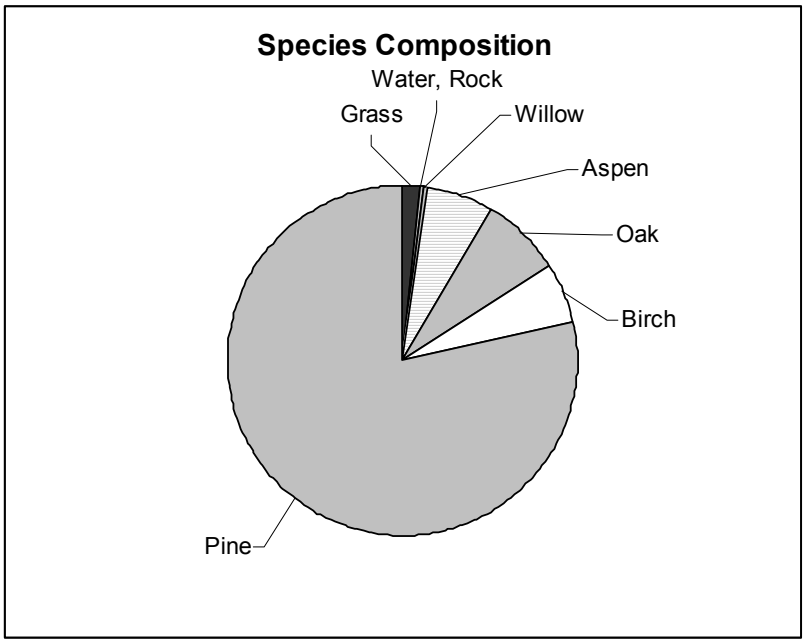
Oak invasion and establishment as an understory species is highly correlated with the scope and intensity of vegetation treatments and natural disturbances as well as aspect. Even in relatively dense, closed-canopy, small-diameter pine stands with little evidence of disturbance, 20 to 30 percent of the ground cover is oak brush. Where stands have been treated with thinning, seed cuts, or prescribed fire, 50 to 75 percent of the ground cover is oak. Oak occupancy is generally greatest on south and west aspects and least on north aspects.

Alternative A would perpetuate existing stand structure in the near future. Under Alternative B, structural diversity would increase over time as shelterwood seed cuts regenerate. Because Alternative B focuses on thinning, it would increase diversity less than Alternative C, which includes a wider variety of treatments. Alternative D would result in the least structural diversity due to its focus on fuel breaks, which would result in single-storied stands. Changes in structural diversity are displayed in detail in the wildlife section, starting on page 3-72.

Species Composition

As is typical in the Black Hills, ponderosa pine forest dominates the project area. Species composition is displayed in **Figure 3-1.**

Figure 3-1. Species Composition

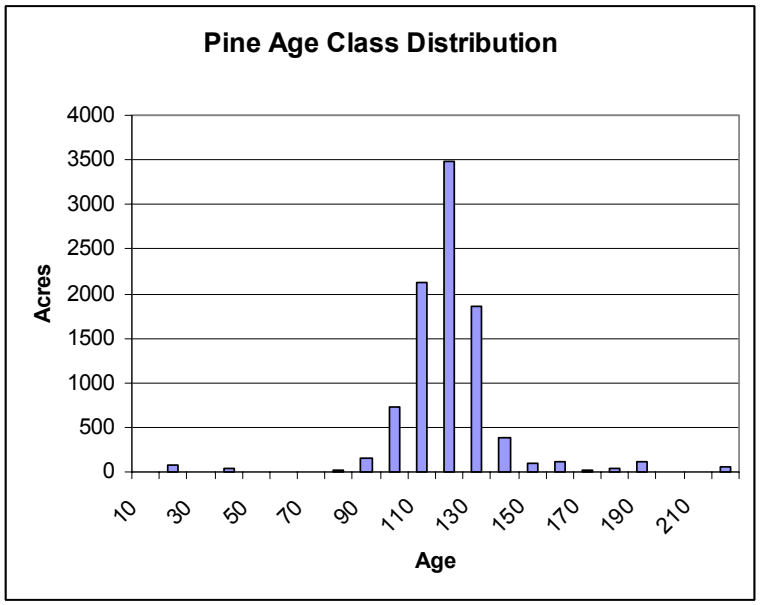


Under Alternative A, trees would continue to encroach into meadows and other openings. As this occurs, forb and grass abundance and diversity would decrease. Vigor of aspen stands and inclusions would tend to decrease with pine encroachment. Treatments such as hardwood restoration proposed under Alternatives B, C, and D would maintain and enhance non-pine types.

Age Class Distribution

Dominant pine on approximately 8,317 acres inventoried within the project area is more than 100 years old (**Figure 3-2**). Stand age ranges from 10 to 220, with approximately 88 percent of stands 100 to 130 years old. Existing age class distribution reflects recurring timber harvest and fire suppression activities over the past 130 years. Alternative A would allow age class distribution to remain dominated by middle-aged stands. Alternative B would move stands into younger age classes through regeneration and patch cut harvests. Alternative C includes the highest acreage of these treatments and would affect age class distribution the most by creating younger age classes (summarized in tables beginning on page 3-72). Alternative D would have little effect on age class distribution, though the 2,337 acres of fuel breaks would result in a large increase in young age classes if allowed to regenerate.

Figure 3-2. Existing Pine Age Class Distribution



Stocking Level

Stocking levels on approximately 2,948 acres of pine are outside the desired range developed using methodology in Forest Plan Appendix H-3. Of that total, 2,331 acres are stocked higher than desired (greater than 60 percent average maximum density). The remaining 617 acres are below desired stocking levels (less than 20 percent average maximum density). Stocking level in stands below the desired range can either be left to grow or can be regenerated. From a silvicultural perspective, stands above the desired range should be thinned.

Basal area, a measure of the cross-sectional area occupied by tree stems, provides a measure of stocking and site occupancy. About 46 percent of the pine-forested acres have a basal area of greater than 100 square feet per acre (an average of about 22 feet between trees 14 inches in diameter) and are at or approaching an overstocked condition. Another 31 percent has basal areas between 60 and 100 square feet, indicating these stands are fully stocked. Ten percent of the area is understocked. Data are incomplete for the remaining 13 percent of the area.

Alternative A would allow stocking levels to continue to increase. Additional stands would become overstocked. Alternative B would reduce stocking levels in all treated stands; most of the thinning treatments would bring stands into the desired stocking range. This alternative would result in more acreage at desired stocking levels than Alternatives A and D but less than Alternative C. Fuel breaks proposed under Alternative D would result in stocking levels below the desired range, while lack of treatment in other stands would allow stocking levels to surpass the desired management zone.

Insects and Diseases

Mountain pine beetle incidence in the project area is currently at endemic levels. Dense stands of ponderosa pine are at the highest risk of damage by mountain pine beetle. Analysis of stand risk both immediately following treatment and 20 years later was conducted based on Edminster et al. (1980).

Acres by risk class and year are shown in **Figure 3-3** for the current condition and in **Figure 3-4** for 2025.

Figure 3-3. Mountain Pine Beetle Risk - 2005

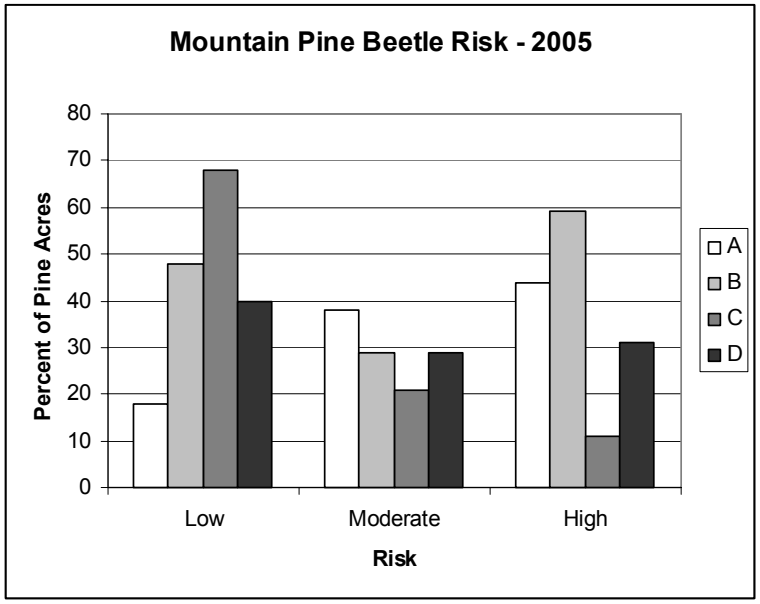
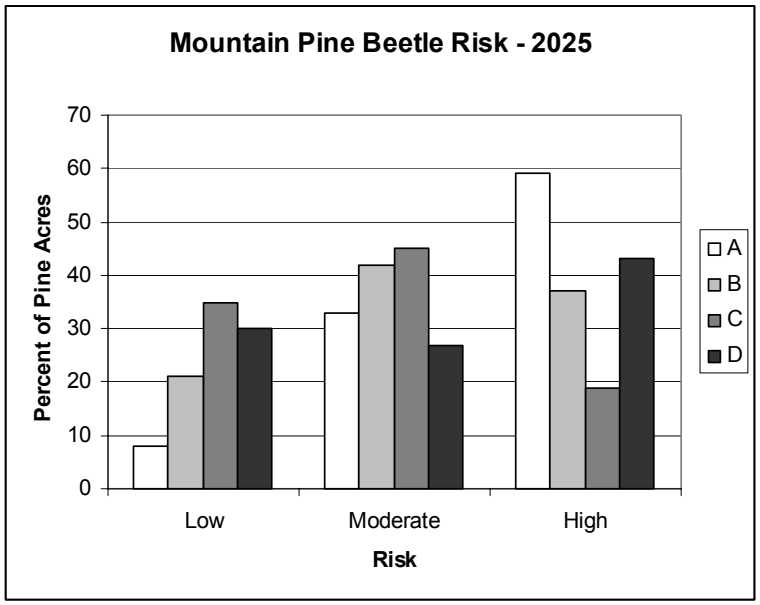


Figure 3-4. Mountain Pine Beetle Risk - 2025



Under Alternative A, risk of losses to mountain pine beetle would continue to increase. Alternative B would decrease risk in treated stands. Alternative C would decrease risk more than any other alternative. Alternative D would decrease risk on fewer acres; proposed fuel breaks would create large, contiguous areas at low risk while also grouping untreated areas. Spatial proximity of untreated stands may increase overall risk.

The pine engraver beetle *(Ips pini)* depends on large quantities of fresh, down material such as green slash, windthrown trees, and dead tops of large trees to build populations to epidemic levels. In the absence of drought, fire, weather damage, or other natural agents that would create such conditions, the probability of a major *Ips* buildup is very unlikely.

Timber Volume Production

Table 3-4 displays estimated merchantable board feet harvested under each alternative. No harvesting would take place under Alternative A. Values were generated using the Forest Vegetation Simulator (FVS), which estimated the volume to be removed by modeled treatments designed specifically to reflect the desired post-treatment condition. Mechanical fuel reduction was categorized as a non-commercial treatment. Alternatives B, C, and D would contribute to the Allowable Sale Quantity for the decade. Alternative A would not.

Table 3-4. Merchantable Timber Volume by Alternative

Measure	Alternative B	Alternative C	Alternative D
Board Feet	8,399,000	16,518,000	18,345,000
Cubic Feet	1,679,800	3,303,600	3,669,000

Future growth and yield were calculated for each alternative. Over the next 40 years, Alternative B would yield slightly less timber volume than Alternative A. This is due to removal of smaller trees during commercial thinning, which reduces the number of non-merchantable stems growing into merchantable classes. Alternative C would yield the most volume over the 40-year period. Alternative D would produce the least as a result of creation and maintenance of open stands in proposed fuel breaks.

Culmination of Mean Annual Increment

All pine stands within the analysis area have been analyzed for culmination of mean annual increment (CMAI). No regeneration harvests for timber production objectives have been proposed on stands that have not achieved CMAI. Patch cuts proposed to improve the balance of structural stages are for the specific management purpose of improving wildlife habitat. As such, these treatments are exceptions recognized in 16 USC 1604(m) and amended Forest Plan guideline 2411. All stands being managed for timber purposes that are scheduled for regeneration harvests have reached CMAI.

Cumulative Effects

The cumulative effects area for the vegetation resource is National Forest System lands in the project area.

In the last 25 years, commercial harvest, non-commercial thinning, and treatments to improve wildlife habitat have occurred on approximately 7,800 acres in the project area. The objective of most treatments was decreasing stand density to promote growth and reduce susceptibility to

mountain pine beetle attack. Past treatments increased growth, improved timber quality, and reduced presence of pathogens. Commercial treatments that substantially reduced stocking levels increased presence and vigor of hardwood species. Cumulatively, these projects reduced area of mature, closed canopy stands while increasing mature stands with open to moderately open canopies, often with an understory of regenerating pine and/or oak. Fire suppression and livestock grazing allowed open areas to become overgrown with trees.

Foreseeable future silviculture activities not connected to this project include post-sale activities associated with the Puma and Rednose timber sales. These include removal of encroaching pine from meadows and restoration/release of hardwoods.

As discussed previously, some of the proposed treatments would convert areas of mature pine forest to earlier successional stages. This landscape would be less prone to mountain pine beetle outbreaks. The cumulative effect of these and past treatments would be a pine community composed of mature, less dense, single-storied stands, interspersed with fully stocked stands of pine seedlings and saplings, open meadows, and hardwood stands. Alternatives C and D would contribute to this condition more than Alternative B, which would encourage development of additional late succession stands. Under all action alternatives, treatments would add to the cumulative effect of increasing understory vegetation diversity, vigor, and competition in openings and less dense stands. Removal of encroaching pine would contribute towards reversing the trend of loss of non-pine communities. Other actions have decreased risk of insect infestation through reduction of stand density; this effect has diminished over time but would be added to by all action alternatives.

3.4.2 FIRE and FUELS

Affected Environment

Historically, fire was a major force in shaping and determining the structure and composition of the ponderosa pine forests of the western United States, including those of the Black Hills. Frequent, low- to medium-intensity ground fires thinned the forest and removed most of the ladder fuels. The composition and structure of today's vegetation is the result of a combination of aggressive fire suppression and past management activities. Photos and records from the late 1800s and early 1900s indicate that today's forests are more continuous, uniform, and dense than under historical conditions. Fire regime is now dominated by large, intense, stand-replacement fires. These fires are difficult to control and can have substantial impacts on environmental and economic resources.

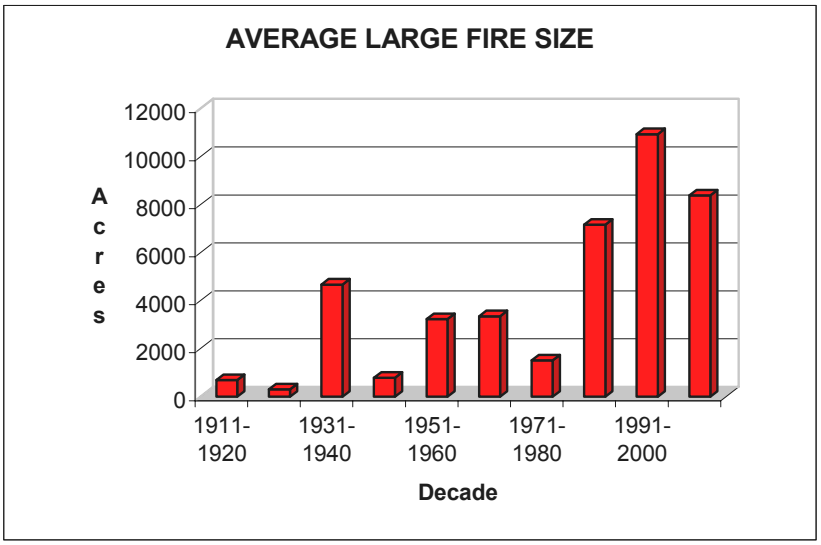
As illustrated in **Table 3-5,** much more of the landscape is forested as compared to estimated conditions in 1875.

Table 3-5. Forest Structure 1875-2000

	Percent of the Black Hills National Forest with:			
Year	**Trees >9"**	**5-9" in Diameter**	**Trees < 5"**	**Meadows/Seedlings**
1875	20.0%	40.0%	0.0%	40.0%
1953	48.9%	19.7%	17.9%	13.5%
1973	63.8%	22.0%	13.9%	0.3%
2000	69.8%	21.8%	2.3%	6.1%

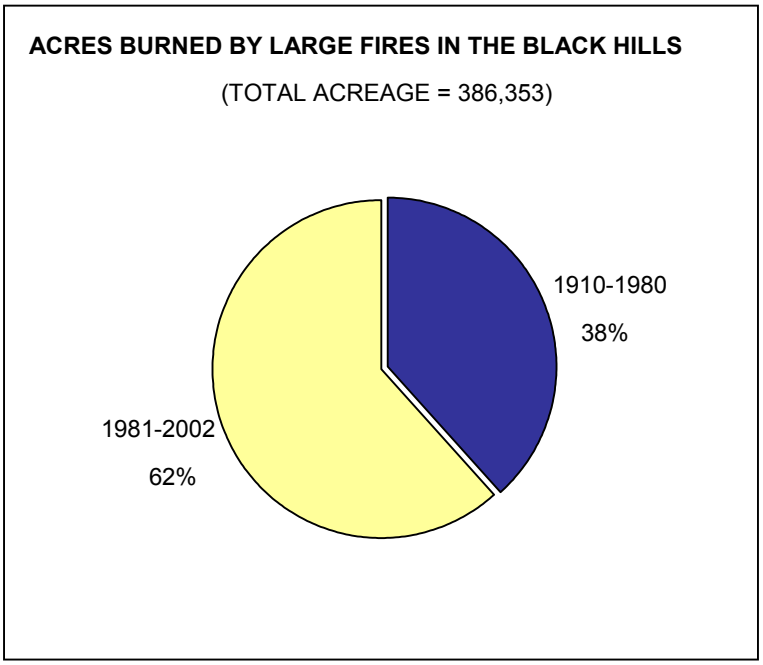
The number of fires on the Black Hills National Forest has remained fairly constant over the years at 65 to 130 starts per year. In recent years, however, some of these fires have burned large areas. Of the fires that reach at least 300 acres in size, average fire size has increased from under 1,000 acres in the early 1900s to over 8,000 acres in recent years (**Figure 3-5).**

Figure 3-5. Average Large Fire Size



Between 1900 and 1980, fires at least 300 acres in size burned about 150,000 acres. Since 1980, large fires have burned nearly 240,000 acres. **Figure 3-6** shows the dramatic increase in acreage burned in recent decades. These large fires have had a substantial impact on Black Hills forests.

Figure 3-6. Acres Burned by Large Fires in the Black Hills



Ponderosa pine evolved to coexist and flourish with fire, particularly frequent, low-intensity under-burns. The thick bark of large trees enables them to resist fire damage. In the past, periodic low-intensity fires consumed small seedlings, pruned lower branches from large trees, and consumed concentrations of woody fuels on the forest floor. The result was a mosaic of conditions. When large crown fires did occur, they probably did not completely consume all trees within a landscape, but left sources of seed for the eventual re-colonization of the burned areas (Sheppard and Battaglia 2002).

Across much of the Black Hills and Bear Lodge Mountains, frequent, low-intensity fire appears to have been the historic norm, but climate cycles periodically altered the fire regime. Evidence indicates that if a somewhat wetter period (perhaps a few years of much wetter than average precipitation) caused an interval between fires to extend longer than usual, the accumulation of fuels and increased stand density would persist until the next dry cycle. Then a larger, more intense, stand-replacing fire was likely to burn though the area. This fire would be outside the norm of regular, low-intensity surface fires (Brown 2003).

Historical data, personal accounts, on-site evidence, and aerial photographs indicate that wildfires have occurred throughout the Dean project area. Limited data available for the project area show that historic fire intervals ranged from about 3 to 41 years, depending on location. Fire scar data show that a fire burned 200-300 acres in the Hemler Dam area in about 1920. Between 1970 and 1990, 38 wildfires occurred in the project area, with the largest being three acres in size. Almost all were caused by lightning. In 2004 there were three wildfires, with the largest burning 22 acres. The most notable fire event in the project area in the last 80 years was the Puma Fire of April 2003, which burned 475 acres.

Management Direction

The Forest Plan as amended directs that all wildfires in the project area be suppressed. Currently, no Fire Management Plan exists that allows wildfires to be managed for Fire Use for Resource Benefit (allowing naturally occurring fires to burn) within the project area. The Appropriate Suppression Response (ASR) for MA 5.4 and MA 5.6 requires confine, contain, and control strategies in all cases for wildfires. The suppression objective for M.A. 5.4 is less than 15 acres; the suppression objective for MA 5.6 is less than 10 acres.

Amended Forest Plan objective 234 is to "create or maintain a moderate to low crown-fire hazard adjacent to occurrences of R2 sensitive and species of local concern plants and botanical areas bordered by continuous, dense, conifer stands where long-term persistence is at risk from a single high-intensity fire". One drainage in the Dean project area contains an R2 sensitive plant species. Under Alternatives B and C, an adjacent stand is proposed for a thinning treatment that would open up the overstory canopy. This treatment, combined with follow-up underburning, would substantially decrease potential crown fire hazard; specifically, the likelihood of a more severe fire with longer heat-residence time would be appreciably reduced.

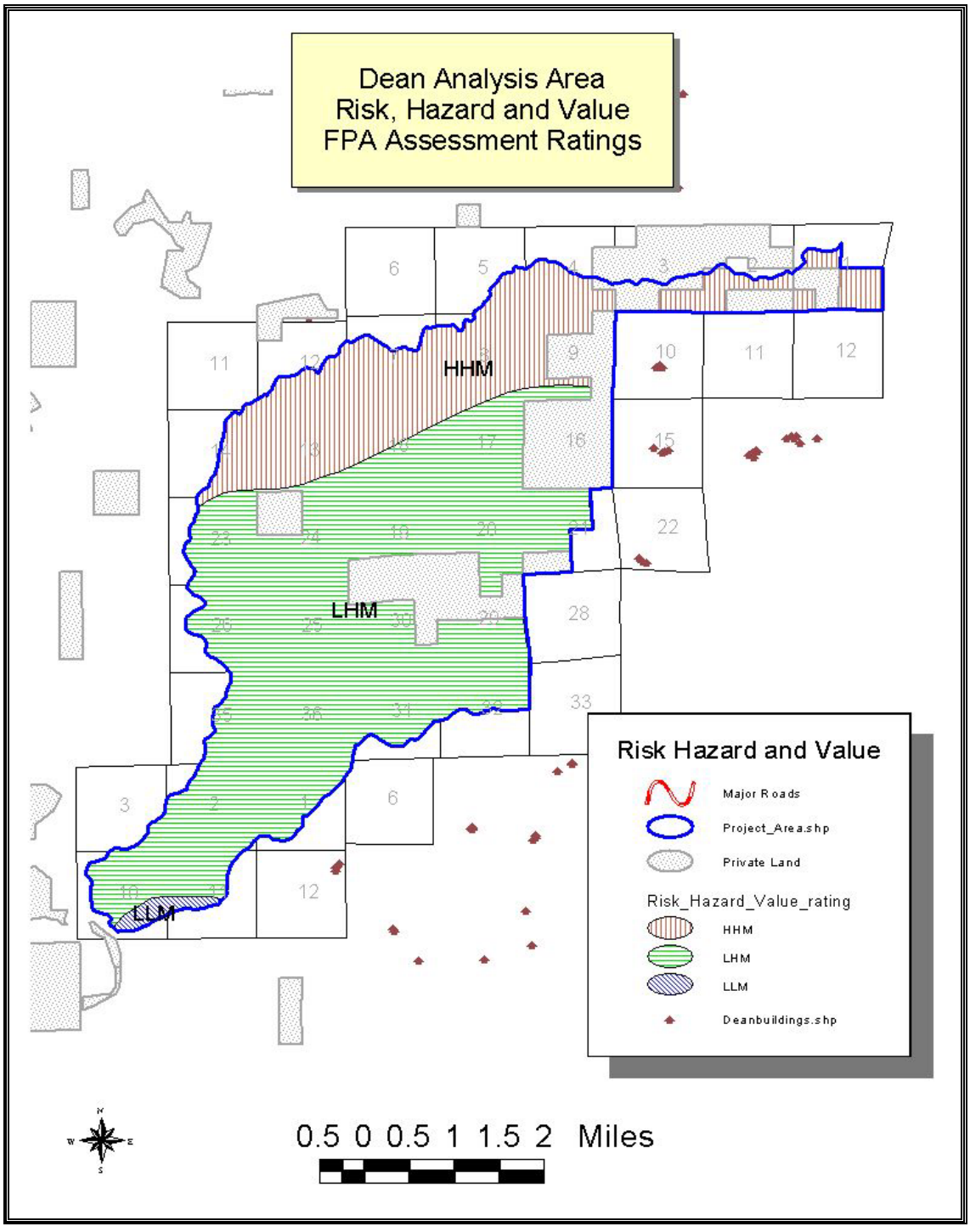
Amended Forest Plan objective 10-01 (USDA Forest Service 2005c) states "Manage for 50 to 75 percent moderate-to-low fire hazard in the WUI and reduce fire hazard within proximity of structures to current NFPA standards…Manage the remainder of the Forest for 50 percent moderate-to-low fire hazard…". Ninety-nine percent of the project area is in the "high hazard" category.

Objective 10-04 is to "reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forest-wide guideline 4110". For the Dean project area, the Fire Protection Assessment ratings of risk, hazard, and value are shown in **Table 3-6** and depicted in **Figure 3-7** (p. 3-37). As shown below, most of the project area has a high hazard rating (high potential fireline intensities), but only a third is at high risk (higher probability of ignition). There are no high values in the area. Areas of high risk/high hazard are concentrated in the northern part of the project area.

Table 3-6. Dean Analysis Area Risk, Hazard and Value Ratings

Risk Rating	Hazard Rating	Value Rating	Acres	Percent of Analysis Area
High	High	Medium	4,294	29
Low	High	Medium	10,335	70
Low	Low	Medium	135	1

Figure 3-7. Risk, Hazard, and Value Ratings



Condition Class

The October 2000 report *Protecting People and Sustaining Resources in Fire-adapted Ecosystems- A Cohesive Strategy* (GAO 2000) classifies fire-adapted ecosystems by fire regime group and condition class. The condition class is used to categorize the current condition with respect to fire regime. The National Fire Plan uses condition class descriptors to identify **risk conditions**. Three Condition Classes have been developed to categorize the current condition with respect to fire regime. Most of the Black Hills is currently in Condition Class 3. The current Condition Class rating for the Dean project area is a mixture of Condition Classes 2 and 3, with the exception of the area burned by the Puma fire (2003), which could be considered the largest contiguous area within the Dean project area that is now in Condition Class 1 (475 acres).

Condition Class 2 is described as one or more fire return intervals have been missed (primarily due to suppression); Condition Class 3 is a situation where fire regimes have been substantially altered from the historic range of variability, which has dramatically changed fire size, frequency, intensity, severity, or landscape patterns. Key ecosystem components have been lost and in order to manage these areas toward Condition Class 1 (where fire regimes are within their historical range of variability), thinning, piling, chipping, or a combination may need to precede broadcast burning treatments in specific locations within the project.

Table 3-5 (page 3-34) shows that the estimate of acres of meadows and/or seedlings was 40 percent of the Black Hills landscape in 1875 but just 6.1 percent in 2000. As shown in **Table 3-7**, for the Dean analysis area, this is closer to two percent of the area. This situation is in large part a result of the extended period of suppression of all wildfires.

Table 3-7. Cover Type

Cover Type	Acres	Percent of Area
Grass	208	2%
Non-cover (gravel pit)	7	<1%
Willow	51	<1%
Aspen	784	6%
Oak	933	7%
Birch	692	6%
Ponderosa Pine	9,786	78%
Water	7	<1%

Potential Fire Behavior

Due to settlement and fire suppression in the area, forest floor duff and live fuels such as shrubs and conifer regeneration have accumulated. Accumulated fuels support higher-intensity fire, including torching and crowning behavior, and longer periods of consumption (heat residence time). The increased burn severity results in greater mortality to plants and soil organisms. Heavy surface fuel accumulation can result in higher surface fire intensities that contribute to an increased potential for crown fire initiation. Hardwood stands are generally flammable in the early spring, late summer, and early fall due to the drying effect of sun and wind on the leaf litter. Furthermore, in the fall the herbaceous plant and shrub component of the understory is dead and dried out, forming a continuous layer of loosely organized fine fuel.

Existing average fuel loading in the Dean project area is generally low to moderate. Fuel site data for the Dean project area indicates a range of surface fuel loadings (less than 3-inch material) varies from approximately two tons per acre to as much as 12.5 tons per acre. Areas of heavier fuel loading are generally located in small patches of storm damage, which tend to be on south or southeast aspects. In two locations, the storm damage was situated at middle to lower portions of the slope, and therefore has the potential to allow a transition to the pine canopies on the slope above the storm damage.

The fire hazard ratings are also confirmed by the expected fire types (**Table 3-8**, below). Approximately half of the project area (54 percent) would experience surface fire. Only 26 percent of the project area would experience passive crown fire. Less than three percent of the project area would experience active crown fire. Less than one percent would experience conditional surface fire, where conditions for sustained active crown fire are met but conditions for crown fire initiation are not met. Portions of the project area that were not rated (16 percent) included private land (no data) or open grasslands, where fire control is not as difficult as in timber stands.

Table 3-8. Crown Fire Potential – Existing

Crown Fire Type (90th Percentile Conditions)	Acres	Percent of Area
Active	433	2.9
Passive	3,822	25.8
Conditional	161	0.1
Surface	8,032	54.2
Private Land or No Data	2,368	15.9

Initiation and sustained spread of crown fires depends on surface fuels and crown fuels. The initiation of crown fire behavior is a function of the surface fire intensity and the canopy fuel characteristics of canopy base height and foliar moisture content. When the surface fire intensity attains or exceeds the critical surface intensity for crown combustion, fire can propagate vertically through the canopy. The ability of a crown fire to spread is a function of the surface rate of spread and canopy bulk density (Van Wagner 1977, Scott and Reinhardt 2001).

Low canopy base height enables fire to spread from the ground into tree crowns. The lower the canopy base height, the less wind needed to initiate crowning. As canopy bulk density increases, the potential for sustained crowning also increases. Stands with higher bulk density can sustain a crown fire if initiated in an adjacent stand. The combination of low canopy base height and higher bulk density (or closely-spaced trees) has the potential to initiate and maintain a crown fire. Both indices are estimated for the characteristics of the project area that influence fire behavior, namely the surface and canopy fuel characteristics, windspeed, relative humidity, and slope, as fire behavior is still determined by some aspect of fuels, weather, and topography. A measure of hazard related to the canopy base height is torching index, which is the open windspeed necessary to move a surface fire in the canopy. In modeling effects of this project, a torching index of 20 miles per hour was used as a threshold for high risk, assuming 90th percentile fuel moisture and weather conditions (the hottest, driest 10 percent of local weather).

Potential fireline intensities in many pine stands are greater than the desired 200 BTUs/foot/second (approximately five-foot flame lengths) as stated in amended Forest Plan guideline 4110. Surface and ladder fuels can create flame lengths greater than five feet (at the flaming front) during the upper end of the 90th percentile conditions. Fires in grass fuel types (fuel models 1 and 2) have moderately rapid rates of spread and can easily exceed the suppression objective.

The potential crown fire hazard in the Dean project area, as shown in Figure 3-8 (page 3-41), could most effectively be reduced by opening some of the stands. This would most likely be with precommercial thinning and commercial harvest. Silvicultural prescriptions should favor thinning from below to basal areas ranging from 20 to 60 square feet per acre, depending on stand characteristics. The intent would be to raise canopy base heights and reduce canopy bulk densities.

Travel Management

The current road system is more than adequate to meet most needs for fire suppression or fuel management treatments. Resources can move from the south end to north end of the planning area in 25 minutes or less. Engine and hand crew resources can safely move from the Ranger Station at Sundance to the planning area in 30 to 40 minutes. Time from detection to initial attack is most often one hour or less across the planning area, with the exception of the Table Mountain area. This area is only accessible by the Table Mountain Trail (NFSR 830.3D) from the west or by non-system trails without public access through private land to the north, south, and east. All of the routes that access the top of Table Mountain are currently rough native surface. Motorized access is accomplished with 4-wheel drive or ATV. Suppression forces would have a difficult route, resulting in a slower rate of mobility to the top eastern end.

Environmental Consequences

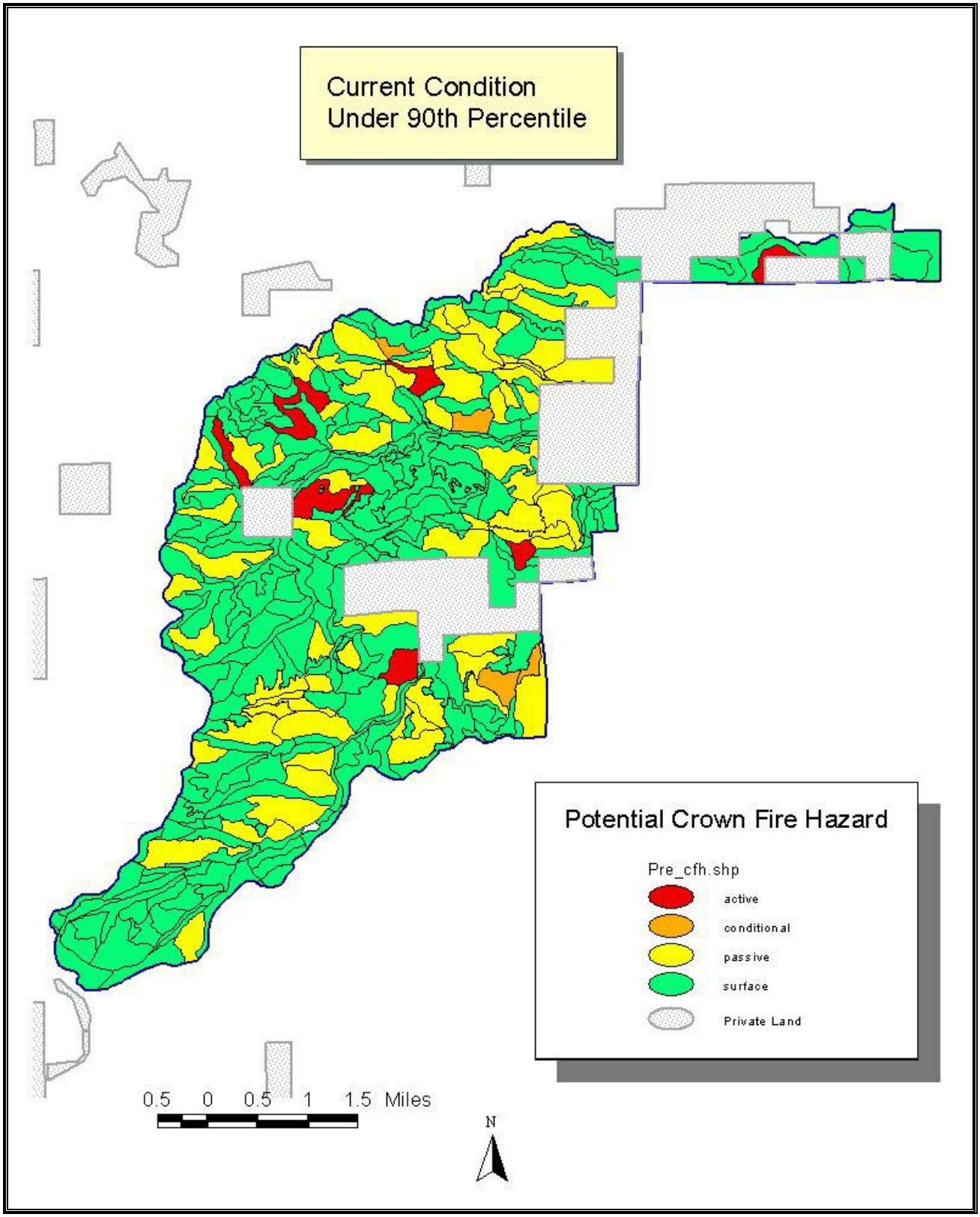
All action alternatives would sufficiently reduce crown density to have lasting effects on crown fire behavior. Comparisons of these effects were assessed for the number of acres in 90th percentile potential crown fire (active, passive, or conditional) and surface fire, both immediately after treatment and 20-30 years in the future.

The Hayman Fire Case Study (Graham 2003) discusses how various fuel treatments affected the spread and intensity of the Hayman Fire, which took place in Colorado in June 2002. This fire burned more than 138,000 acres in 20 days along the Colorado Front Range. Prior fuel treatments or earlier, less severe wildfires did alter the fire behavior of the Hayman Fire and therefore had a benefit (Graham 2003). It can be readily assumed that fuel treatments would have similar effects on wildfire behavior within the Dean project area.

No Action (Alternative A)

Surface and ladder fuels would continue to accumulate over time under the no action alternative. The risk of an epidemic-level insect or disease outbreak would increase. Since no landscape-scale attempt would be made to alter the current vegetative trends or evolving fuel conditions in the project area, the risk of stand-replacing wildfire would increase. The amount of open meadowland, which could be used as safety zones, anchor points, helispots, and staging areas during wildfire suppression, would continue to decrease as shrubs and trees encroach. Fire

Figure 3-8. Crown Fire Potential - Existing



suppression would continue, but risk to fire fighters and the public would increase. A large fire event would cause the loss of certain wildlife habitats and sensitive plant habitats, timber resources, and visual quality. Loss of vegetative cover could negatively affect soils and watersheds. No changes to the existing system roads would occur that would affect the ability of ground-based fire suppression resources to travel and deploy quickly. Fires suppression response time would not be affected.

Table 3-9. Crown Fire Potential - Alternative A (+20 Years)

Crown Fire Type (90th Percentile Conditions)	Acres	Percent of Area
Active	574	4.6
Passive	6,021	40.6
Conditional	257	1.7
Surface	5,593	37.7
Private Land or No Data	2,371	15.4

Comparing Table 3-8 to Table 3-9 shows that over the next 20 years the amount of potential active crown fire acreage would increase from 433 acres to 574 acres under Alternative A. The amount of potential passive crown fire would increase from 3,822 to 6,021 acres. Potential conditional crown fire would increase from 161 to 257 acres. Surface fire acres would decrease from the current 8,032 acres to the projected 5,593 acres. The overall risk of potential crown fire would increase by 32%.

Direct and Indirect Effects – Alternative B

The Forest Vegetation Simulator – Fire and Fuels Extension (FVS-FFE) model was run to predict the effects of Alternative B on crown fire hazard. The potential type of crown fire is shown in **Table 3-10** and **Figure 3-9**. Treatments proposed under Alternative B would decrease crown fire hazard over Alternative A by approximately 27 percent across the analysis area. The number of stands (and resulting acreage) that would experience active, passive, or conditional crown fire types would decrease. This reflects the reduction in surface and ladder fuels, which would reduce the potential for a crown fire to carry in these stands, allowing fire to return to the surface where it can be more easily controlled by suppression crews. Treatments would take place on 1,353 acres within one-quarter mile of private land.

Table 3-10. Crown Fire Potential - Alternative B (+20 years)

Crown Fire Type (90th Percentile Conditions)	Acres	Percent Change
Active	334	-42
Passive	3,241	-46
Conditional	62	-76
Surface	8,811	+58
Private Land or No Data	2,371	n/a

Figure 3-9. Crown Fire Potential - Alternative B

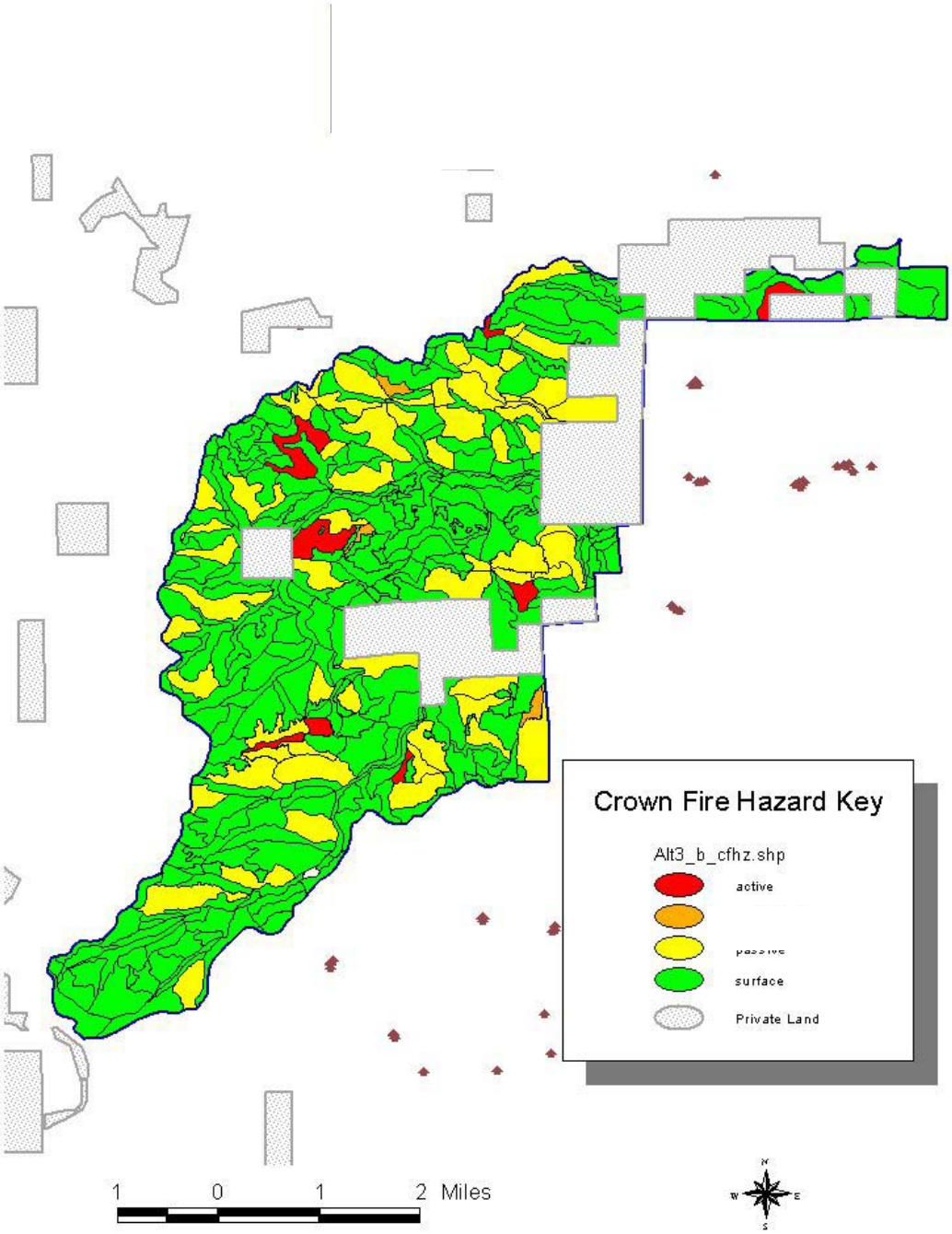
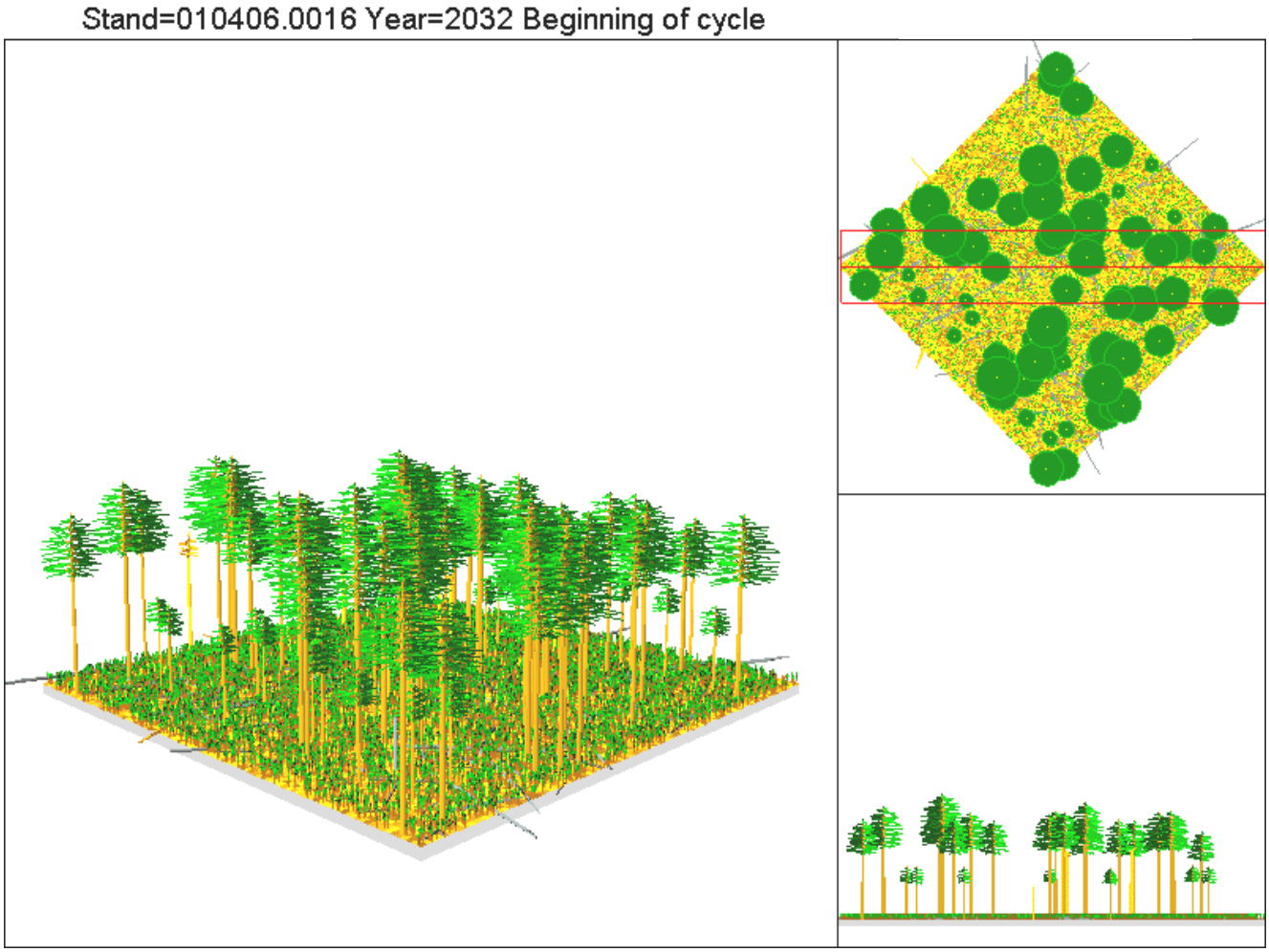


Figure 3-10 is a Stand Vegetation Simulator (SVS) image of a stand thinned from below in 2007 and then treated with an underburn in 2010. The image represents the stand immediately after the burn. As is shown in Figure 3-10, mortality would be heaviest in the smaller diameters, and less in the larger diameters due to the thicker, fire-resistant bark of the older trees and the higher crown base height across the stand resulting from thin-from-below treatment prior to burning. Not all of the smaller diameters are killed, which would leave an uneven-aged stand with an average larger tree diameter. This treatment would move the stand to an older average age in the long term, but the structural stage (SS), which is currently 4C, may change to 4A or 4B in the short term. The stands would likely be classified as 4C stands again in approximately 20 years, and grow to SS 5 when the average age reaches approximately 160 years in year 2050.

Figure 3-10. Simulation of Thin from Below with Prescribed Burn

In **Figure 3-11**, p. 3-47, SVS shows the same stand projected to 2032. Some larger snags that would be created during the underburn in 2010 would still be standing, creating hardened snags for the benefit of snag-associated wildlife species. The stand in Figure 3-11 is modeled at an average age of 143 years. The model indicates that the stand would support surface fires after the under-burn and would maintain the surface fire rating until at least 2032.

Figure 3-11. Simulation of Thin from Below with Prescribed Burn - 2032



Smoke management would be considered during any burning. Modeling indicates that a broadcast burn unit of 150 acres burned in five hours would produce about 6.5 tons of particulate matter less than 10 microns in size and 5.5 tons of particulate matter less than 2.5 microns in size. The effect on any potential receptors would be well within EPA and state standards as long as smoke dispersal is fair or better. No Class A airsheds would be likely to receive smoke with fall and spring prevailing winds.

Travel Management

Alternative B would close the project area to off-road motorized travel except within 200 feet on each side of the Truck Trail for winter snowmobiling. The Truck Trail would also be open to ATVs and other vehicles less than 50 inches wide in summer and fall. Motorized travel would otherwise be restricted to currently open system roads.

Under this alternative, potential increased usage of OHVs along the Truck Trail could increasing the risk of human-caused fire, but closure of the rest of the area to off-road motorized vehicles

would reduce the risk overall. Approximately six miles of new road construction would be necessary to implement proposed vegetation treatments, and 24 miles of unclassified roads would be decommissioned. This alternative would likely result in a minor reduction in the risk of human-caused fires. Access for administrative purposes such as fire suppression would be allowed behind locked road closures as is currently allowed.

Direct and Indirect Effects – Alternative C

This alternative would use silvicultural treatments to alter stand structure by reducing canopy densities. Prescribed burning is proposed on 2,764 acres. Burning would be used to reduce surface and ladder fuels that could contribute to crown fire initiation. Most of the broadcast burning would probably be conducted at the 'moderate' complexity level, but each burn unit would be evaluated separately as a burn plan is prepared. Some of the open, south-facing slopes proposed for burning may be implemented with surrounding snow cover and rate as 'low' complexity. The application of under-burning would be intended to mimic low-severity fires that occurred prior to settlement.

Of the 2,746 acres proposed for broadcast burning, 1,740 acres would need commercial harvest prior to burning. Using prescribed fire so heavily in this alternative would reflect the longevity of the beneficial effects over many other treatments. During analysis of this alternative, it was observed that broadcast burning, alone or with other treatments, would reduce potential crown fire hazard for at least 20 years and for more than 40 years in many stands. Broadcast burning returns more stands to Condition Class 1 more quickly than most other treatments. Natural vegetation responds very well after low-severity fire, and nutrient recycling from burning is much more rapid and beneficial than recycling dependent on bacterial decay.

Air quality effects would be the same as those discussed under Alternative B.

About 1,000 acres of broadcast burning is proposed in stands that would not have prior mechanical treatment. Some stands are open enough to adequately ventilate so that scorch would remain within acceptable limits. Others would be thinned with fire – the smaller diameters would be killed while larger trees would experience some scorch. Larger trees would lose some lower branches, further reducing ladder fuels.

Chipping and mulching are proposed on 207 acres, mostly as a treatment for sites dominated by oak brush. Broadcast burning would take place approximately a year later in an attempt to set back the oak brush and possibly reestablish grasses and forbs. Mechanized chipping and mulching would likely be used concurrently throughout much of the 647 acres of precommercial thinning identified in this alternative. The advantage of this kind of machinery over manual cutting and piling of fuels, followed by pile burning and reseeding, is the ability to complete the precommercial thinning in one entry.

Treatments would take place on 1,724 acres within one-quarter mile of private land.

The FVS-FFE model was run to predict potential crown fire hazard after implementation of Alternative C. The potential types of crown fire by number of stands and acres are shown in **Table 3-11** and the subsequent map, **Figure 3-12** (p. 3-48). Alternative C would decrease crown fire hazard by 57 percent as compared to Alternative A. The area likely to experience active, passive, or conditional crown fire types would decrease. Keeping fire on the ground increases ease of control. This alternative would also move approximately 25% of the project area from Condition Class 2 or 3 to Condition Class 1.

Table 3-11. Crown Fire Potential - Alternative C (+20 Years)

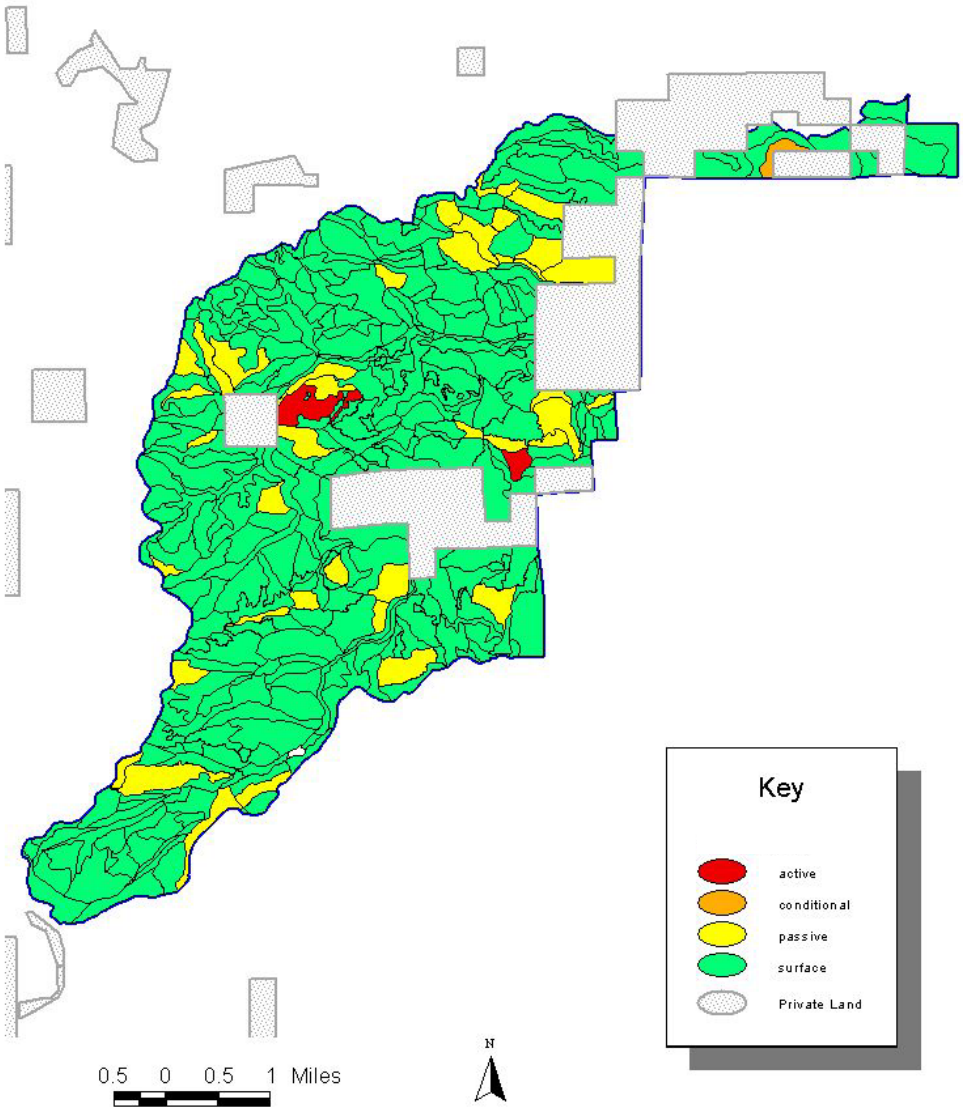
Crown Fire Type (90th Percentile Conditions)	Acres	Percent Change
Active	138	-68
Passive	1,610	-58
Conditional	36	-78
Surface	10,664	+25
Private Land or No Data	2,368	

Proposed vegetation treatments would result in a reduction in crown fire hazard from approximately 1,784 acres to 1,161 acres by year 2032. Modeled surface fire would be projected to increase to 10,664 at the end of all proposed treatments and would be further improved to 11,205 by 2032 (see also Table 3-13, p. 3-53).

Travel Management

Alternative C would closure the project area to off-road use by motorized vehicles. Approximately six miles of new road construction would be necessary to implement proposed vegetation treatments, and 24 miles of unclassified roads would be decommissioned. This alternative would likely result in a minor reduction in the risk of human-caused fires. Access for administrative purposes such as fire suppression would be allowed behind locked road closures as is currently allowed.

Figure 3-12. Crown Fire Potential - Alternative C



Direct and Indirect Effects – Alternative D

This alternative proposes fuel breaks constructed in quarter-mile wide buffers around any private land within the analysis area, and 400 feet on either side of main roads. Acres of prescribed burning would be the same as those proposed under Alternative C (2,764 acres); however, none of the commercial treatments proposed under Alternative C that would precede broadcast burning would take place under Alternative D. Treatments would take place on 2,056 acres within one-quarter mile of private land.

The fuel breaks considered in this alternative could be attained by commercially thinning all merchantable pine within the buffers to 20 square feet of basal area per acre. All surface fuel (activity fuels) would be removed via whole-tree yarding and burning the slash piles at the landings. Chipping and/or grinding the material may also take place under this alternative. Any POL (products other than logs) within the buffers would be removed in the same manner. No other cutting would be considered with this proposal with the exception of 194 acres of habitat improvements.

Broadcast burning treatments would be used to reduce fuel loads. Effects of burning could include reduction in canopy density. Broadcast burning in a dense stand without prior commercial thinning would be feasible, but would come with an increase in escape risk. The burn prescriptions would have a narrower 'window' in which conditions allow burning without excessive scorch and mortality to the overstory. Scorched and/or dead trees would be more common, and risk to firefighter safety would increase due to the lack of ventilation within the tight canopies.

This alternative would reduce the overall potential crown fire hazard across the analysis area. Modeled outputs are nearly as positive as those of the proposed action. The FVS-FFE model was again used to predict potential crown fire hazard. Acres of potential type of crown fire are shown in **Table 3-12** and **Figure 3-13**. Alternative D would decrease crown fire hazard as compared to Alternative A by approximately 44 percent. Area likely to experience active, passive, or conditional crown fire would decrease, reflecting the reduction in surface and ladder fuels.

Table 3-12. Crown Fire Potential - Alternative D (+20 Years)

Crown Fire Type (90th Percentile Conditions)	Acres	Percent Change
Active	181	-58
Passive	1,621	-58
Conditional	101	-37
Surface	10,586	+24
Private Land or No Data	2,368	

Figure 3-13. Crown Fire Potential - Alternative D

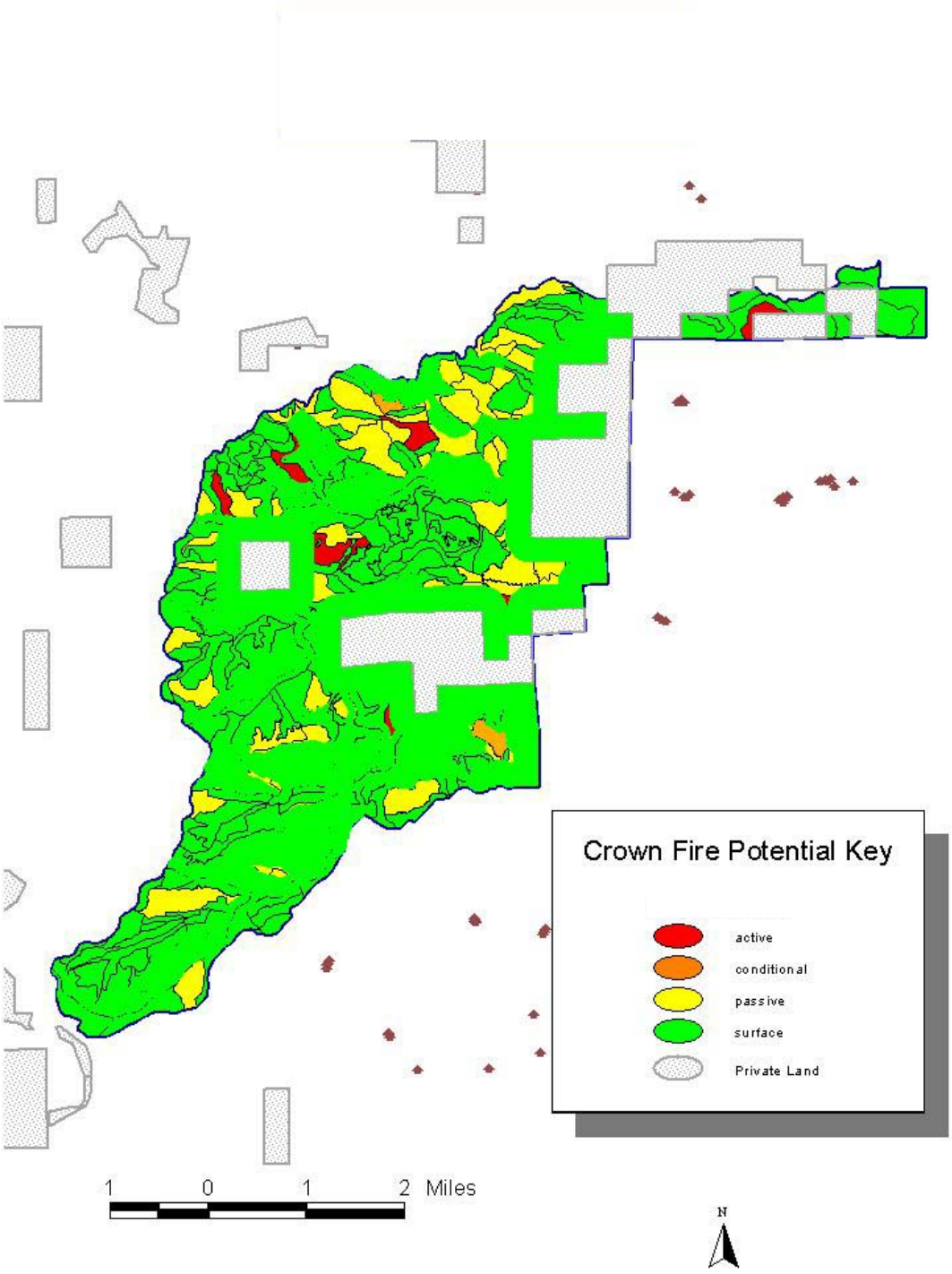
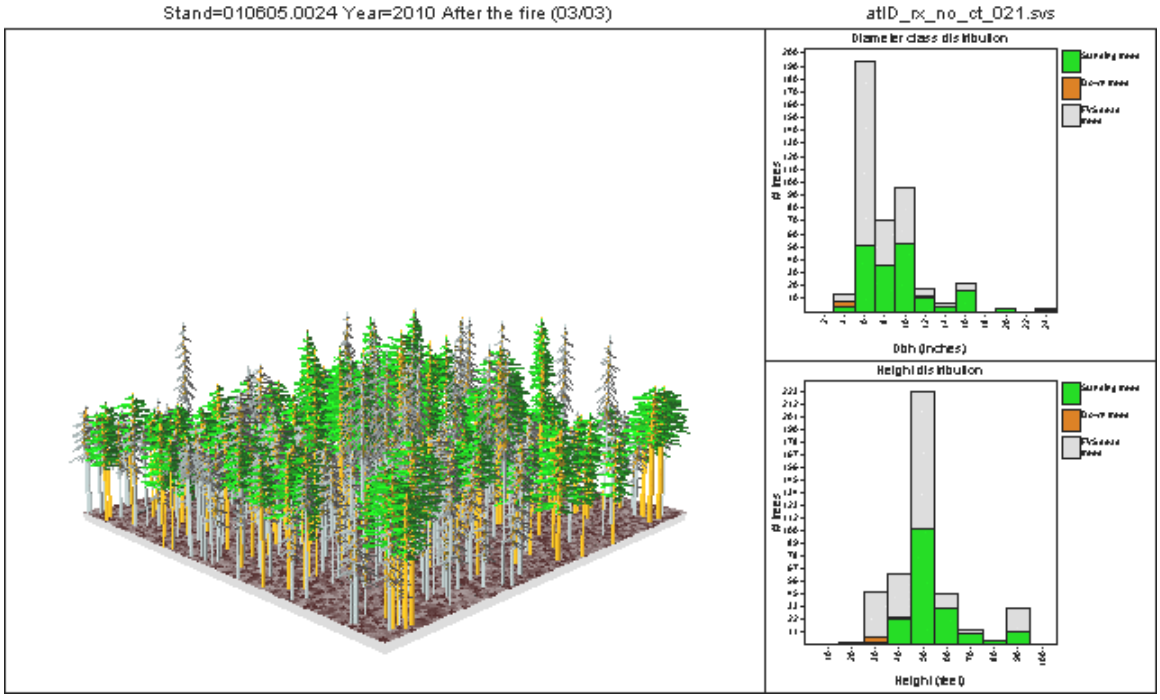


Figure 3-14. Simulation of Prescribed Burn without Thinning



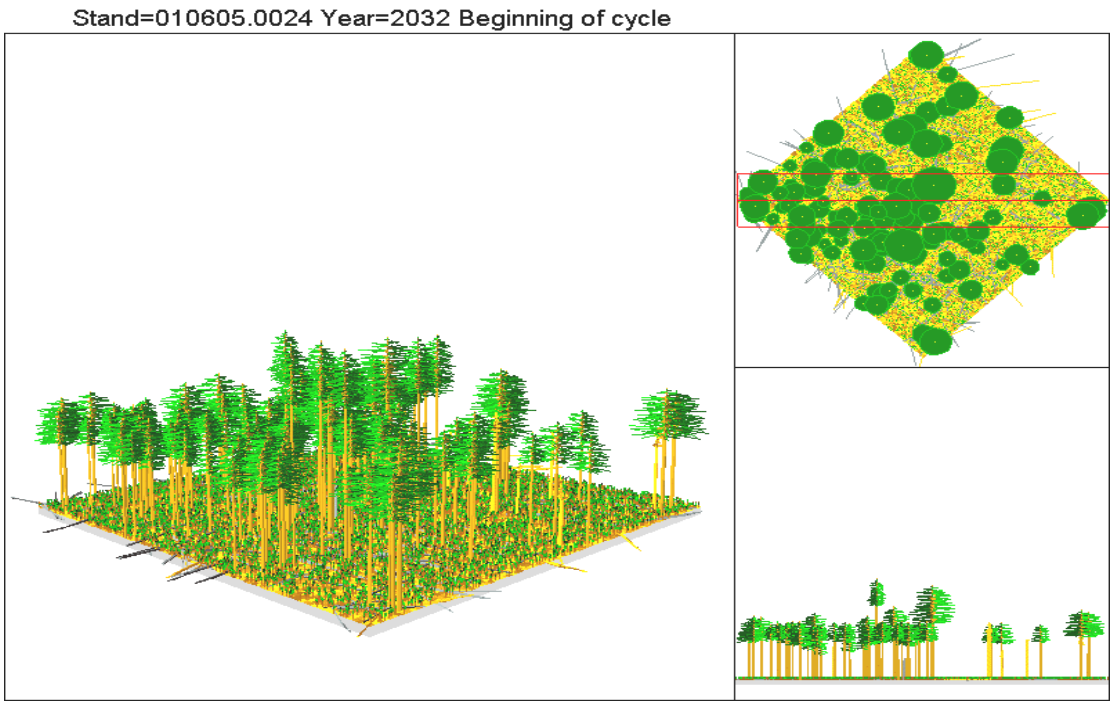
The stand represented in **Figure 3-14**, above, would have no commercial thinning prior to broadcast underburning. The image demonstrates the effects of this type of treatment on mortality within the stand and the overall stand appearance after treatment. Notice that the stand may not look as aesthetically appealing as before the prescribed fire treatment, but that given time, even only 20 years, the stand has recovered.

As shown in the above figures, mortality would be heaviest in the smaller diameters (between 4 and 8 inches DBH) and less in the larger diameters. Most of the smaller diameters would be killed, leaving a fairly even-aged stand consisting of older, big trees. This treatment would result in a high density of snags, mostly of relatively small diameter. The stands would be open but patchy relative to their pre-treatment condition. Stands would remain open until pine regeneration becomes established and would have an increasing component of down wood as snags fall.

This treatment would move the stand to an older average age, but SS, which is currently 4C, would change to 4A or 4B in the short term. The stand would likely become 4C again in approximately 20 years, and grow to SS 5 when the average age reached approximately 160 years in year 2050. **Figure 3-15** shows the same stand projected to 2032. Some larger snags that were created during the underburn in 2010 would still be standing. The stand in Figure 3-11 is modeled at an average age of 143 years. The stand would be likely to experience only surface fires until at least 2032.

Effects on air quality would be similar to those described under Alternative B.

Figure 3-15. Simulation of Prescribed Burn without Thinning - 2032



Travel Management

Under this alternative, off-road motorized travel would be permitted across the project area except where currently prohibited. Most system roads currently open would remain open. This alternative would likely have a minor reduction in the risk to human caused fires. Access behind locked road gates for administrative purposes such as fire suppression would continue to be allowed.

Summary Comparison of Alternatives

Table 3-13 and Figure 3-16 compare acreage of potential fire type under each alternative. Alternatives C and D would result in the largest area where fires are likely to stay on the ground, increasing ease of suppression. Under Alternatives A and B, there would be more areas where fires may transition into tree crowns, causing additional damage, potential for spread, and difficulty of suppression.

Table 3-13. Comparison of Crown Fire Potential by Alternative (Acres)

Crown Fire Type	Alternative A	Alternative B	Alternative C	Alternative D
Active	433	334	138	181
Passive	3,822	3,241	1,610	1,621
Conditional	161	62	36	101
Surface	8,032	8,811	10,664	10,586

Figure 3-16. Comparison of Crown Fire Potential by Alternative

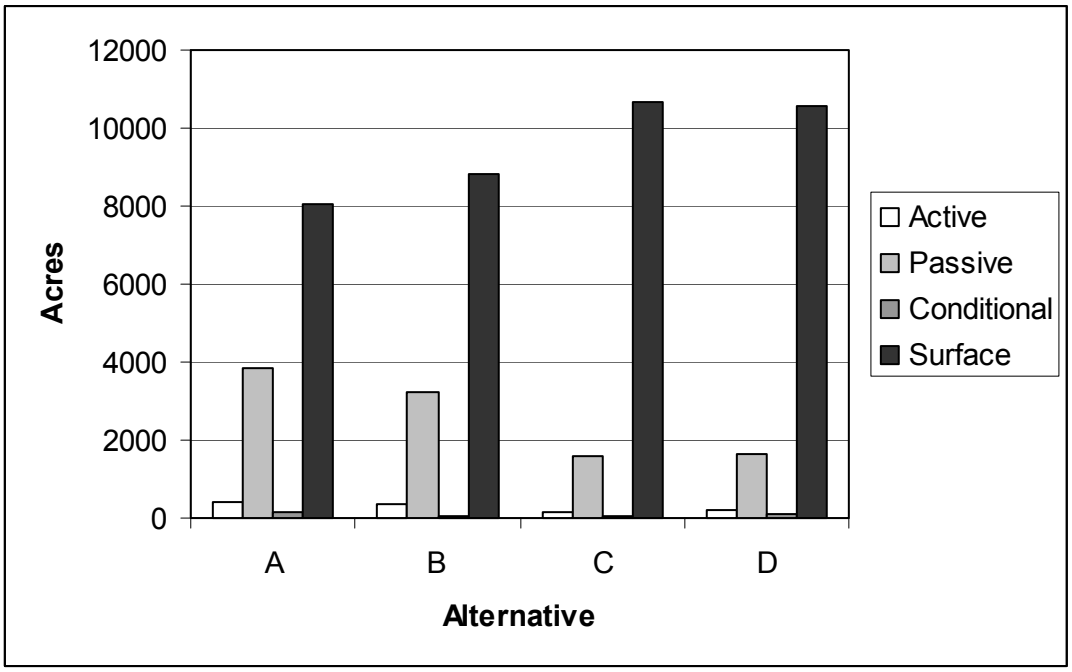


Table 3-14 compares acreage treated under each alternative within one-quarter mile of private land.

Table 3-14. Treatment within 1/4 Mile of Private Land

Alternative	Acres	Percent of Project Area
A	0	0
B	1,353	46
C	1,724	58

D	2,056	70

Cumulative Effects

The cumulative effects analysis area for fire and fuels is National Forest System lands in the project area. Past, present, and future actions are described starting on page 3-1. The effects of past activities have been increased stem density, basal area, and ladder fuels. Timber management and livestock grazing have removed biomass that could otherwise contribute to fire spread and intensity but have also contributed to a decrease in average tree diameter and loss of open areas. The 2003 Puma Fire acted against these effects and moved the burned parts of the analysis area to a less hazardous condition. Ongoing and foreseeable actions, including the Truck Trail Fuel Break project and fuel treatments and pine encroachment cutting planned as follow-up activities to the Rednose Timber Sale, will reduce fuel loading and decrease the cumulative effects of historic fire suppression.

Alternative A would add to the cumulative effects of fire suppression without reducing basal area or removing biomass through timber harvest or fuel treatments. Condition class would continue to move further from the historic range of variability, and the chance of large, intense fires that could cause substantial damage to various resources would continue to increase. The cumulative effect could be evident for decades. Alternatives B, C, and D would work against many of the cumulative effects discussed above by removing fuels, reintroducing fire, maintaining openings, and enhancing naturally fire-resistant vegetation communities such as aspen stands. The resulting condition class would be closer to the historic range. Alternative C would have the greatest and most widespread influence on cumulative effects in the next decade, as stand structure and fuels would be modified to reduce fire hazard across a larger area than under the other alternatives. Alternative B would also decrease cumulative effects of past fire suppression and forest management but across a smaller area and more gradually due to generally less aggressive treatments. Alternative D takes a different approach, proposing modification of stand structure only in strategic locations to reduce fire spread. This alternative would not add to cumulative effects in treated areas, but biomass would continue to accumulate in the larger blocks of untreated areas, adding to the cumulative effect of increased hazardous fuel conditions.

3.4.3 RANGE

The Dean project area includes approximately 75 percent of the Farrall Grazing Allotment and 95 percent of the Redwater Grazing Allotment. The Farrall Allotment encompasses 12,275 acres, including parts of the drainages of Little Beaver, South Fork Spring, North Redwater, and Little Creeks. The Redwater Allotment encompasses approximately 5,998 acres. The western two-thirds and northern half of the allotment are drained by Middle Redwater Creek, with the remainder drained by South Redwater Creek. Hemler Dam and Sheep Nose Mountain are locally familiar features of this allotment. Elevation ranges from 4,480 feet to 5,200 feet on the northern portion of Farrall and from 4,663 feet to 5,787 feet on the southern portion of Farrall and Redwater.

Field surveys using cover-frequency methodology were conducted during the 2004 field season to re-read transects that were set up in Farrall in 1994 and Redwater in 1995. This methodology is used to provide quantitative measurements of canopy cover and frequency by plant species, ground cover, and production by life form for inventory and monitoring purposes. Short-term

utilization studies using the Ocular Estimate Method, also known as the Landscape Appearance Method, have occurred over several years to monitor utilization in key areas and ensure compliance with direction in the Forest Plan as amended.

Affected Environment

Seventy-eight percent of the project area is forested with ponderosa pine. Approximately 78 percent (8,495 total acres) of the available livestock forage or primary range is found under pine. Other overstory components include bur oak, quaking aspen, and paper birch. These cover 11 percent of the primary range. In reality, ponderosa pine communities should be considered secondary range. Livestock use of pine communities varies depending on stand density, existence of pine regeneration and oak brush, availability of water, and topography, but is often light.

All other primary range is found in grasslands, meadows, and riparian areas, which make up one to two percent of the project area. Meadows and riparian areas are preferred over all other areas by grazing livestock due to the close proximity of water to available forage. As a result they tend to be more heavily used by livestock. For this reason they are considered key areas for monitoring and evaluation for range condition, trend, and degree of use by livestock and/or wildlife. Range surveys in selected key areas indicate dominance by introduced grasses such as Kentucky bluegrass (*Poa pratensis*) and timothy (*Phleum pratense*). Native grasses include junegrass (*Koeleria macrantha*), *Stipa* spp., slender wheatgrass (*Elymus trachycaulus*), and western wheatgrass (*Pascopyrum smithii*). Native sedges (*Carex spp.*) are fairly abundant in most key areas. The forb component is dominated by dandelion (*Taraxacum officinale*), an introduced species, and common yarrow (*Achillea millefolium*).

Current livestock stocking rates are based on forage production on primary range. As pine encroaches on primary range, forage availability decreases. This leads to increased livestock utilization in areas where forage is still available.

Grazing is currently authorized under permit as described below.

Table 3-15. Grazing Allotments and Permits

Allotment	Grazing System	Pastures	Number and Type of Permits	Livestock Numbers	Season of Use
Farrall (North Unit)	Two-pasture deferred	Merrick* Icebox	3 term 1 private land	188 cow/calf	6/11-10/15
Farrall (South Unit, with Redwater)		Ridge**	1 term	75 c/c	6/11-10/7
		Madison**	1 term	13 c/c	6/11-10/7
Farrall (Table Mountain)	Season-long	n/a	1 term with on/off provisions	75 c/c	6/11-10/15
Redwater	Three-pasture deferred	Truck Trail Upper Lower	3 term	168 c/c	6/11-10/7
Farrall Riparian***					

*95 percent of the Merrick pasture is not within the project area.
**Madison and Ridge pastures are used in conjunction with the Redwater Allotment.
***The riparian pasture is used by permittees from both the Farrall and Redwater Allotments, usually at the end of the season, often for gathering.

Management plans for these allotments are currently being revised. Publication of the associated North Zone Range 2006 EIS is expected in spring 2006. The proposed action is use of adaptive management to modify livestock numbers, pasture rotations, and seasons of use in response to monitoring of allotment conditions.

Within the project area there are 15 ponds/dugouts and nine developed springs. Availability and quality of water in the ponds and dugouts vary from year to year, depending on precipitation and runoff. Approximately 15 miles of fence exist in the project area. A quarter-mile section of the Merrick Spring pipeline system runs along NFSR 830.3 and the project area boundary. Storage tank #104036 and watering tank #104035 are also located in this area along the project boundary.

Environmental Consequences

Rangeland is defined in the Region 2 Rangeland Analysis and Management Training Guide as land producing or capable of producing native forage for grazing and browsing animals and lands that have been revegetated naturally or artificially to provide a forage cover that is managed like native vegetation. It includes all grasslands, forblands, shrublands, and those forested lands which can continually or periodically, naturally or through management, support an understory of herbaceous or shrubby vegetation that provides forage for grazing or browsing animals.

Impacts to the rangeland resources in the Dean project area revolve mainly around forage production that may increase or decrease depending on alternative. Road construction, closure, and decommissioning would impact the use of available forage for livestock as well as access to range improvements necessary for proper livestock management.

Effects Common to All Action Alternatives

No changes in current grazing management are proposed under the Dean project. Livestock grazing would be expected to continue with current permitted numbers unless modified in Annual Operating Plans or by other NEPA decisions, and no structural range improvements are proposed in any of the alternatives.

Removal of timber through commercial and noncommercial treatment would provide transitory range. Transitory range is an area that temporarily produces an increase in rangeland vegetation. These areas would occur when the tree and sometimes shrub overstory are removed, allowing the grass/forb component to take full advantage of available sunlight and moisture. This would improve the quality and quantity of forage available to livestock. Livestock distribution throughout the project area would increase as treatment areas are opened up and roads are improved or new ones are built. Impacts to primary range, usually located in meadows, upland grasslands, and riparian areas, would lessen as cattle distribute throughout the transitory range. This would aid in maintaining or moving these communities towards desired condition.

Removal of bur oak brush from 55 acres would be very beneficial to livestock. Available forage within these areas would increase, which would contribute to an improvement of livestock distribution. Proposed patch cuts would benefit livestock as well as wildlife. Patch cuts would provide more open areas and increase available forage and distribution of livestock with similar effects on primary range. Proposed removal of pine encroachment in riparian areas would improve these communities. As other areas are opened up through other treatment activities, utilization by livestock of forage in riparian areas would lessen due to improved cattle distribution.

Prescribed fire and mechanical fuel reduction treatments proposed under all action alternatives would aid in maintaining or moving primary range towards satisfactory condition. These actions would help reduce succession of upland grasslands and meadows to pine while increasing available forage. Prescribed fire would have a direct short-term impact on permittees and livestock grazing. Pasture rotations, season of use, and/or livestock numbers may need adjustment in order to allow sufficient recovery time in burned areas (amended Forest Plan standard 4107). New vegetation in burned areas often becomes very desirable to livestock and wildlife because of palatability and access. Amended Forest Plan Standard 4107 states that prescribed fire burned areas will be deferred from livestock grazing for a portion or all of the following growing season to increase regrowth of forage species. Close coordination between the District fuels/fire and range staffs is planned in order to provide adequate time for the vegetation to recover before it is grazed and to minimize impacts on permittee operations.

Roads analysis was completed with consideration of access needs by permittees and the Forest Service. Permittees need access to maintain improvements such as fences and water developments and to manage livestock grazing, which normally occurs between June 1 and October 15. All roads would help facilitate livestock movement and aid in distribution across the rangeland.

No Action (Alternative A)

Under this alternative, no actions would be taken at this time. Livestock grazing would continue.

This alternative would allow continued encroachment of ponderosa pine communities on primary range. Encroachment of pine into grassland communities, meadows, and riparian areas would increase grazing pressure on these areas as they shrink in size. This would ultimately reduce their capability under the currently permitted livestock numbers. Utilization direction described in amended Forest Plan standard 2505 may eventually be exceeded, making it difficult to maintain satisfactory condition in some areas.

Alternative B

Commercial thinning would result in varying increases of grasses and forbs in treated stands, creating transitory range. Shelterwood seed cut treatments would create transitory range until pine regeneration becomes established.

Mature stand enhancement (thin from below) treatments may provide additional forage. The 416 acres of this treatment focusing on a more open canopy would create or promote a pine savannah type, increasing forage availability and improving livestock distribution. Long-term maintenance of these areas would greatly improve livestock distribution and relieve pressure on primary grazing areas. Varying density of the overstory would result in varied amounts of the grass/forb component that makes up available forage for livestock and wildlife.

Permittees often use ATVs and pickups to monitor livestock and maintain improvements as required by the terms and conditions of their grazing permits. Under all alternatives, permittees would retain motorized administrative access.

Road construction would improve livestock distribution across the associated pastures by providing easy access to areas that currently have limited access. Where possible, road closure structures would be placed so that cattle still have access to cattle trails.

Alternative C

Alternative C proposes treatments similar to those of Alternative B, with the exception of mature stand enhancement treatments. Instead, Alternative C includes additional acres of precommercial thinning. This treatment would reduce stand density and may provide some transitory range.

The proposed change in Management Area designation from 5.4 to 5.6 would require no change in livestock management.

Alternative C would treat more acres than Alternative B and would therefore create more transitory range.

Effects of travel management would be the same under this alternative as Alternative B.

Alternative D

Fuel break construction would take place on approximately 2,337 acres. This would be accomplished by reducing stand density around private property and along main roads. The resulting low stand density would increase secondary range. Off-road motorized travel would continue to be allowed across the project area except where currently prohibited. This would not affect current management of livestock grazing. Any closures of system roads that are currently open may require authorization for permittees to access range improvements.

Cumulative Effects

The cumulative effects analysis area for the range resource includes National Forest System lands in the Farrall and Redwater Allotments. Past and ongoing timber harvest and prescribed fire have created and will continue to create transitory range, improving livestock distribution and available forage. All action alternatives would add to this effect, reducing time livestock spend on primary range and helping to meet amended Forest Plan objectives 301 and 302 and standard 2505.

3.4.4 BOTANY

Affected Environment

The Dean project area contains a variety of habitats. Mixed stands of paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and beaked hazelnut (*Corylus cornuta*) are common on north-facing slopes. Dry ponderosa pine stands, often mixed with shrub-form bur oak (*Quercus macrocarpa*), occur on the upper parts of slopes and south aspects. Other forested areas are commonly a mix of ponderosa pine and hardwoods, the proportion of which depends on moisture levels and aspect. Open grass and sedge meadows are occasionally found in draw bottoms and along creeks.

The Dean project area contains habitat considered suitable to support sensitive plant species. Some of this suitable habitat is considered high-quality habitat for sensitive plant species and consists of stands of birch and birch/aspen mix as well as some high-quality riparian habitats. These sites often have a high percentage of canopy cover and/or moist soils; they usually support a diversity of understory species, including mosses and lichens.

Field Surveys

Prior to field surveys, a pre-field review of Rocky Mountain Region sensitive plant species and high-probability sensitive plant habitat was completed using the Black Hills National Forest Plant Database (USDA Forest Service 2005a), Wyoming Natural Diversity Database records, and communication with district personnel. Based on this review, it was determined that field surveys were needed. A thorough survey was conducted of the Dean project area in 2002. Additional surveys conducted for other projects within the Dean project area boundary were conducted during the 1995 and 1996 field seasons and are considered in the effects analysis.

The 2002 surveys were conducted by a qualified contractor. The focus of surveys was not only on locating individual occurrences of sensitive species but also on identifying and mapping community types, associated species, indicator species, and the probability of an area to support sensitive plant species. Sensitive plants and other plant species of interest that were located in the project area are displayed in **Table 3-16.**

Table 3-16. Sensitive and Other Plant Species of Interest

Scientific Name	Common Name	Region, Forest, and State Ranking	Number of Occurrences
Botrychium virginianum	Rattlesnake fern	Species of Insufficient Information, Wyoming S2	4
Carex concinna	Low northern sedge	Species of Insufficient Information, Wyoming S1	1
Carex richardsonii	Richardson's sedge	Wyoming S1	2
Cynoglossum virginianum var. *boreale*	Northern wild comfrey	New to Wyoming	8
Elymus villosus	Hairy wildrye	Species of Insufficient Information, Wyoming S1	5
Lycopodium dendroideum	Treelike clubmoss	Wyoming S2	2
Platanthera orbiculata	Large round-leaved orchid	R2 Sensitive, Wyoming S1	1
Prosartes hookeri	Drops of gold	Species of Insufficient Information, Wyoming S2	1
Scirpus cyperinus	Cottongrass bulrush	Wyoming S2	7

Scientific Name	Common Name	Region, Forest, and State Ranking	Number of Occurrences
Vaccinium membranaceum	Square-twigged huckleberry	Species of Insufficient Information	1

One sensitive plant species is known to occur in the Dean project area: *Platanthera orbiculata* (large round-leaved orchid), known from a single site. The occurrence does not fall within any proposed treatment units under any alternative. Suitable habitat exists for four sensitive plant species and may occur for two additional species.

Surveys indicate that about seven percent of the project area is in high-quality moist forested and riparian meadow vegetation communities. These communities provide habitat for the following sensitive plant species:

Carex alopecoidea	Fox-tail sedge
Cypripedium parviflorum	Yellow lady's slipper
Lycopodium complanatum	Trailing clubmoss
Viburnum opulus var. americanum	Highbush cranberry

Habitat may exist in the project area for two additional sensitive species, *Botrychium lineare* (narrowleaf grapefern) and *Botrychium campestre* (prairie moonwort, Iowa moonwort).

Environmental Consequences

Effects Common to All Action Alternatives

Under all action alternatives, most proposed activities would not take place in areas considered high-quality sensitive plant habitat. Exceptions are some areas of hardwood enhancement in riparian areas. Encroaching pine would be removed. The extent of treatment would be determined based on the potential for habitat enhancement in the long term and the amount of ground disturbance necessary to implement the treatment. Disturbance would be minimized (pages 2-7, 2-9). In general, removal of encroaching pine from riparian meadows is expected to enhance suitable sensitive plant habitat.

Potential effects on suitable habitat from activities that may occur outside proposed treatment units (such as log landing and skidding) would be minimized through consultation with a qualified botanist (page 2-9). No road construction would take place in suitable habitat. Decommissioning of unclassified road U620103 would reduce disturbance by motorized vehicles of high-quality sensitive plant habitat.

A possible beneficial indirect effect under Alternatives B, C, and D could result from decommissioning of roads. Decommissioning roads would have a beneficial effect on all plant communities and "eventually, obliterated roads would be expected to function like undisturbed areas" (USDA Forest Service 1997).

There is much uncertainty regarding risks to *Botrychium lineare*. Disturbances and land management activities may create and maintain suitable habitat for this species or may negatively impact existing populations, depending on the disturbance intensity and frequency (Beatty et al. 2003).

No Action (Alternative A)

Under Alternative A, no new actions would take place at this time. There would be no immediate direct or indirect effects on known populations of sensitive plants, moist forested habitat, or riparian meadow habitat. Over time, there may be an indirect effect of increased risk of stand-replacing fire or changes in suitable habitat from pine encroachment. Continued fire suppression without mechanical treatment of

vegetation or prescribed fire could result in increased fuel loads and possibly a reduction in available water to other species and systems. In addition, lack of treatment could intensify wildfire susceptibility and behavior. Areas that would not normally burn, i.e. moist areas considered high-probability sensitive plant habitat, could ignite and burn with uncharacteristic intensity. This could result in a loss of sensitive plant habitat or sensitive plant populations.

See previous section regarding effects on *Botrychium lineare*.

Alternative B

Commercial thinning and broadcast burning are proposed adjacent to the known sensitive plant site. Design criteria are included to minimize the risk to the occurrence (design criteria, page 2-9). Alternative B may have beneficial indirect effects on *Platanthera orbiculata* through reduction of fuels near the occurrence. This treatment may decrease the risk of intense, stand-replacing fire reaching the site. Additional indirect effects of Alternative B may include minimal increased water yield resulting from the removal of pine from adjacent timber stands via silvicultural treatments and prescribed burns. If increased water yield does result, suitable habitat for *Platanthera orbiculata* and other sensitive plant species could benefit. A negative effect could occur if ground-disturbing activities encroach on the site and facilitate noxious weed infestation. Design criteria would prevent or minimize weed infestation and its effects (pages 2-5, 2-7, 2-9).

No activities are proposed elsewhere in moist forest or riparian meadow communities. Alternative B would have no direct effects on this habitat. Indirect effects on sensitive species or their habitat could result from nearby silvicultural and fuel treatments. A beneficial indirect effect of implementing Alternative B would be a reduction in the risk of stand-replacing fire, which could damage sensitive plant habitat.

Direct and indirect effects on high-quality sensitive plant habitat and known populations could result from opening the Truck Trail to ATVs. Assuming no change in current levels of enforcement of off-road travel restrictions, effects could include impacts to individual plants from ATVs running off the designated trail and into adjacent drainages. Ground disturbance and seed transport by off-road motorized vehicles could result in new infestations of noxious weeds. Noxious weeds have the potential to out-compete desired plant species, and spray from herbicides used to help control weeds could have negative effects on sensitive plants.

Roads act as corridors for the dispersal of invasive weeds. Weed infestation could also follow ground disturbance associated with proposed vegetation treatments. Weeds are one of the greatest risks to sensitive plant species, particularly for those found in riparian areas and wetlands due to the concentration of a variety of management activities and uses that occur in these habitats (USDA Forest Service 2003a). Since all new construction and reconstruction of roads would be located away from high-quality sensitive plant habitat, additional negative indirect effects would not be anticipated due to these actions. Design criteria included in Chapter 2 would minimize spread of noxious weeds and indirect effects on these habitats. Closure of the area to off-road motorized use would reduce risk of direct damage to sensitive species and their habitat and introduction of noxious weeds.

Alternative C

Silvicultural treatments proposed adjacent to known sensitive plant sites are similar to those described for Alternative B, with the addition of a shelterwood seed cut/overstory removal treatment. With application of prescribed design criteria, direct and indirect effects on

Platanthera orbiculata, moist forest communities, and riparian meadow communities would be similar to those described for Alternative B. Alternative C includes a higher acreage of mechanical fuel treatments than other alternatives and would have a greater chance of negatively affecting these species and habitats. Closure of the area to off-road motorized use would reduce risk of direct damage to sensitive species and their habitat and introduction of noxious weeds.

Alternative D

Treatment proposed adjacent to the known sensitive plant site includes prescribed burning but no mechanical treatments. Design criteria (page 2-9) would protect the occurrence of *Platanthera orbiculata*. Alternative D includes the fewest acres of mechanical treatment, and the magnitude of indirect effects on moist forested communities and riparian meadow communities would therefore be less than under the other action alternatives.

Cumulative Effects

Although negative impacts from implementing any alternative would be possible, they would be outweighed by the beneficial effects of reducing the risk of stand-replacing wildfires and improving riparian habitat through removal of ponderosa pine. This approach of managing to restore and preserve habitat for long-term benefits despite potential short-term negative effects (introduction of weeds, loss of plant or wildlife individuals, or initial changes to habitat) is supported by the US Fish and Wildlife Service (USFWS/NOAA 2002).

The cumulative effects area for *Platanthera orbiculata* is moist forest habitats with a paper birch and hazelnut component, with or without a ponderosa pine component, within the Dean project area. The cumulative effects area for species associated with moist forest and riparian meadow communities is the extent of those communities in the project area. Activities such as livestock grazing, road building, recreation, fire suppression, water diversion, and near-extirpation of beaver have decreased suitability of some areas as habitat for sensitive plant species. The action alternatives may add to the cumulative effect of weed infestation, though design criteria are prescribed to minimize the risk and address any infestations that do occur. By avoiding known sensitive plant sites and high-quality habitat, the action alternatives would not add to other cumulative effects on *Platanthera orbiculata* or high-quality habitats.

Risks

The risk to *Platanthera orbiculata* and moist forest and riparian meadow communities from implementing Alternative A would be low because no actions would take place and it is suspected that ecological processes would continue unaltered in the next five to 10 years. The risk of implementing Alternatives B, C, and D would be low because areas of suitable habitat were identified and surveyed within the project area; no populations of *Platanthera orbiculata* are known to exist inside any proposed treatment units under any alternative. In addition, all high-quality potential sensitive plant habitat would either be avoided or, in the case of pine removal from riparian meadow treatments, design criteria would reduce ground disturbance and provide the best habitat improvement scenario. Risk would be further reduced because protective measures associated with Best Management Practices and Forest Service Manual 2509.25 apply.

Determination - Platanthera orbiculata

Due to potential for indirect and cumulative effects, and low risk as described above, all alternatives "may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" of *Platanthera orbiculata.*

Determination – Species Associated with Moist Forest and Riparian Meadow Communities

Due to potential for indirect and cumulative effects, and low risk as described above, all alternatives "may adversely impact individuals, but are not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" of species associated with moist forest and riparian meadow communities

Botrychium lineare *(narrowleaf grapefern)*

Risks

There is much uncertainty regarding risks to *Botrychium lineare*. Disturbances and land management activities may create and maintain suitable habitat for this species or may negatively impact existing populations, depending on the disturbance intensity and frequency (Beatty et al. 2003).

Determination

Due to the uncertainties and limited information for this species in the Black Hills and Rocky Mountain Region, it is difficult to assess whether the activities associated with Alternative A, B C, or D for the Dean project would have no effect, a potential adverse effect, or a potential beneficial effect on *Botrychium lineare*. Based on the information that is available, a determination of "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing" is made for *Botrychium lineare.* The rationale for this determination is based upon the following:

1. The known Black Hills *Botrychium lineare* occurrence is not within the Dean project boundary and would not be disturbed by the activities associated with the project. While the full extent of the distribution of *Botrychium lineare* in the Black Hills is currently unknown, the appearance of aboveground sporophytes at the single known site is indicative of a viable population with extensive supporting underground biomass (including mycorrhizae) (USDA Forest Service 2004e). Therefore, while loss of individuals may occur in currently unknown sites (if any) in the Dean project area, the viable population at the known occurrence site would not be affected.

2. The baseline data for the known occurrence documents that the species is able to colonize areas of past disturbance, and the species is currently persisting at the known occurrence with limited ongoing disturbances (USDA Forest Service 2005a).

3. Forest canopy cover would decrease in some portions of the project area, which could benefit *Botrychium lineare*. Although specific data are lacking on the Black Hills National Forest, earlier successional conditions that occur with opening the overstory canopy could produce conditions that may be beneficial to site colonization by this wind-dispersed, spore-producing species, if the associated mycorrhizal species and other microsite conditions are present (USDA Forest Service 2004e).

Botrychium campestre *(prairie moonwort, Iowa moonwort)*

Risks

There is much uncertainty regarding risks to *Botrychium* species in the Black Hills, including *B. campestre*. Disturbances and land management activities may create and maintain suitable habitat or may negatively impact existing populations.

Determination

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

1. The single verified occurrence of *B. campestre* is not located within or near the Dean project area and would not be disturbed by the activities associated with the project. While the full extent of the distribution of *B. campestre* in the Black Hills is currently unknown, the appearance of above-ground sporophytes at the known site is indicative of a viable population with extensive supporting underground biomass (including mycorrhizae). Therefore, while loss of individuals may occur in currently unknown sites (if any) in the Dean project area, the viable population at the known occurrence will not be affected by the project.

2. Baseline data for this occurrence documents that the species is able to colonize past disturbance areas (on either side of a gravel road and in the road ditch), and the species is currently persisting at the known occurrence with ongoing disturbances.

3. Forest canopy closure would decrease in some portions of the Dean project area under all action alternatives, which could benefit *B. campestre*. Although specific data are lacking on the Black Hills National Forest, the earlier successional conditions that occur with opening the overstory canopy could produce conditions that may be beneficial to site colonization by this wind-dispersed, spore-producing species, if the associated mycorrhizal species and other microsite conditions are present (D. Reyher and B. Burkhart, 2004).

4. If there is an unknown occurrence of this species in the Dean project area, it is possible that it could expand, if present, or site conditions could be altered as a result of some level of disturbance by either fuel treatments or timber harvest activities (i.e. earlier successional conditions including shrub shade reduction, disturbed site conditions, and changes in plant competition patterns) that may be favorable for colonization by *Botrychium* spp. spores, as long as associated mycorrhizae and other microsite conditions are present. Skidding that occurs when the ground is not frozen could result in below-ground disturbance that may impact some unknown individuals. Conversely, skidding may create conditions suitable for colonization by *B. campestre* (USDA Forest Service 2005a).

5. There are no data suggesting a direct impact of weeds on *Botrychium* species, but their mutual affinity for disturbance may cause *Botrychium* species and their habitats to be vulnerable to negative impacts from weeds.

6. Since the habitat for *B. campestre* cannot be categorized by one known occurrence in the Black Hills, it is not possible to adequately address cumulative effects by habitat.

Species of Local Concern

One plant Species of Local Concern (SOLC) is known to occur in the project area. Habitat for three other SOLC plants is found in the project area. A complete list of SOLC plants and their habitat associations is found in the botany specialist's report in the Dean project file.

Table 3-17. Plant Species of Local Concern

Species	Species Present	Habitat Present	Habitat
Plants			
Gentiana affinis Pleated gentian	N	Y	Riparian meadow, moist forest
Petasites sagittatus Arrowleaf sweet coltsfoot	N	Y	Riparian meadow, moist forest
Polystichum lonchitis Northern hollyfern	N	Y	Moist forest
Salix lucida Shining willow	Y	Y	Riparian meadow, moist forest

***Salix lucida* (shining willow)**

Shining willow is considered globally secure (G5). The currently assigned rank in South Dakota is critically imperiled (S1). The species has not been assigned a status rank in Wyoming (SNR/SU) (NatureServe 2005).

Direct and Indirect Effects on Plant SOLC

In the Black Hills, the primary habitat for the three species with possible habitat but without known occurrences in the project area is expected to be conditions associated with riparian vegetation communities and/or moist forested communities, usually with a birch or spruce component. The following analysis applies to all four plant SOLC and their habitat.

Although the action alternatives differ in objectives, emphasis areas, and acres to be treated, and therefore would be expected to result in different magnitudes of potential effects, the types of effects to shining willow occurrences and high-quality plant SOLC habitat are expected to be similar. For this reason, all three action alternatives are analyzed together with a discussion on the differences in magnitude of effects between alternatives.

Silviculture and Fuels Treatments: Shining willow occurrences and areas with high-quality suitable plant SOLC habitat conditions have been excluded from silviculture and fuel treatment units in all action alternatives. Since shining willow occurrences and high-quality plant SOLC habitat are excluded, direct effects to occurrences and habitat would be minimal.

Indirect effects on shining willow occurrences and areas with high-quality plant SOLC habitat from adjacent or nearby silviculture and fuels treatments are possible. A beneficial indirect effect of implementing Alternative B, C, or D would be reduction in the risk of stand-replacing fire. Heavy fuel loading may contribute to widespread, high-severity wildfires; these could negatively

affect moist riparian communities that under less intense fire conditions would act as fuelbreaks. Creating fuelbreaks along with additional fuels reduction treatments could, in the case of a wildfire, cause crown fires to drop to the ground before burning into known sites and/or suitable habitat. This would reduce the likelihood of severe fire effects on riparian meadow and moist forested communities. Prescribed burning and selective thinning of adjacent conifer stands would maintain a mosaic of seral stages, increase available moisture, and decrease the potential for widespread crown fires (USDA Forest Service 2005b).

A potential indirect effect that could be negative or positive, depending on magnitude and location, is increased water yield resulting from a reduction of stocking in upland pine stands. It is possible that an increase in available moisture could improve and/or expand plant SOLC habitat conditions.

A possible negative indirect effect could be the creation of new weed infestations from ground disturbance associated with mechanical vegetation treatments and prescribed burning. Noxious weeds have the potential to out-compete desired plant species, and spray from herbicides used to help control weeds can also have negative effects on plant SOLC. Design criteria (Chapter 2) would reduce indirect effects on habitat due to noxious weeds.

Alternative C proposes the same number of acres of prescribed burn as Alternative D but more than twice the amount of mechanical treatments. Alternative B falls between D and C in acres of mechanical treatment acreage. Therefore, the magnitude of indirect effects resulting from silviculture and fuels treatments could be expected to be greatest under Alternative C and least under Alternative D. Under all alternatives, however, direct and indirect effects are likely to be minimal due to avoidance of habitat.

Riparian Treatments: Under all action alternatives, overlap occurs between the two shining willow occurrences, suitable plant SOLC habitat conditions, and riparian units proposed for pine removal. These pine removal treatments are expected to improve conditions for shining willow and habitat for other plant SOLC associated with open riparian conditions, but may result in temporary (one- to two-year) impacts due to ground disturbance. While direct impacts to plant SOLC and associated habitat conditions are possible, design criteria would limit the extent of potential impacts. Therefore, while direct impacts to shining willow and associated SOLC plant habitats are possible, the risk is low. The magnitude of direct effects resulting from this treatment is expected be the same for all action alternatives since riparian treatments are the same under these alternatives.

Indirect effects could include those described in the previous section for silviculture and fuels treatments, such as negative effects from potential weed encroachment and potential beneficial effects from increasing site moisture. A decreased pine component in riparian meadows could contribute to an improvement in conditions to support shining willow and other plant SOLC associated with the same habitat. While negative indirect impacts to occurrences and habitat are possible, design criteria would limit the extent of negative effects while increasing the likelihood of beneficial effects. The magnitude of indirect effects (both negative and positive) for riparian treatments would be the same for all action alternatives.

Travel Management: Direct effects on habitats associated with plant SOLC due to travel management activities would vary among the action alternatives. Under Alternative B, the Truck Trail would be open seasonally to use by ATVs and other motorized vehicles 50 inches or less in width. Potential direct effects resulting from this new designation could include impacts to high-quality suitable plant SOLC habitat from vehicles running off the designated trail and into

adjacent drainages. This designated ATV trail is not proposed under Alternative C or D, and therefore no direct impacts are expected from travel management actions under these two alternatives.

There is the potential for negative indirect effects from creating new roads and reconstructing existing roads under Alternatives B, C, and D. Roads act as corridors for the dispersal of invasive weeds. Weeds are one of the greatest risks to plant SOLC, particularly those found in riparian areas and wetlands due to the concentration of a variety of uses that occur in these habitats (USDA Forest Service 2005b).

Under Alternative B, indirect effects could result from the new seasonal ATV designation along the Truck Trail. A possible negative indirect effect could be the creation of new weed infestations from ground disturbance associated with ATV use on and off the designated trail. Noxious weeds have the potential to out-compete desired plant species, and spray from herbicides used to help control weeds can also have negative effects on plant SOLC. New construction and reconstruction of roads would be located away from high-quality suitable plant SOLC habitat, and additional negative indirect effects are not anticipated due to travel management actions.

A possible beneficial indirect effect of Alternatives B, C, and D could result from decommissioning of roads. Allowing the land to be free of disturbances caused by motorized vehicles in these areas has the potential to improve plant habitat by allowing vegetation to reestablish and shade and moisture levels to increase as a result of increased canopy cover. Decommissioning roads is expected to have beneficial effects on plant communities.

Alternative B is the only alternative with the new ATV designation proposal on the Truck Trail. Therefore, negative indirect effects resulting from this designation would only apply to Alternative B. The magnitude of indirect effects due to building new roads and reconstructing existing roads would be essentially the same in Alternatives B and C. Alternative D has fewer miles of road reconstruction and no new road construction, so fewer negative indirect effects resulting from these actions would be expected. Beneficial indirect effects from road decommissioning are expected to be essentially the same for all three action alternatives.

Cumulative Effects on SOLC

The cumulative effects area for shining willow and potential habitat for the three additional SOLC listed above is high-quality moist forested and riparian meadow communities in the project area.

Silviculture/Fuels Treatments/Travel Management: Activities such as livestock grazing, road building, recreation, fire suppression, water diversion, and near-extirpation of beaver have decreased suitability of some areas as habitat for SOLC. The action alternatives may add to the cumulative effect of weed infestation, though design criteria are prescribed to minimize the risk and address any infestations that do occur.

Fire suppression has resulted in negative cumulative effects such as increased fuel loading and changes in microsite moisture and hydrologic regimes. Silviculture, fuels, and wildlife treatments proposed in the Dean project area under Alternatives B, C, and D would act against these negative effects by reducing fuel loads and possibly increasing surface water. The same activities may also result in noxious weed infestations, which would add to negative cumulative effects. All activities are designed with invasive species management in mind (see Chapter 2); design criteria such as prompt revegetation with native species and provisions for monitoring and

treatment of weed infestations would reduce the potential for this project to increase cumulative effects of noxious weed infestation on SOLC occurrences habitat.

Riparian Treatments: Cumulative effects could include those described in the previous section for silviculture and fuels treatments, such as negative effects associated with weed encroachment and potential beneficial effects from conserving or increasing soil moisture conditions. Cumulative impacts to habitat are possible, but design criteria included to conserve and protect moist soil conditions and riparian areas during timber harvest and road-building activities would prevent noticeable contributions to cumulative effects. The magnitude of cumulative effects (both negative and positive) resulting from riparian treatments is expected to be the same for all action alternatives since riparian treatments are the same under each alternative.

Risks: The risk of implementing Alternative B, C, or D is low because areas of suitable habitat conditions were identified and surveyed within the project area, and plant SOLC occurrences and habitat would be avoided or, in the case of pine removal from riparian areas, treatments have been designed to reduce ground disturbance. Risk to the species is expected to be further reduced because conservation and protective measures associated with Best Management Practices and Forest Service Manual 2509.25 apply.

Implementation of activities under this project would be expected to move conditions in the project area and on the Forest towards applicable Phase 2 Amendment goals and objectives (see Chapter 1). As a result, plant SOLC occurrences and plant SOLC habitat conditions are likely to persist within the project area.

3.4.5 NOXIOUS and INVASIVE WEEDS

It is estimated that most land units in the Black Hills National Forest are infested with varying populations of noxious weeds (USDA Forest Service 2003a). Human-caused disturbances, including timber harvest, recreation, mining, grazing, road development, and fire, have historically contributed and continue to contribute to the introduction, establishment and spread of noxious weeds.

Affected Environment

Weed infestations were inventoried in the project area during the 2004 field season. Approximately 1,500 acres were found to be infested to varying degrees by noxious weeds. Weed species and extent are displayed in **Table 3-18**.

Table 3-18. Noxious Weeds

Common Name	Scientific Name	Acres
Canada thistle	*Cirsium arvense*	420
Common tansy	*Tanacetum vulgare*	Less than 1
Houndstongue	*Cynoglossum officinale*	388
Leafy spurge	*Euphorbia esula*	Less than 1
Common mullein	*Verbascum thapsus*	391
Musk thistle	*Carduus nutans*	297
St. Johnswort	*Hypericum perforatum*	Less than 1
Yellow toadflax	*Linaria vulgaris*	4

Twenty-eight biological control sites exist within the project area. The following table shows the target weed species and insects used. Some sites may include more than one species of insect.

Table 3-19. Biological Control Sites and Species

Weed Species	Control Agent (Insect)	Number of Sites
Canada thistle	*Cassida rubiginosa*	2
Canada thistle	*Larinus planus*	5
Canada thistle	*Urophora cardui*	16
Yellow toadflax	*Brachypterolas pulicarius*	4

Environmental Consequences

Known weed infestations occur in areas proposed for activities. Any time there is ground disturbance, noxious weeds have the potential to spread from existing infestations or for new species to colonize an area.

No Action (Alternative A)

Inventory and treatment of noxious weeds would continue. Roads and trails would continue to be avenues for spread of noxious weeds. Off-road vehicle travel would continue to promote the spread of noxious weeds by providing a means of transport; seeds collect in wheel-wells and grills of ATVs and other off-road vehicles and are dispersed during travel. Cattle would also continue to provide a means of dispersal.

Effects Common to All Action Alternatives

Commercial and non-commercial timber harvest activities, road work, and fuel reduction could provide mechanisms for the introduction, establishment, and spread of noxious weeds. Where soil disturbance occurs, the potential for establishment of noxious weeds would be high. Application of design criteria such as minimizing ground disturbance and prompt revegetation of disturbed areas (pages 2-5, 2-7, and 2-9) would be critical to preventing establishment of new infestations.

Prescribed fire, while beneficial to ecosystem health, can also facilitate the spread of noxious weeds. Treatment of weed infestations prior to prescribed fire implementation would be important to reducing the risk of spread (design criteria, page 2-5). Monitoring of burned areas and treatment of new infestations would also be necessary (monitoring, page 2-11).

Alternative B

Alternative B would conduct vegetation management on 41 percent of the project area. As stated above, adherence to design criteria and monitoring recommendations would be critical to preventing expansion of weeds and new infestations. Travel management emphasis would be on non-motorized use, with the exception of ATV use on the Truck Trail. If off-trail use occurs, especially in draws adjacent to the Truck Trail, new noxious weed infestations could result and negatively affect habitat for rare plant species (see page 3-59).

Alternative C

Alternative C proposes vegetation management on 60 percent of the project area. Due to the increased area proposed for activities, risk of new infestations would be incrementally greater than under Alternative B. Off-road motorized travel would be prohibited and no ATV trails would be designated, decreasing opportunities for vehicles to spread weeds.

Alternative D

Alternative D proposes vegetation management on 40 percent of the project area. New infestations could occur as under other alternatives, with implementation of design criteria and monitoring essential to minimizing or preventing infestations. Lack of road construction would mean fewer disturbed areas with attendant opportunity for additional noxious weed infestations. Alternative D would not restrict off-road motorized vehicle use, and the probability of weed spread by this vector would remain high.

Cumulative Effects

The cumulative effects area for noxious weeds is NFS lands in the project area. Ecologically, noxious weeds in the project area have indirectly affected wildlife, livestock, and possibly rare plants by displacing native vegetation and reducing the ability of ecosystems to function properly. These results may occur in any grass/forb community but can be especially problematic in riparian areas, upland grasslands, and meadows. When these areas become infested with noxious weeds, forage available for wildlife and livestock is reduced, and rare plants can be displaced. The action alternatives could add to this effect. Application of amended Forest Plan standards and design criteria and monitoring listed in Chapter 2, along with prompt weed control, if needed, would minimize the additive effect of the action alternatives and nearly eliminate it within five years of project implementation.

3.4.6 WILDLIFE

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

The ponderosa pine ecosystem in the Black Hills evolved in dynamic equilibrium with recurrent disturbances, especially fire, insects, and short- and long-term climatic cycles (Parrish et al. 1996). The composition and structure of today's vegetation is the result of a combination of fire suppression and past management activities (USDA Forest Service 2002). Across much of the Black Hills, frequent recurring disturbances such as wildfire and bark beetle outbreaks maintained a generally open, mature pine canopy with a productive and diverse understory (Sieg and Severson 1996). In the absence of frequent, low-intensity fires, increased density and canopy cover of pine stands has resulted in broad, contiguous expanses of mid-aged trees with abundant pine regeneration and sparse understories (Parrish et al. 1996). Such stands are vulnerable to large-scale insect epidemics and wildfires. These shifts have increased habitat for species that prefer continuous, mid-age forests while decreasing habitat availability for wildlife associated with more open and closed forests as well as older trees. Historically, frequent fires created many different age classes of ponderosa pine, thus enhancing diversity across the landscape (Uresk and

Severson 1989). Encroachment of pine into meadows, hardwood stands, and riparian areas has reduced grass, forb, and shrub availability.

Topography in the project area varies from steep, mountainous terrain to gentle slopes and valleys. Vegetation in the project area is primarily ponderosa pine, with a sizable component of bur oak, quaking aspen, and paper birch. Many stands are composed of mixed species; for example, pine stands with an oak understory are common. Pine is encroaching into some hardwood stands, riparian areas, and meadows. Both hardwoods and regenerating pine occur as common understory components and contribute greatly to screening cover and forage for a variety of wildlife species. The area also exhibits a variety of age classes of ponderosa pine created by timber harvest in the past several decades as well as openings created by the 2003 Puma Fire.

A wide variety of wildlife species inhabit the Dean project area, including elk, white-tailed and mule deer, mountain lion, coyote, porcupine, beaver, red squirrel, least chipmunk, northern leopard frog, Black Hills redbelly snake, finescale dace, land snails, and various fritillary and crescent butterfly species. Frequently observed birds include Merriam's turkey, red-breasted nuthatch, brown creeper, black-capped chickadee, MacGillivray's warbler, American robin, gray jay, red-naped sapsucker, white-winged junco, pine siskin, red crossbill, yellow-rumped warbler, ruby-crowned kinglet, cordilleran and dusky flycatchers, warbling vireo, western tanager, and ovenbird. Northern goshawks and Cooper's hawks have been documented in the area. The Dean project area provides important fawning and calving habitat for deer and elk. Parts of the area are deer winter range.

Structural Diversity

Habitat structural stage distribution is a measure of the structural diversity of wildlife habitat. Some species are associated with open forest while others prefer dense, mature stands or small trees. Structural stages are described as follows:

SS 1: Grasses and forbs
SS 2: Seedlings and saplings
SS 3A: 5-9" diameter, 0-40% cover
SS 3B: 5-9" diameter, 40-70% cover
SS 3C: 5-9" diameter, 70-100% cover
SS 4A: 9"+ diameter, 0-40% cover
SS 4B: 9"+ diameter, 40-70% cover
SS 4C: 9"+ diameter, 70-100% cover
SS 5: Late succession (old growth)

Table 3-20 displays existing structural stage distribution by cover type for NFS lands in the project area.

Table 3-20. Habitat Structural Stage by Cover Type - Existing

	Habitat Structural Stage									
Cover Type	**1**	**2**	**3A**	**3B**	**3C**	**4A**	**4B**	**4C**	**5**	**Total**
Grass	212									212
Oak		68	27	626	212					933
Aspen			44	193	362	100	74			773
Birch				361	85	14	234			694
Willow				51						51
Pine					87	2344	5688	1274	382	9775
Total	212	68	71	1231	746	2458	5996	1274	382	12438*

*Total does not include 14 acres of non-forested land.

Ponderosa pine stands are dominated almost exclusively by trees at least nine inches in diameter. Most stands are of moderate density (40 to 70 percent crown cover). There are very few young stands and no identified openings in forested stands. Oak stands are dominated by mid-sized stems.

Table 3-21 through **Table 3-23** display changes in forest stand structure by alternative for all cover types. **Figure 3-17** compares ponderosa pine structural stages by alternative.

Table 3-21. Habitat Structural Stage by Cover Type - Alternative B

	Habitat Structural Stage									
Cover Type	**1**	**2**	**3A**	**3B**	**3C**	**4A**	**4B**	**4C**	**5**	**Total**
Grass	212									212
Oak	12	68	46	595	212					933
Aspen			44	193	362	100	74			773
Birch				361	85	14	234			694
Willow				51						51
Pine	75			87		3190	5381	660	382	9775
Total	299	68	90	1287	659	3304	5689	660	382	12438*

*Total does not include 14 acres of non-forested land.

Table 3-22. Habitat Structural Stage by Cover Type - Alternative C

	Habitat Structural Stage									
Cover Type	**1**	**2**	**3A**	**3B**	**3C**	**4A**	**4B**	**4C**	**5**	**Total**
Grass	212									212
Oak	12	68	46	595	212					933
Aspen			44	193	362	100	74			773
Birch			51	309	85	14	234			694
Willow				51						51
Pine	75	1721		87		2997	3932	582	382	9775
Total	299	1789	141	1235	659	3111	4240	582	382	12438*

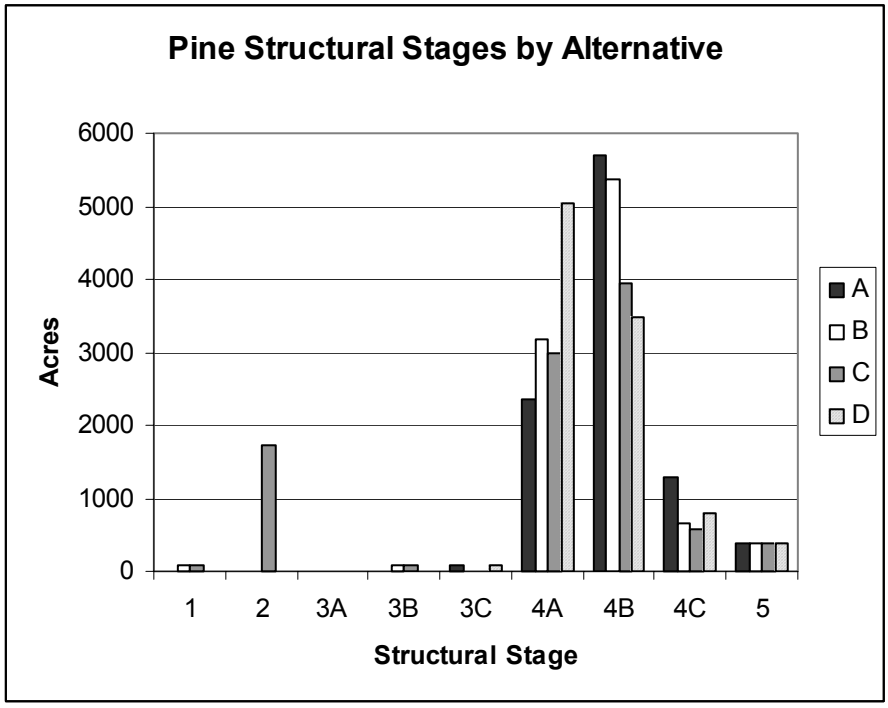
*Total does not include 14 acres of non-forested land.

Table 3-23. Habitat Structural Stage by Cover Type - Alternative D

	Habitat Structural Stage									
Cover Type	**1**	**2**	**3A**	**3B**	**3C**	**4A**	**4B**	**4C**	**5**	**Total**
Grass	212									212
Oak	62	6	194	459	212					933
Aspen			44	193	362	100	74			773
Birch				361	85	14	234			694
Willow				51						51
Pine					87	5129	3485	782	292	9775
Total	274	6	238	1064	746	5243	3793	782	292	12438*

*Total does not include 14 acres of non-forested land.

Figure 3-17. Pine Structural Stages by Alternative



Alternatives B and C would diversify pine structure to a small degree by increasing grass/forb areas through patch cuts. Conversely, these alternatives would eliminate the very few existing acres of structural stage 3C. Stands would remain dominated by trees at least nine inches in diameter with less than 70 percent crown cover. Mature, dense forest would decrease substantially under all action alternatives, though existing late succession stands would not be affected.

Alternatives B, C, and D would increase oak diversity through creation of earlier successional stages and eventual development of larger trees.

Late Succession Forest

There are currently 382 acres classified as structural stage 5 (late successional forest). This represents approximately four percent of the forested stands in the project area. Reconnaissance of the area suggests the amount of late successional pine may be underestimated. There are 1,274 acres of stage 4C (mature trees with at least 70 percent canopy cover); approximately 619 of these acres are close to meeting the definition of structural stage 5 and could develop into late succession over time. These stands, which would not be treated under Alternative B or D, are potential nesting habitat for goshawks, thermal cover for deer and elk, and habitat for other species that prefer dense, closed-canopy conditions. Alternative B would treat certain stands to increase late succession characteristics over time (see description of treatment on p. 2-4). Approximately 37 acres of stage 4C forest that could otherwise develop into stage 5 in the next few decades would be treated under Alternative C, reducing the potential value of these stands for species associated with late succession forest. Effects on associated wildlife species are discussed later in this section.

Grassland Communities

There are approximately 212 acres (two percent of the project area) in natural openings, meadows, and prairie. Grasslands and meadows provide unique habitats not found elsewhere in the forested ecosystem. Many of these meadows are being encroached upon by adjacent ponderosa pine, and in some cases bur oak and aspen. Without treatment, meadow habitat would eventually disappear. Ponderosa pine has also encroached on riparian habitat. This encroachment is decreasing the quantity of riparian grassland habitat.

Proposed removal of pine from meadows and riparian grassland communities would be designed to increase and enhance these limited habitats. A wider array of available habitats would support a more diverse array of wildlife species. All action alternatives include 376 acres of pine removal.

Amended Forest Plan objectives 5.4-206 and 5.6-204 guide management of ponderosa pine structures, including structural stage 1 (grass/forb). These openings are within forested stands, are generally smaller than the grasslands discussed above, and have different vegetation composition. There are currently no identified grass/forb openings in forest stands in the Dean project area. Patch cuts are proposed on 75 acres under Alternatives B and C, which would increase grass/forb structural stage to 0.8 percent of pine acres. Fuel breaks proposed under Alternative D would be sparsely forested and would provide some areas of grass/forb habitat. Broadcast burning proposed under all action alternatives would enhance grass/forb habitat, particularly when applied after mature stand enhancement treatments (see p. 2-4). These treatments would enhance foraging habitat for species such as white-tailed deer and Merriam's turkey.

Structural Diversity Objectives

Management Area 5.4

The Forest Plan Phase 2 Amendment includes objectives for distribution of pine stand structure and tree size. These objectives are applied on a Management Area basis. MA 5.4, which includes the Dean project area, has the following objective:

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

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

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

Stands with an average tree size of "very large" are defined as follows: "The majority of tree stocking based on basal area is in live trees at least 9 inches in diameter, and within that group, the majority of the basal area is in live trees at least 16 inches in diameter" (RMRIS Data Dictionary, 9/14/94).

Alternative C would change MA designation in part of the project area to MA 5.6. Objective 5.6-204 is identical to objective 5.4-206.

Current pine structural diversity in the project area and the effects of each alternative are displayed in Table 3-20 through Table 3-23 (above). **Table 3-24** displays current acres of mature pine stands (SS 4) with tree size identified as "very large" and the effects of each alternative.

Table 3-24. Acres of Mature Ponderosa Pine (SS 4) with Tree Size of "Very Large" by Alternative (Project Area)

Alternative A (Existing)	Alternative B	Alternative C	Alternative D
2,672	3,273	3,610	4,441

To demonstrate how the Dean project contributes to objective 5.4-206, **Table 3-25** displays existing structural stage distribution in MA 5.4 across the Forest and how the Dean alternatives would affect this distribution.

Table 3-25. Structural Stage Distribution in MA 5.4 (Forest-wide)

Struc-tural Stage	Objec-tive (%)	Existing		Alternative A		Alternative B		Alternative C*		Alternative D	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
1	5	73,924	22	73,924	22	73,999	22	73,934	22	73,999	22
2	5	6,665	2	6,665	2	6,665	2	7,275	2	6,665	2
3A	10	23,995	7	23,995	7	23,995	7	23,995	7	23,995	7
3B	15	29,769	9	29,769	9	29,856	9	29,856	9	29,769	9
3C	5	21,141	6	21,141	6	21,054	6	21,054	6	21,141	6
4A	25	78,076	23	78,076	23	78,912	23	77,296	23	80,852	24
4B	25	69,816	20	69,816	20	69,569	20	66,066	20	67,597	20
4C	5	37,338	11	37,338	11	36,674	11	36,366	11	36,796	11
5	5	498	<1	498	<1	498	<1	237	<1	408	<1
Total	100	341,222	100	341,222	100	341,222	100	336,079	100	341,222	100

*Alternative C would move 5,143 acres in the project area from MA 5.4 to MA 5.6, so overall totals for MA 5.4 are less than under other alternatives.

Table 3-25 shows that all alternatives would have little effect on overall pine structural stage distribution across MA 5.4. Alternative B would contribute toward objective 5.4-206 for structural stages 3B, 3C, 4A and 4C and move slightly away from the objective for structural stages 1 and 4B in acres. The table shows that structural stage 1 in MA 5.4 across the Forest already exceeds the objective, but most of it is in the Jasper Fire area in the southern Black Hills. Structural stage 1 is lacking in the Dean project area, and all action alternatives would improve distribution of this habitat element.

Alternative C would contribute toward the objective for structural stages 2, 3B, 3C, and 4C while moving away from the objective for structural stages 1, 4A, and 4B. The decreases in 4A and 4B are due to treatments that reduce basal area sufficiently to affect fire hazard, and to overstory removal. Alternative C would not reduce structural stage 5 acres across the project area, but would decrease this structure in MA 5.4 by moving part of the project area to MA 5.6.

Alternative D would contribute toward objective 5.4-206 for structural stages 4A and 4C while moving away from the objective for structural stages 1, 4B and 5. The decreases in 4B and 5 are due to the low density prescribed for fuel breaks.

Table 3-26 displays Forest-wide acres and percentages of mature pine stands with tree size of very large in MA 5.4 and how these would change as a result of the Dean project alternatives.

Table 3-26. Acres of Mature Ponderosa Pine (SS 4) with Tree Size of "Very Large" in MA 5.4 (Forest-wide)

Objec-tive	Existing		Alternative A		Alternative B		Alternative C*		Alternative D	
% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4
10%	17,742	10	17,742	10	18,343	10	16,689	9	19,511	10

*Alternative C would move 5,143 acres in the project area from MA 5.4 to MA 5.6, so overall totals for MA 5.4 are less than under other alternatives.

Table 3-26 shows that currently there are 17,742 acres (10 percent) of mature pine stands with tree size of very large. Alternative A would not change this acreage. Alternatives B, C, and D would increase acres of mature pine stands with very large trees by cutting smaller trees, raising the average tree diameter in treated stands. In the table above, Alternative C appears to move away from the objective, though this apparent change is due to moving part of the project area from MA 5.4 to MA 5.6. Alternative C would actually increase acreage of mature pine with a tree size of very large, and this is reflected in numbers for MA 5.6.

Management Area 5.6

To demonstrate how the Dean project contributes to objective 5.6-204, **Table 3-27** displays existing structural stage distribution in MA 5.6 across the Forest and how the Dean alternatives would affect this distribution.

Table 3-27. Structural Stage Distribution in MA 5.6 (Forest-wide)

Struc-tural Stage	Objec-tive (%)	Existing		Alternative A		Alternative B		Alternative C*		Alternative D	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
1	5	1,048	5	1,048	5	1,048	5	1,113	5	1,048	5
2	5	267	1	267	1	267	1	622	3	267	1
3A	10	808	4	808	4	808	4	808	3	808	4
3B	15	296	2	296	2	296	2	296	1	296	2
3C	5	158	1	158	1	158	1	158	1	158	1
4A	25	6,082	31	6,082	31	6,082	31	8,229	33	6,082	31
4B	25	7,096	36	7,096	36	7,096	36	9,181	37	7,096	36
4C	5	3,804	19	3,804	19	3,804	19	4,034	16	3,804	19
5	5	26	0	26	0	26	0	287	1	26	0
Total	100	19,585	100	19,585	100	19,585	100	24,728	100	19,585	100

*Alternative C would move 5,143 acres in the project area from MA 5.4 to MA 5.6, so overall totals for MA 5.6 are greater than under other alternatives.

Table 3-27 shows that all alternatives would have little effect on overall pine structural stage distribution across MA 5.6. There would be no differences among Alternatives A, B, and D across the Forest. Alternative C would move toward objective 5.6-204 for structural stages 1, 2, 4C, and 5, and away from this objective for 3A, 3B, 4A, and 4B stands. These changes are in part due to moving 5,134 acres of the project area from MA 5.4 to MA 5.6.

Table 3-26 displays Forest-wide acres and percentages of mature pine stands with very large trees in MA 5.4 and how these would change as a result of the Dean project alternatives.

Table 3-28. Acres of Mature Ponderosa Pine (SS 4) with Tree Size of "Very Large" in MA 5.6 (Forest-wide)

Objec-tive	Existing		Alternative A		Alternative B		Alternative C*		Alternative D	
% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4
10%	3,739	22	3,739	10	3,739	10	5,730	34	3,739	22

*****Alternative C would move 5,143 acres in the project area from MA 5.4 to MA 5.6, so overall totals for MA 5.6 are greater than under other alternatives.

Table 3-28 shows that in MA 5.6 across the Forest there are currently 3,739 acres (22 percent) of mature pine stands dominated by very large trees. Alternative A, B, and D would not change this acreage. Alternative C would increase acres of mature pine stands with very large trees, partly by cutting smaller trees, raising the average tree diameter in treated stands, and partly due to increasing overall acreage in MA 5.6.

Hardwood Communities

Hardwood tree species dominate stands on approximately 2,451 acres (20 percent of the project area). There are also numerous drainages and mixed stands that are dominated by ponderosa pine but support aspen and oak communities. There is, therefore, opportunity in the Dean project area to contribute to amended Forest Plan objectives for hardwood management. Pine has already been removed from some hardwood stands in the project area under other decisions, but other stands need this treatment to reduce competition with pine. Habitat diversity provided by hardwoods is desirable, and hardwood restoration is needed to maintain these stands.

Hardwood restoration would take place on 69 acres under all action alternatives. These sites are currently typed as hardwood, so cover type would not change. The treatment would reduce competition with pine, extending the life of the hardwood habitat to the benefit of species such as ruffed grouse.

Snags

Amended Forest Plan objective 211 directs management of pine forest for an average of three hard snags per acre greater than nine inches in diameter and 25 feet tall. Twenty-five percent should be greater than 14 inches in diameter. Density is averaged across the associated watershed, but snags must be well distributed. All snags are to be retained if an area is below objective 211 (standard 2301).

Complete data on the distribution, density, and size of existing snags in the project area are not available. Field reconnaissance suggests that snags of a variety of sizes are common and well distributed, but for the purposes of this analysis the assumption is made that there is a lack of snags and standard 2301 applies.

Snags would generally not be cut under any alternative unless they pose a hazard to workers (design criteria, page 2-10). Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. Field review suggests that there is currently good distribution of snags within the project area. Cutting of standing dead trees is prohibited. The Phase 2 Forest Plan Amendment FEIS determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. The contribution of this project to Forest-wide structural stage objectives is discussed above. All alternatives would comply with amended Forest Plan snag direction.

Down Woody Debris

Amended Forest Plan standards 2307 and 2308 require retention of at least 50 linear feet of down wood per acre. Logs should be at least 10 inches in diameter. Down woody debris was sampled

in the Dean project area during fuels inventory. There is an average of approximately 61 linear feet of down wood per acre. Alternative A would allow this figure to continue to increase across the project area. Alternatives B, C, and D are likely to decrease down wood in stands proposed for fuel reduction and prescribed fire. Treatment prescriptions would identify amount and size of down wood to be left on site. Regardless of prescription, it is likely that the project area would continue to meet standards 2307 and 2308 because fuel reduction focuses on fine, easily ignited fuels rather than large logs.

Big Game Habitat

The entire project area is currently in Management Area 5.4 (big game winter range emphasis). Alternative C would change MA designation of part of the project area to 5.6 (big game, recreation, and forest products emphasis). This designation would more accurately reflect actual deer and elk use of much of the project area. During spring and early summer, the area provides important calving and fawning habitat. The abundant hardwood stands provide excellent habitat in which to rear young. Hiding cover is well distributed. In winter, lower elevations and south aspects provide winter range for deer. Thinning and prescribed fire proposed on south-facing slopes under Alternatives B and C would increase quality and quantity of forage.

Hardwood treatments and pine harvest proposed under all action alternatives would also improve forage conditions. Forage species important to deer and elk, such as chokecherry, wild rose, serviceberry, aspen, oak, and grasses, respond well to fire as well as harvest treatments that open the tree canopy. Browse production within burn areas typically increases for three to five years following the burn and then returns to pre-burn conditions. Past treatments in this area have demonstrated vigorous response from oak, aspen, and other valuable forage species.

Amended Forest Plan standard 3203 requires retention of big game screening cover along at least 20 percent of the edges of arterial and collector roads. Due to the large amount of understory vegetation, the project area provides adequate cover along most roads.

Amended Forest Plan objective 5.4-207 directs management of MA 5.4 toward an open road density of one mile of road per square mile of land, or less, from December 15 through May 15. Open road density during this period is currently 1.35 miles per square mile. With the exception of NFSR 843.1, most open roads in the project area are used as snowmobile trails in the winter. This includes the Truck Trail (NFSR 830.1), which is open only in winter for use as a snowmobile trail. Under Alternative C, the reality that big game make little use of much of the project area during winter is reflected by the proposal to change the upper elevations to MA 5.6. Open road density in MA 5.4 would decrease under this alternative to 0.45 miles per square mile.

Alternative B would decrease open road density to 1.30 miles per square mile and Alternative D to 1.29. All action alternatives would move the project area towards lower road density in accordance with objective 5.4-207.

See page 3-127 for discussion of effects specific to white-tailed deer and mule deer and page 3-126 for discussion of effects specific to elk.

Riparian and Aquatic Communities

Surface water and riparian habitats in most of the Dean project area are localized and limited to drainage bottoms where water levels are perennial or intermittent. Perennial streams include Cow

Creek, the North and Middle Forks of Redwater Creek, and several unnamed, intermittent creeks that drain into them. These perennial creeks are, for the most part, healthy, but there are impacts to the associated riparian areas that cause increased sedimentation. Loss of beaver, past livestock over-utilization, motorized vehicles, flood events, and road development have all contributed to degradation of stream character and health. Ponderosa pine has encroached on riparian habitat as well. This encroachment has decreased quantity of riparian grassland and riparian shrubland habitats. Pine is encroaching on 51 acres of riparian willow habitat. Treatment proposed under Alternatives B, C, and D would remove encroaching pine and improve riparian willow habitat, benefiting species such as MacGillivray's warbler.

A riparian shrub component is present in many drainages, but in many cases poorly located roads have reduced moist microclimate and resulted in fragmented shrub communities. Some riparian areas have undergone changes in vegetation structure, including a reduction in shrub component due to grazing. Road decommissioning proposed under all action alternatives and area closure proposed under Alternatives B and C would improve this habitat. This project would not modify livestock grazing, but revision of allotment management plans is under way as a separate effort.

Two water impoundments, Hemler Reservoir and Redwater Pond (beaver pond), have collected substantial amounts of sediment over the years. Migrating waterfowl use both bodies of water. Duck broods have been documented on both ponds during the summer. Kingfisher and great blue heron have been observed at Hemler Reservoir. Hemler Reservoir was once a brook trout fishery, but has not been stocked since 1994. The reservoir provides habitat for finescale dace, and both of these impoundments provide northern leopard frog habitat. Both ponds and their associated riparian habitats, as well as many wildlife species, would benefit from proposed dredging and maintenance.

Beaver are present in the project area but are limited to drainages with a high abundance of hardwoods. Beaver can be found at Hemler Reservoir and some of the smaller, unnamed perennial streams that feed into the Redwater drainage. Evidence of historic beaver activity can be seen throughout the project area. There is not an abundance of beaver complexes in the area, but beaver populations have recently been increasing Forest-wide, especially in the Bear Lodge Mountains. Proposed decommissioning of roads in wet drainages may help this species flourish and repair much-needed riparian habitat.

Stock dams and developed springs are available for wildlife use, but water becomes scarce in some areas during late summer and drought years.

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

Emphasis Species – Federally Listed Species

Twenty-one federally listed wildlife species have been identified by Region 6 of the U. S. Fish and Wildlife Service (USFWS). Of these, the black-footed ferret and bald eagle are the only species that have the potential to occur on the BHNF (USFWS 2004). One federally listed species, the bald eagle, is known to occur in the project area. The project area does not contain habitat for black-footed ferret, a candidate species.

Bald Eagle

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

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

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

Analysis of Effects

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

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Determination

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

Emphasis Species – Region 2 Sensitive Wildlife Species

Twenty-seven sensitive species were identified as potentially occurring on the Forest (USDA Forest Service 2003b). The full list is contained in the Dean project area Biological Evaluation, located in the project file. Of these, 16 species or their habitats may occur within the project area and are discussed in this section. Occurrence of six of these species has been documented within the project area (**Table 3-29**).

Table 3-29. Sensitive Wildlife Species Evaluated

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

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

Fringed Myotis

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

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

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

In FY 2003, five hibernacula were monitored across the Forest, with this species found at one location. Because this species tends to hibernate individually, most often in cracks and crevices, and to change roost sites often in summer, it can be difficult to locate; consequently, few observations have occurred despite monitoring efforts. In 2003, the Forest installed or repaired gates at seven roost sites to protect the species from human disturbance. This protection reflects an upward trend in known bat habitat and demonstrates active management to successfully accomplish the intent of objective 221 (USDA Forest Service 2004b).

Analysis of Effects

Direct and Indirect: No known caves or abandoned mines occur in the project area. Rock crevices exist in cliffs, but these areas would not be affected by any proposed activities. Under all alternatives, mature stands (SS 4 and 5) would provide day roost opportunities, but little foraging habitat (open areas). Under the action alternatives, treatments that remove mature forest may reduce the availability of day roosts. Alternative C would decrease mature forest by 18 percent. Alternatives B would decrease mature forest by less than 1 percent and Alternative D would not change acreage of this habitat. Inadvertent loss of some individuals or roost snags is unlikely but possible under Alternatives B, C, and D if undetected roosts are present in treated areas. Snag removal would be allowed primarily only to protect worker safety (design criteria, page 2-10), and management towards structural stage objectives would provide snags through time. Treatments that increase the diversity of structural stages (such as patch clearcuts) would create suitable foraging habitats. Alternative C would affect the most potential day roost habitat but would create suitable foraging habitats. Enhancement of riparian habitat and repair of water impoundments proposed under all action alternatives would improve foraging habitat.

Cumulative: Impacts from past, ongoing, and foreseeable actions on maternity, hibernating, and roosting habitat have probably been negligible due to a lack of caves and mines within the project area. Snag distribution on the landscape has been altered through fire suppression and removal of snags during past timber harvest and firewood cutting. The ongoing Truck Trail project may have a small additive effect through removal of hazardous snags. Foreseeable activities are not expected to affect snags. Snag retention standards as well as road closures proposed under the action alternatives would reduce the potential for landscape-level impacts to this species, but due

to removal of hazardous snags, the action alternatives may have a small additive effect on this habitat. Because all other snags would be retained and new snags would continue to develop, all alternatives would conserve or enhance habitat for this species (objective 221).

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

Determination

Implementation of Alternative A would have no impact on the fringed myotis. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individual fringed myotis bats, but is not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing. Individual bats may be adversely impacted if undiscovered roosts are present in treated areas. Habitat modification may also affect individual bats.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Townsend's Big-eared Bat

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

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

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on Townsend's big-eared bats because no new activities would occur. Treatments proposed under Alternative B, C, or D are unlikely to directly affect this species because, though bats may forage in the project area, there are no known caves or mines and thus no potential hibernacula or maternity roosts. Inadvertent loss of some individuals or roosts is unlikely but possible if undetected roosts are present in treated areas. Enhancement of riparian areas and repair of water impoundments would improve foraging habitat. Prescribed fire and some mechanical vegetation treatments may increase prey availability (Cerovski 2002, Dykstra et al. 1999).

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

Determination

Implementation of Alternative A would have no impact on the Townsend's big-eared bat. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing. Individuals may be impacted if undiscovered caves or mines occur in treatment areas.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Goshawk

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

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

Goshawk territory occupancy was last assessed in the Fiscal Year 2003 Black Hills National Forest Monitoring Report (USDA Forest Service 2004b). Territory occupancy in 2003 was higher across the Forest than any year since 1999 (USDA Forest Service 2004b). Population trend appears to be relatively stable or slightly decreasing due to habitat loss to wildfires. Goshawk nesting activity (and territoriality/ detectability) is known to fluctuate annually and may depend on weather and other random or variable events. Goshawk habitat appears to have been

relatively stable over the five-year reporting period, but observed natural events and management activities have caused some reduction in nesting habitat. New or previously unknown nests have also been discovered.

Goshawk surveys were conducted in the project area during the 2002, 2003, and 2005 field seasons. Goshawk surveys followed the Southwestern Region Goshawk Inventory Protocol (Lloyd 1992) and survey methodology outlined in Bosakowski (1999). Five goshawk nests in three territories were found during surveys. Two additional nests just outside the project area appear to be alternate nests for a territory that includes nests inside the project area. Two nests were active in 2003 and one was active in 2005.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effects on the northern goshawk because no new activities would occur. Succession of vegetation communities would provide an increase in the amount of suitable nesting habitat but a decrease in the amount of suitable foraging habitat. Before any treatments were conducted under Alternatives B, C, and D, design criteria would be applied to minimize potential effects to this species (amended Forest Plan standards 3108 and 3111). These measures include restricting the timing of activities near goshawk nests. Nevertheless, foraging goshawks may be displaced or disturbed by project activities. All action alternatives could result in mortality of individuals if trees with currently unknown, occupied nests were cut. This is unlikely to occur because goshawks are defensive and vocal around nests, and any newly discovered nests would be protected in accordance with amended Forest Plan standard 3204. No activities that involve tree cutting are proposed in known nest stands. Prescribed fire would not take place in nest stands during nesting season and would improve habitat conditions through reduction of pine understory. Alternatives that remove the most mature stands would have the greatest potential to affect goshawk nesting habitats. Alternative D would remove the most SS 4B and 4C, followed by Alternative C, and then Alternative B. All alternatives would conserve goshawk habitat in accordance with objective 221.

There is a higher potential for a large-scale fire or insect outbreak to destroy goshawk nesting and foraging habitats under Alternative A than under Alternatives B, C, and D. However, the potential for these large-scale events to occur is relatively low, particularly in the near future. The combined effects of the smallest amount of preferred SS removal and the minimized risk of a large-scale fire under Alternative B would benefit this species the most. Alternative A would be less favorable than Alternative B, but better than Alternatives C and D because mature forests would be preserved, although the risk of large-scale events would not be reduced.

Cumulative: Past timber harvest in the project area has decreased suitable goshawk nesting habitat while improving habitats for prey species such as red squirrels. Overall effects may have been neutral; given the typical size of goshawk breeding territories, the project area appears to be fully occupied by territories, and active nests have been recorded consistently in recent years. Proposed activities would reduce density of some mature stands, possibly reducing suitability as goshawk nesting habitat. Alternative B, designed to develop additional late-succession habitat, would have a smaller additive effect than the other action alternatives and may result in development of additional habitat over the next 20 to 30 years. By reducing risk of stand-replacing fire, all action alternatives would decrease risk of widespread loss of goshawk nesting and foraging habitat. All action alternatives would create openings, enhance non-pine habitats, and open up forest understories, which would act against the cumulative trend of loss of these

foraging areas due to fire suppression. The project would therefore conserve or enhance habitat for this species (objective 221).

Actions that occur on privately owned lands within the project area are not expected to affect this species based on the lack of suitable habitat on these mostly non-forested lands.

Determination

Implementation of Alternative A would have no impact on the northern goshawk. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to affect individual goshawks through disruption of goshawk behavior and modification of preferred nesting and foraging habitats, as discussed in the text above.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that goshawk is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Peregrine Falcon

This discussion of peregrine falcon is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 246-248. Detailed information on peregrine falcon status and habitat contained in Appendix C is incorporated here by reference.

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

In the Black Hills, peregrine falcons are uncommon spring migrants, rare fall migrants, and rare winter visitors (SDOU 2002). Historical records suggest nesting in Dark Canyon near Rapid City in 1948 and 1956, and a juvenile bird was banded in 1960 (Pettingill and Whitney 1965). There are no confirmed breeding records since that time despite sporadic reports of peregrines in Spearfish Canyon.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the peregrine falcon because no new activities would occur. There would continue to be little habitat suitable for peregrine falcons due to lack of sizable cliffs. Marginally suitable foraging habitat would increase under Alternatives B, C, and D. There is a remote possibility that nests could be affected under Alternative B, C, and D if old hawk nests are used. Any newly discovered raptor nests would be protected (amended Forest Plan standard 3204). Due to mobility of adults and lack of activities in preferred cliff habitat, direct effects are unlikely to occur.

Cumulative: Peregrine falcons have not been observed in four years of monitoring across the Forest (USDA Forest Service 2004b). Past activities in the project area are unlikely to have affected peregrine falcons due to shortage of suitable cliff habitat and lack of activities in these

areas. Proposed activities are equally unlikely to affect this species' habitat. All alternatives would conserve or enhance habitat for this species (objective 221).

Determination

Implementation of Alternative A would have no impact on peregrine falcons. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the very small potential of each alternative to disrupt nesting. Proposed actions are more likely to have positive effects through creation of foraging habitat.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Flammulated Owl

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

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

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

No owl surveys have been conducted in the project area. Based on published information, and the recent Black Hills sightings, it is reasonable to expect that the flammulated owl may be present in suitable habitats in the project area.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the flammulated owl because no new activities would occur. Mature stands would provide preferred flammulated owl habitats. Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives B, C, and D if undetected nests are present in treated areas. Under Alternatives B, C, and D, commercial thinning would also create preferred nesting and foraging conditions for this species by promoting open, mature stands. Alternative D would increase preferred habitat the most,

resulting in 5,249 acres of structural stage 4A (about 2,000 acres more than Alternative B or C). This increase would be in fuel breaks, however, where stand density would be very low and density of snags required for nesting may be correspondingly low. Existing snags would generally be protected (page 2-10). Higher density thinning proposed under Alternatives B and C is likely to create more favorable habitat.

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

Determination

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. Because available data do not clearly indicate whether a population of flammulated owls exists on the Forest, the Phase 2 Amendment FEIS was not able to determine likelihood of persistence. The Dean alternatives are, however, unlikely to affect colonization or establishment of flammulated owls on the Forest because of the low occurrence of this species in relation to the amount of potentially suitable habitat. A large amount of unoccupied but suitable habitat would be available for owl colonization. All action alternatives would comply with amended Forest Plan direction, and further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Yellow-billed Cuckoo

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

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the yellow-billed cuckoo because no new activities would occur. Oak stands would generally persist and possibly stagnate in the absence of management influences. Under Alternatives B, C, and D, proposed treatments would move the overall character of treated hardwood stands away from continuous, even-aged conditions toward patchier stands with areas of younger vegetation, which may be preferred by this species. Proposed enhancement of hardwood stands in riparian areas would improve habitat for this species.

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

Determination

Implementation of Alternative A would have no impact on the yellow-billed cuckoo. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on a small potential for disturbance of nests and each action alternative's overall improvement of potential yellow-billed cuckoo habitat.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black-backed Woodpecker

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

Suitable habitat for black-backed woodpecker includes mature and immature pine stands with canopy cover of at least 60 percent (Mohren and Anderson 2001). This species is associated with insect outbreaks and large fires. In the Black Hills, this species is considered a rare permanent resident in higher elevations (SDOU 2002). This species' preference for burned forests in a time of fire suppression, its eruptive populations, and lack of population information has identified it as a species of concern (Finch 1992). This species has been recorded in the project area. Suitable habitat in the project area is found in recently burned areas and pockets of dense timber and beetle-killed trees. There are no large areas of bark beetle infestation in the project area, but the 2003 Puma Fire overlaps the north part of Dean.

The Forest monitors this species through the Rocky Mountain Bird Observatory (RMBO). Other woodpecker studies have been conducted in the Black Hills in the last five years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed 24 black-backed woodpeckers in 2001 and

134 in 2002. Seventy-five were observed in 2003 and 68 in 2004 in fewer habitat types than were surveyed in previous years (Panjabi 2005).

Analysis of Effects

Direct: Alternative A would have no direct effect on the black-backed woodpecker because no new activities would occur. As stands mature, the availability of dead or decaying trees would increase and provide suitable habitats for this species. As these same stands become dense and ladder fuels increase, the potential for a large-scale fire or insect outbreak would increase. Conditions created by a large-scale event would provide highly suitable foraging and nesting habitats for this species.

Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives A, B, and C if undetected nests are present in treated areas. Removal of snags and mature trees within the treatment units may decrease the availability of nesting trees. This effect is most likely to occur under Alternative C, which proposes commercial treatment on the largest area. Alternative D would treat the fewest acres, though the very low density of the resulting fuel breaks would provide little suitable habitat for black-backed woodpeckers. Alternative B, which would work towards development of additional late succession stands, would benefit this species. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety (design criteria, page 2-10).

Treatments proposed under Alternatives B, C, and D would reduce the risk of a large-scale fire or pathogen event as compared to Alternative A, but there would be relatively little difference in the risk reduction among these alternatives. Potential habitat in the form of structural stage 4C and 5 pine stands would decrease by 30 percent (Alternative D) to 42 percent (Alternative C).

Cumulative: The Puma Fire created suitable black-backed woodpecker habitat in the project area. Fire suppression has allowed mature stands to persist in some areas, while timber harvest and other activities have decreased density of other mature stands and reduced snag numbers. All action alternatives would add to the cumulative effect of loss of dense, mature stands. Alternative C would add to the loss of these stands and, like the other action alternatives, reduce the chance of stand-replacing fire that could create additional habitat. Alternative B would ultimately increase black-backed woodpecker habitat through mature stand enhancement treatments, while Alternative D would make a lasting addition to the cumulative effect. Proposed prescribed burning would probably create small, scattered pockets of black-backed woodpecker habitat, but generally would not kill mature trees or add substantially to habitat for this bird. This would have a negligible effect on preferred habitat across the Forest, which continues to be created by expanding bark beetle infestations and drought conditions.

Determination

Implementation of Alternative A would have no impact on the black-backed woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential for project activities to harm individuals and remove suitable habitats while protecting most existing snags.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that black-backed

woodpeckers are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

American Three-toed Woodpecker

This discussion of three-toed woodpecker is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 190-196. Detailed information on three-toed woodpecker status and habitat contained in Appendix C is incorporated here by reference.

The three-toed woodpecker is a montane forest species. Foraging occurs in areas with abundant dead and decaying trees that are infested with wood-boring insects, especially in recently burned areas (Hutto and Young 1999, Anderson 2003). This species has not been documented in the Dean project area. Mature, closed-canopy, and old-growth spruce are preferred for nesting, but aspen is also used in the Black Hills.

The Forest monitors this species through the Rocky Mountain Bird Observatory. Distribution appears to be tied strongly to mature spruce stands (Panjabi 2005). RMBO observed 12 three-toed woodpeckers in 2001, 26 in 2002, and 44 in 2003. Spruce types were not surveyed in 2004, but RMBO observed seven three-toed woodpeckers in late-succession mixed pine/spruce stands and one in an aspen stand. Habitat and population trends appear stable (USDA Forest Service 2004b).

Analysis of Effects

Direct and Indirect: Habitat in the project area is only marginally suitable for this species due to lack of spruce, which appears to be naturally absent from the Bear Lodge Mountains. In the project area, three-toed woodpeckers are most likely to be found in dense, decadent stands with beetle infestation. Alternative A would have no direct effect on three-toed woodpeckers because no new activities would occur. As stands mature, the availability of dead or decaying trees would increase and provide potentially suitable habitats for this species. As these same stands become dense and ladder fuels increase, the potential for a large-scale fire or insect outbreak would increase. Conditions created by a large-scale fire event would provide suitable foraging and nesting habitats for this species. Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives B, and C, and D if undetected nests are present in treated areas. Thinning proposed under the action alternatives would decrease occurrence of dense stands; structural stages 3C and 4C would decrease by about 50 percent under Alternatives B and C and by 36 percent under Alternative D. In general, treatments proposed under these alternatives would reduce the risk of a large-scale event relative to Alternative A, but there would be relatively little difference in the risk reduction among these alternatives.

Cumulative: Past actions that have affected potential three-toed woodpecker habitat in the project area include timber harvest and fire suppression. Timber harvest has reduced risk of insect infestation and fire suppression has prevented widespread, simultaneous tree mortality. The action alternatives would add to this cumulative effect by decreasing insect risk in treated stands and the potential for large-scale fires. Existing snags across the project area would generally be left standing, and suitable habitat in the Puma Fire would not be affected. Recent wildfires and beetle infestations have created suitable habitat across the Forest. The action alternatives would decrease habitat in the project area, but this would have a negligible effect on habitat across the Forest. All alternatives would maintain habitat in accordance with objective 221.

Determination

Implementation of Alternative A would have no impact on the three-toed woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential for project activities to harm individuals and remove suitable habitats as well as protection of most existing snags.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Lewis's Woodpecker

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

Lewis's woodpecker inhabits open country with scattered trees. Open, park-like ponderosa pine forests are believed to be primary breeding habitat (Anderson 2003, DeGraaf et al. 1991). This species is known to nest in burned areas. In a ponderosa pine forest in southeastern Wyoming, Linder and Anderson (1998) found 98 percent of nests were surrounded by burned ponderosa pine. Lewis's woodpeckers also inhabit mature cottonwood riparian areas and oak woodlands. In southeastern Colorado, this woodpecker used large dead or decaying cottonwoods for nesting and winter mast storage, and tended to avoid dense stands of trees throughout the year (Vierling 1997). Snags at least 12 inches in diameter are preferred for nesting (Thomas et al. 1979). This species is vulnerable to loss of large snags and large-diameter trees through timber harvest.

Analysis of Effects

Direct and Indirect: The Puma Fire area provides by far the most suitable Lewis's woodpecker habitat in the project area. None of the alternatives would affect stands killed by the fire. Alternative A would have no direct effect on Lewis's woodpecker because no new activities would occur. As untreated stands mature, they would become denser, making them less suitable for the Lewis's woodpecker. Inadvertent loss of some individuals or nests is unlikely but possible under Alternatives B, C, and D if undetected nests are present in treated areas. In general, only hazard snags would be cut (page 2-10).

None of the action alternatives would impact optimal habitat for this species, which consists of old burns with numerous large snags. Under Alternatives B, C, and D, potential foraging and nesting conditions would be created by treatments such as commercial thinning that promote more open, mature stands (structural stage 4A). Certain treatments that move stands away from open, mature conditions, such as patch cutting and overstory removal, would decrease moderately suitable nesting and foraging habitats. Alternative D would increase marginal Lewis's woodpecker habitats the most, because it would result in the largest increase in open, mature stands (SS 4A, 118 percent increase). This habitat would increase by 36 percent under Alternative B and by 28 percent under Alternative C. None of the alternatives would create preferred habitats (large burned areas). Under Alternative A, the chance of a large-scale fire

would be greatest; this would create Lewis's woodpecker habitat, but the potential for such an event to occur would remain relatively low. The other alternatives would decrease the chance of a large fire occurring.

Cumulative: Nine Lewis's woodpeckers were detected during 2003 Rocky Mountain Bird Observatory efforts, all within burned areas. This was the largest number of Lewis' woodpeckers observed in the Black Hills since the start of the bird monitoring program. Four were observed in 2004. This species prefers nesting in older snags; therefore, habitat is expected to increase as recent burns age (USDA Forest Service 2004b). The Puma Fire created habitat in the project area while past timber harvest and fire suppression have generally prevented formation of additional habitat. Because proposed activities would not create large burned areas or destroy habitat through salvage logging, they would add minimally to cumulative effects in the project area and affect Forest-wide habitat for Lewis's woodpeckers negligibly. All alternatives would conserve or enhance habitat for this species (objective 221).

Determination

Implementation of Alternative A would have no impact on the Lewis' woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. There is a small potential to directly impact individuals during implementation. These alternatives may also impact nesting and foraging habitat, as discussed above.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Loggerhead Shrike

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

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

Risks include pesticides and loss of breeding habitat due to forestation of open areas.

Analysis of Effects

Direct and Indirect: Alternative A would have no effect on the loggerhead shrike because no new activities would occur. Small amounts of non-commercial treatment and prescribed fire are proposed in moderately suitable habitat under Alternatives B, C, or D. These activities involve a small potential for direct effects on nesting shrikes. Proposed treatments could also increase abundance of small mammal, bird, and insect prey sources. Removal of encroaching pine would enhance potential habitat.

Cumulative: Past fire suppression has increased forest cover in the project area, possibly decreasing shrike habitat. Proposed activities would reduce forest density and enhance riparian vegetation, which would result in no addition to the cumulative effect. Habitat on the Forest as a whole is marginal for this species due to its preference for brushy, open areas. Because proposed activities would not create large open areas but would contribute to enhancing existing open areas, they would have no more than a negligible effect on Forest-wide habitat for loggerhead shrikes. All alternatives would conserve or enhance habitat for this species (objective 221).

Determination

Implementation of Alternative A would have no impact on the loggerhead shrike. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on limited potential for direct and indirect effects.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that loggerhead shrike is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Grasshopper Sparrow

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

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

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

Service 2005). There are only 212 acres of grassland habitat within the Dean project area, but the sparrows could be found there in small numbers.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Indirect impacts to grassland habitat could include declining habitat due to fire suppression and the encroachment of pine into meadow habitat. Risk of wildfire and mountain pine beetle outbreaks would gradually increase. Stand-replacing events would result in increased and enhanced grassland habitat.

Alternatives B, C, and D could result in localized negative effects on grasslands lasting one to two years. Proposed pine encroachment removal in riparian/grassland areas would have overall beneficial effects by reducing loss of openings to forest. Structural stage 1 (meadow and grassland) acres would increase by 41 percent under Alternative B and C and by 29 percent under Alternative D (see structural stage tables starting on page 3-72). Under Alternatives B and C, restrictions on off-road motorized travel could reduce potential negative effects on grasslands. These habitat improvements would result in a small increase in grassland habitat, which would contribute to a negligible to slight Forest-wide increase in grassland habitat and possibly grasshopper sparrows. Prescribed fire is not proposed in grasslands under any of the alternatives, so restrictions on timing and extent of burning in grasslands are not necessary (standard 3215).

Cumulative: Fire suppression and resulting pine encroachment have decreased meadow and riparian grassland communities throughout the Dean project area. Past burns such as the Puma Fire created small areas of potential habitat for this species. Proposed activities would work against the cumulative effect of loss of grassland habitat by cutting encroaching pine and burning.

Determination

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that grasshopper sparrow is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Leopard Frog

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

The northern leopard frog is found in freshwater sites with profuse vegetation, brackish marshes, and moist fields. This species is primarily nocturnal and is found throughout northern North America except on the West Coast (Behler and King 1979). During the spring, they can be found in ephemeral pools and streams. Adults may disperse into upland sites during the summer (Smith

2003). Leopard frogs are common throughout the Black Hills and occur across the Bearlodge Ranger District in permanent and semi-permanent water sources. This species has been observed in the project area. Risks include habitat loss/alteration from overgrazing, predation, and reduced water quality/quantity.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effects on the northern leopard frog because no new activities would occur. Forest would continue to mature and spread in the absence of natural events. Treatments included under Alternatives B, C, and D would avoid suitable aquatic frog habitats. Proposed timber harvest and prescribed fire could affect individuals using upland habitats. Under the action alternatives, numerous Forest Plan standards, BMPs, and design criteria would be applied to minimize the potential for surface runoff and sediment to enter aquatic environments. Alternatives B and C propose road construction and all action alternatives propose timber harvest on steep slopes. With application of design criteria, these activities would cause minimal sedimentation and subsequent effects on frog habitat. All water sources and their associated riparian areas are protected under the Clean Water Act and Wyoming Best Management Practices. Dredging of Hemler Reservoir and Redwater Pond would enhance high-quality frog habitat and increase the lifespan of these impoundments. Prescribed burning in riparian habitat could reduce cover in the short term (one growing season), but the ultimate effect of enhancing riparian vegetation would be favorable.

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

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

Determination

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that leopard frog is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with

amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black Hills Redbelly Snake

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the Black Hills redbelly snake because no new activities would occur. Treatments proposed under Alternatives B, C, and D may disturb small areas of suitable redbelly snake habitat and could impact individual snakes. Open road density would decline under the action alternatives, reducing the potential for vehicle-caused mortality. Restriction of off-road motorized vehicles under Alternatives B and C would further reduce the potential for impacts.

Displacement of individuals may occur under the action alternatives as down woody debris may be moved during skidding operations, but debris would not be removed from the site. Amended Forest Plan standard 2308 provides direction for maintaining down woody debris in logging units. No barriers adjacent to wetlands would be created under any action alternative (standard 3116). Prescribed burning may temporarily impact snake distribution by affecting ground vegetation characteristics and causing snake dispersal, increasing vulnerability to predation and vehicles. Improvement of Hemler Reservoir and Redwater Pond would enhance high-quality habitat and increase the lifespan of these impoundments. Prescribed burning in riparian habitat could reduce cover in the short term (one growing season), but the ultimate effect of enhancing riparian vegetation would be favorable.

Cumulative: Past road construction between riparian areas and potential hibernacula has increased the potential for snake mortality. Livestock grazing in riparian areas has often reduced cover, increasing vulnerability to predation. Ongoing and foreseeable actions related to allotment management plan revision should reduce impacts of grazing in riparian areas. Proposed riparian enhancement treatments would increase cover. Under all alternatives, open roads would continue to pose a hazard, but open road density would decrease under the action alternatives. All alternatives would maintain or enhance redbelly snake habitat (objective 221).

Determination

Implementation of Alternative A would have no impact on the Black Hills redbelly snake. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of

viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to harm individual snakes and temporarily disturb suitable snake habitats.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Finescale Dace

This discussion of finescale dace is tiered to the Phase 2 Amendment FEIS, Appendix C (Biological Assessment/Biological Evaluation), pages 161-167. Detailed information on finescale dace status and habitat contained in Appendix C is incorporated here by reference.

Finescale dace habitat includes pools, boggy headwaters, creeks, ponds, and especially beaver ponds over silt and near vegetation. This native species occurs as a disjunct population in the Black Hills (Isaak et al. 2003). The distribution of finescale dace in the Black Hills is limited to a small area in the northern Black Hills and Bear Lodge Mountains, where they are found most often in standing water habitats such as decadent beaver ponds (McDowell pers. comm. 2004). This species is found in the project area in Hemler Reservoir, where the population appeared to be "thriving" when surveyed in 2003 (USDA Forest Service 2004b). Surveys have not located dace upstream or downstream of the reservoir. This population was first recorded in 1976 and was supplemented in 1982 with fish from Ogden Creek (USDA Forest Service 2004b).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on finescale dace because no new activities would occur. Sediment would continue to accumulate in Hemler Reservoir, and habitat for finescale dace could eventually be lost. Periodic drawdown of the reservoir limits the establishment of a sustainable non-native game fishery. This eliminates the potential for competition and/or predation on finescale dace. Water withdrawals are likely to continue under all alternatives. Dredging of the reservoir may result in mortality of individuals. The population would be moved to Redwater Pond during dredging of Hemler to minimize losses (see treatment description, p. 2-8). Dredging and spillway repair would enhance habitat and increase the lifespan of this impoundment. These actions would have an overall positive effect on finescale dace habitat. Proposed vegetation management could result in a temporary increase in water yield, which, if measurable, would benefit this species. Other indirect effects on aquatic habitat across the range of alternatives are disclosed in Section 3.3.1 (Watershed, Geology, and Soils).

Cumulative: Historic near-extirpation of beaver and introduction of predatory game fish have negatively affected habitat for this species. Recent increase in beaver activity, especially in the Bear Lodge Mountains, is likely to benefit finescale dace. Livestock grazing, mining, water diversion, road construction, and motorized vehicle use in wet areas have had and continue to have negative effects on fish habitat. Overall, habitat trend appears to be stable or slightly declining (USDA Forest Service 2004b). Alternatives B, C, and D would have a positive effect on habitat for finescale dace by improving habitat at Redwater Pond and potentially establishing a finescale dace population. With implementation of BMPs and other design criteria, all action alternatives would maintain or enhance habitat (objective 221).

Determination

Implementation of Alternative A would have no impact on the finescale dace. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on the potential to harm individual fish. Overall effects of habitat improvement would be positive.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Regal Fritillary Butterfly

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the regal fritillary because no new activities would occur. Potential habitat could become forested over time. Removal of encroaching pine, proposed under Alternatives B, C, and D, could impact individual butterflies and larvae. None of the alternatives would convert potential regal fritillary habitat to another use or vegetation type. Pine encroachment cutting proposed under the action alternatives would set back forestation of existing openings and should stimulate growth of grasses. Burning is not proposed in grasslands. Fuel breaks proposed under Alternative D would result in large blocks of very low-density forest, which could provide suitable habitat.

Cumulative: Due to a lack of treatment, Alternative A would allow forest to continue to encroach on grasslands. Alternatives B, C, and D would not contribute to habitat loss and would improve regal fritillary habitat. Ongoing and foreseeable actions related to allotment management plan revision may reduce impacts of grazing in grassland habitats. All alternatives would maintain or enhance habitat (objective 221).

Determination

Implementation of the no action alternative would have no impact on the regal fritillary butterfly. This determination is based on the lack of new activities in the project area. Implementation of Alternative B, C, or D may adversely impact individuals, but is not likely to result in a loss of

viability in the Planning Area, nor cause a trend toward federal listing. Individual butterflies may be impacted as discussed above under direct and indirect effects.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Cooper's Rocky Mountain Snail

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

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

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

Studies conducted by Frest and Johannes (2002) documented four snail colonies in the Dean project area. District biologists identified additional colonies, one containing Cooper's snail and *Oreohelix strigosa berryi* and another containing just *O. s. berryi*, a species of concern. Amended Forest Plan standard 3103 protects known colonies of Cooper's Rocky Mountain snail from adverse effects of management actions.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the Cooper's Rocky Mountain snail because no new activities would occur. Pine forest would continue to mature and spread in the absence of natural events. Alternatives B and C would avoid all known colonies. Under Alternative D, one colony exists in a proposed fuel break. The colony and a buffer would be excluded from treatment (page 2-10). Treatments prescribed under Alternatives B, C, and D may affect this species if unknown colonies occur within treatment areas. Unoccupied suitable habitats that occur within the treatment units may be altered by soil compaction, increased insolation, and alterations to the detrital layer. Exclusion of damp sites and deciduous forest from most treatments reduces the area of potential direct effects. All known colonies and any colonies discovered during implementation would be protected with disturbance-free buffer zones (page 2-10). All alternatives would maintain or enhance habitat (objective 211).

Cumulative: Past actions across the landscape, including cattle grazing and timber harvest, were identified by Frest and Johannes (2002) as factors in restricting habitat available to this and several other

land mollusk species. Ongoing and foreseeable actions related to allotment management plan revision may reduce impacts of grazing in these habitats. Because known and high-probability sites would not be disturbed under any alternative, habitat would be maintained or enhanced (objective 221).

Determination

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Emphasis Species – Management Indicator Species

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

Table 3-30 lists MIS for the Forest, as provided in the Forest Plan and modified by the Phase 2 Amendment (USDA Forest Service 2005). Each species was evaluated for its potential to be affected by the proposed project. Species without suitable habitat present in the project area were not evaluated further.

Table 3-30. Management Indicator Species

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

Beaver

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

The beaver is selected as an MIS for this project because of its association with riparian habitat and adjacent hardwood forest. Beaver are found in riparian habitat throughout North America except Florida, southwestern deserts, and the Arctic tundra. The beaver is North America's largest rodent, with adults weighing 30 to 60 pounds (Higgins et al. 2000). Beavers are semi-aquatic and widely distributed in large rivers and lakes with constant water levels, marshes, small lakes, and streams with weak flows adequate for damming (Higgins et al. 2000). Beaver require a permanent, relatively constant flow of water with accessible foods such as willow and aspen. Historically, they played an immense ecological role in sustaining wetlands and riparian habitat in the Black Hills. Beavers were heavily trapped by early explorers and by the late 1800s populations were low and restricted to remote portions of the Black Hills. Populations have increased with the advent of game regulations and management, but have not reached historical numbers (BHNF 2005a).

Observations across the District suggest that beaver colonies are expanding into suitable habitat. Beaver numbers are increasing and habitat appears stable. Estimated population in 2004 was 250-390 individuals. The long-term beaver population trend in the Black Hills has been upward since hunting regulations moderated heavy trapping. Surveys conducted in 2004 will serve as a baseline comparison for determining future trends. Although riparian habitats have decreased since the pre-European settlement era, short-term habitat trend is unknown. Changes in habitats and populations will likely be slow, and may take decades to distinguish (BHNF 2005b).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Continued pine encroachment on other vegetation types could eventually decrease water flows. Pine encroachment may also contribute to loss of willow, aspen, or cottonwood communities. Risk of stand-replacing fire and mountain pine beetle outbreaks would gradually increase. A stand-replacing event would have short-term (less than 5-year) negative effects and ultimately positive effects through increased hardwood habitat and possibly increased water yield.

Alternatives B, C, and D include the very slight potential for individual mortality due to management activities. Possible indirect impacts include habitat loss or disturbance that may occur from vegetation management in riparian areas. The risk of these effects would be minimal due to application of amended Forest Plan standards (1113, 1115, 1116, 1203, 1204, 1301, and 1306), BMPs, and project-specific design criteria (page 2-7) to minimize soil and vegetation disturbance in riparian areas. Riparian and aspen enhancement treatments would be more likely to improve beaver habitat through expansion and rejuvenation of hardwood vegetation. Alternatives B, C, and D would enhance hardwood and riparian habitat by removing pine encroachment on about 69 acres of hardwoods and 376 acres of riparian habitat. This would contribute to achievement of amended Forest Plan direction on enhancement of hardwoods (objective 201) and riparian (objective 213). By contributiing to these objectives, the project also would enhance beaver habitat (objective 238a). Beaver may respond accordingly to these habitat improvements, though change may be small and slow because the vegetation will take time to respond. Dredging of Hemler Reservoir and Redwater Pond would provide additional habitat.

Cumulative: The greatest impacts to beaver are caused by human trapping and hunting. Other predators such as mountain lions are also known to kill beaver. Fire suppression has allowed pine

forest to expand in the project area, crowding out aspen and other hardwoods and decreasing available water to riparian habitat (Tangenberg 2005). Activities such as road construction have sometimes negatively impact beaver habitat by increasing sediment delivery to streams. Some riparian areas and hardwood stands have been negatively impacted due to periodic overutilization and trampling by livestock. Ongoing and foreseeable modifications to allotment management plans are expected to alleviate existing riparian overuse problems. With application of design criteria to avoid impacts to riparian areas and streams, proposed activities are unlikely to add to negative cumulative effects. Proposed activities such as hardwood enhancement would act against the cumulative loss of quality hardwood and riparian habitats.

The beaver was chosen as an MIS because of its link to particular features of the forest rather than any concerns regarding population viability. Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that beaver are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black-backed Woodpecker

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

Black-backed woodpecker was selected as an MIS for this project because of its association with snags, burned forest, and mature forest. In the Black Hills, black-backed woodpecker distribution and abundance are closely associated with recent stand-replacing fires. They are associated with pine habitats that have high populations of their main prey, larvae of wood-boring and bark beetles. This species is considered a rare permanent resident in higher elevations of the Black Hills (SDOU 2002). Black-backed woodpeckers have been recorded in the project area. Suitable habitat in the project area is found in recently burned areas and pockets of dense timber and beetle-killed trees. The 2003 Puma Fire overlaps the north part of Dean by about 420 acres. Dense timber (structural stages 3C and 4C) occur on about 1,360 acres in the project area. Extent of beetle infestation has not been quantified, but no areas of beetle-killed trees larger than an acre have been identified.

The Forest monitors this species through the Rocky Mountain Bird Observatory (RMBO). Other woodpecker studies have been conducted in the Black Hills in the last five years by the South Dakota School of Mines and Technology, the University of Wyoming, and the Forest Service Rocky Mountain Research Station. RMBO observed 24 black-backed woodpeckers in 2001 and 134 in 2002. Seventy-five were observed in 2003 and 68 in 2004 in fewer habitat types than were surveyed in previous years (Panjabi 2005, USDA Forest Service 2004 &&?monitoring rpt). Forest-wide, both the population trend and habitat trend appear to have been increasing for the black-backed woodpecker over the past several years due to the amount of new habitat created and the number of birds observed (USDA Forest Service 2003&&report).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the black-backed woodpecker because no new activities would occur. As stands mature, the availability of dead or decaying trees would increase and provide suitable habitats for this species. As these same stands become dense and ladder fuels increase, the potential for a large-scale fire or insect outbreak would

increase. Conditions created by a large-scale event would provide highly suitable foraging and nesting habitats for this species.

Alternatives B and D would reduce mature, dense forest (SS 4C and 5) by about 36 percent, while Alternative C would decrease this habitat by 42 percent (see tables starting on page 3-72). Much of this habitat would be thinned, meaning its potential for use as nesting habitat may again increase as the stands grow. This effect would occur most rapidly under Alternative B, which would treat stands to promote development of late-succession forest. Under Alternative D, potential nesting habitat in fuel breaks (including 97 acres of existing late-succession forest) would be lost for decades due to the low density of the proposed treatment.

Alternatives B, C, and D could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities or if trees with occupied nests are cut. Snags would generally not be cut unless they pose a hazard to workers (design criteria, page 2-10). Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. There is currently good distribution of snags within the project area and cutting of standing dead trees is prohibited, thus contributing toward achievement of amended Forest Plan objective 211. The Phase 2 Forest Plan Amendment FEIS determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. All action alternatives would contribute toward achievement of the Forest-wide structural stage objective for SS 4C in MA 5.4 (5.4-206) by decreasing 4C from the current 11 percent toward the 5 percent objective (see tables starting on page 3-76). Alternatives B and C would have no effect on SS 5 in MA 5.4, but Alternative D would move SS 5 away from the Forest-wide objective. The Forest-wide structural stage objective for MA 5.6 (5.6-204) is relevant only for Alternative C since only that alternative proposes a management area change. Alternative C would contribute toward meeting this objective by decreasing SS 4C from the current 19 percent toward the 5 percent objective and having no effect on SS 5. No activities are proposed under any alternative in the Puma Fire, so the project would not affect achievement of objective 11-03. Because Alternatives B and C would contribute toward achievement of amended Forest Plan objectives for snag habitat and structural stage distribution and would not affect burned areas, they would also contribute toward achievement of objective 238b regarding maintenance of black-backed woodpecker habitat. Alternative D would contribute toward achievement of the snag objective and would not affect burned areas, but would move away from achievement of Forest-wide objectives for SS 5 in MA 5.4. Alternative D thus would not entirely contribute toward achievement of objective 238b.

Cumulative: The Puma Fire created suitable black-backed woodpecker habitat in the project area. Fire suppression has allowed mature stands to persist in some areas, while timber harvest and other activities have decreased density of other mature stands and reduced snag numbers. Proposed activities would add to the cumulative effect of loss of dense, mature stands. Alternative B would ultimately act against the cumulative effect by increasing black-backed woodpecker habitat through mature stand enhancement treatments, while Alternative D would make a lasting addition to the cumulative effect. Proposed prescribed burning would probably create small, scattered pockets of black-backed woodpecker habitat, but generally would not kill mature trees or add substantially to habitat for this bird. This would have a negligible effect on preferred habitat across the Forest, which continues to be created by expanding bark beetle infestations and drought conditions.

Black-backed woodpecker was selected as an MIS to evaluate the effects of amended Forest Plan implementation and natural change on the ability of the Forest to support species that rely on mature and late-successional forest, burned forest, insects, and snags. Population viability is

appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that black-backed woodpeckers are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Brown Creeper

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

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

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

This species has been observed in the project area. There are currently 382 acres of late-succession stands in the project area and 1,274 additional acres of dense, mature pine forest.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on the brown creeper because no new activities would occur. Continuing maturation of stands and natural mortality of large trees would provide additional brown creeper habitat.

Alternatives B and D would reduce mature, dense forest (SS 4C and 5) by about 36 percent, while Alternative C would decrease this habitat by 42 percent (see tables starting on page 3-72). Much of this habitat would be thinned, meaning its potential for use as nesting habitat may again increase as the stands grow. This effect would occur most rapidly under Alternative B, which would treat stands to promote development of late-succession forest. Under Alternative D, potential nesting habitat in fuel breaks (including 97 acres of existing late-succession forest) would be lost for decades due to the low density of the proposed treatment.

Alternatives B, C, and D could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities or if trees with occupied nests are cut. Snags would generally not be cut unless they pose a hazard to workers (design criteria, page 2-10). Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. There is currently good distribution of snags within the project area and cutting of

standing dead trees is prohibited, thus contributing toward achievement of amended Forest Plan objective 211. The Phase 2 Forest Plan Amendment FEIS determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. All action alternatives would contribute toward achievement of the Forest-wide structural stage objective for SS 4C in MA 5.4 (5.4-206) by decreasing 4C from the current 11 percent toward the 5 percent objective (see tables starting on page 3-76). Alternatives B and C would have no effect on SS 5 in MA 5.4, but Alternative D would move SS 5 away from the Forest-wide objective. The Forest-wide structural stage objective for MA 5.6 (5.6-204) is relevant only for Alternative C since only that alternative proposes a management area change. Alternative C would contribute toward meeting this objective by decreasing SS 4C from the current 19 percent toward the 5 percent objective and having no effect on SS 5. Because Alternatives B and C would contribute toward achievement of amended Forest Plan objectives for snag habitat and structural stage distribution, they would also contribute toward achievement of objective 238a regarding maintenance of brown creeper habitat. Alternative D would contribute toward achievement of the snag objective, but would move away from achievement of Forest-wide objectives for SS 5 in MA 5.4. Alternative D thus would not entirely contribute toward achievement of objective 238a.

Cumulative: Fire suppression has allowed mature stands to persist in some areas, while timber harvest and other activities have decreased density of other mature stands and reduced snag numbers. Proposed activities would add to the cumulative effect of loss of dense, mature stands. Alternative B would ultimately act against the cumulative effect by increasing brown creeper habitat through mature stand enhancement treatments, while Alternative D would make a lasting addition to the cumulative effect.

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

Grasshopper Sparrow

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

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

Grasshopper sparrows have been monitored on the Black Hills since 2002 in cooperation with the Rocky Mountain Bird Observatory (Panjabi 2003, 2005). They occur widely in native mixed-grass prairies in the southern Black Hills and locally further north in the central Black Hills (Panjabi 2005, USDA Forest Service 2005). Panjabi (2005) found them in the highest density in mixed-grass prairie habitat. They may also occur in other types of grasslands (Panjabi 2003).

Using Panjabi's relative densities and acres of existing grasslands, current population estimates range from approximately 6,500 to 17,000 birds associated with grassland habitat (USDA Forest Service 2005). There is very little grassland habitat within the Dean project area, but the sparrows could be found there in small numbers.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Indirect impacts to grassland habitat could include declining habitat due to fire suppression and the encroachment of pine into meadow habitat. Risk of wildfire and mountain pine beetle outbreaks would gradually increase. Stand-replacing events would result in increased and enhanced grassland habitat.

Alternatives B, C, and D could result in localized negative effects on grasslands lasting one to two years. Proposed treatments would have overall beneficial effects by reducing pine encroachment. Under Alternatives B and C, restrictions on off-road motorized travel could reduce potential negative effects on grasslands. These habitat improvements would result in a small increase in grassland habitat, which would contribute to a negligible to slight Forest-wide increase in grassland habitat. The action alternatives would therefore contribute toward achieving Forest-wide objectives for grasshopper sparrow, including objectives 205 and 238a.

Cumulative: Fire suppression and resulting pine encroachment have decreased meadow and riparian grassland communities throughout the Dean project area. Past burns such as the Puma Fire created small areas of potential habitat for this species. Proposed activities would work against the cumulative effect of loss of grassland habitat by cutting encroaching pine and burning.

The grasshopper sparrow was chosen as an MIS because of its link to particular forest features rather than any concerns regarding its population viability. Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that grasshopper sparrow is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Ruffed Grouse

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

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

Ruffed grouse is classified by Wyoming and South Dakota state wildlife agencies as an upland game bird. There is an annual fall hunting season. Harvest data from the Wyoming Black Hills

suggest ruffed grouse numbers are increasing (Sandrini 2005). Habitat across Bearlodge District is relatively stable. There are about 773 acres of aspen in the Dean project area. **add forest trend in aspen&& Forest-wide habitat and population trends are not known at this time because ruffed grouse is a new MIS (BHNF 2005b).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Indirect impacts to grouse habitat include forest succession that favors pine and contributes to loss of aspen. Habitat and ruffed grouse numbers are expected to gradually decrease under this alternative. Risk of stand-replacing fire and beetle infestation would gradually increase. Stand-replacing events would have short-term (less than 5-year) negative impacts but ultimately beneficial impacts by expanding and rejuvenating aspen stands. Current travel management would likely continue to have some effect on grouse habitat due to disturbance to nesting birds and brood-rearing habitat.

Alternatives B, C, and D include the potential for individual mortality due to management activities. Potential habitat loss or disturbance could occur during commercial and non-commercial timber harvest, mechanical thinning, prescribed burning, and road construction in aspen areas. Proposed activities would have an overall positive effect in the next 10 to 20 years by decreasing pine cover and encouraging the growth and expansion of aspen stands. This would contribute to a slight increase in suitable aspen habitat across the Forest. This slight increase would contribute to achieving amended Forest Plan habitat objectives for ruffed grouse, including objectives 201 and 238a. Habitat improvement in may facilitate an increase of ruffed grouse numbers in the project area and a negligible increase Forest-wide. Restrictions on off-road motorized travel under Alternatives B and C would reduce the potential for negative impacts on nesting and brood-rearing.

Cumulative: Past actions, particularly fire suppression and reduction in beaver numbers, have resulted in reduction of healthy aspen stands. Conversely, past burns such as the Puma Fire and prescribed burning have positively affected potential ruffed grouse habitat. Hunting also has an impact on grouse in the project area and across Bearlodge District. Proposed activities would act against negative cumulative effects by enhancing riparian and hardwood habitat and reintroducing fire.

Ruffed grouse was chosen as an MIS because of its link to particular features of the forest rather than any concerns regarding its population viability. Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that ruffed grouse are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives, including hardwood restoration (objective 201). All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Song Sparrow

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

Song sparrow is selected as an MIS because of its dependence on riparian areas across much of its range. Panjabi (2001) found song sparrow to be closely associated with riparian and wetland

habitat on the Forest. It is an uncommon and local resident in the Black Hills (Tallman et al. 2002). Panjabi (2003) suggests it is an excellent indicator of riparian habitat. Song sparrows breed throughout the United States, from Newfoundland to the Aleutian Islands, and winter in the southern United States to central Mexico (Udvardy and Farrand 1994).

Song sparrows are found throughout the Black Hills but are more common in the north. They occur mainly in streamside thickets, especially willows (Panjabi 2001). Breeding Bird Survey data show that song sparrow populations are stable to slightly increasing in the Black Hills (Sauer at al. 2003). Population estimates range from approximately 8,000 to 14,000 birds (BHNF 2005). Forest-wide habitat trends are not known at this time because this species is a new MIS (BHNF 2005).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Pine encroachment could contribute to loss of riparian species such as willow. Risk of stand-replacing wildfire and mountain pine beetle outbreaks would gradually increase. Stand-replacing events would have short-term (less than five-year) negative impacts but ultimately beneficial effects on riparian habitat through reduction of pine cover, enhancement of hardwoods, and possibly increased water yield.

Alternatives B, C, and D include the potential for individual mortality due to management activities. Given this species' mobility usual nesting habitat in riparian hardwood vegetation, direct effects are unlikely to occur. Possible indirect impacts include habitat loss or disturbance that may occur from vegetation management in riparian areas. The risk of these effects would be minimal due to application of amended Forest Plan standards (1301, 1306) to minimize disturbance in riparian areas. Riparian and aspen enhancement treatments would be more likely to improve song sparrow habitat through expansion and rejuvenation of hardwood vegetation.

Removal of pine encroachment on 376 acres of riparian habitat is expected to contribute to a slight increase in suitable song sparrow habitat across the Forest. These activities would contribute to achieving amended Forest Plan song sparrow habitat objectives, including objectives 213 and 238a.

Cumulative: Fire suppression has allowed pine forest to expand in the project area, crowding out aspen and other hardwoods and decreasing available water to riparian habitat (Tangenberg 2005). Some riparian areas and hardwood stands have been negatively impacted due to periodic overutilization and trampling by livestock. Ongoing and foreseeable modifications to allotment management plans are expected to alleviate existing riparian overuse problems. With application of design criteria to avoid impacts to riparian areas, proposed activities are unlikely to add to negative cumulative effects. Proposed activities such as hardwood enhancement would act against the cumulative loss of quality hardwood and riparian habitats.

Song sparrow was chosen as an MIS because of its link to particular features of the forest rather than any concerns regarding its population viability. Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that song sparrow is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

White-tailed Deer

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

White-tailed deer inhabit a wide variety of habitats and are extremely adaptable, making this species the most widespread cervid in North America. White-tailed deer live in every habitat type, including grasslands, mountains, deserts, tropical rainforests, swamps, and urban settings (Higgins et al. 2000). In the Black Hills, white-tailed deer inhabit a variety of forest types and structural stages. The Forest has designated the white-tailed deer as an MIS for early successional ponderosa pine forests (Sieg 1990). White-tailed deer in the Black Hills migrate between distinct summer and winter ranges. Hardwood stands of aspen and birch are prominent features in white-tailed deer's selection of home ranges and their use of sites within these ranges (Stefanich 1995). Kennedy (1992) suggested aspen stands are highly selected during fawning. During winter, deer move to winter ranges that include lower-elevation forests that offer cover and browse and open habitats adjacent to wooded draws (Stefanich 1995).

White-tailed deer foraging habitat (ponderosa pine SS 1, 2, 3A and 4A, grasslands, and meadows) make up 21 percent of the Dean project area. Dense thermal/hiding cover (pine SS 3C, 4C, and 5) make up about 14 percent of the project area. Across the Forest, trend has been upward for foraging habitat (about 5 percent between 1995 and 2004) and downward for cover habitat (about 3 percent in the same period) (USDA Forest Service ___ &&feis p iii-293).

White-tailed deer population across the Wyoming portion of the Black Hills grew almost 40 percent between 1997 and 1999. It then decreased by 30 percent from 1999 to 2001 due to poor reproduction and recruitment brought on by climatic conditions and disease. From 2002 to the present, white-tailed deer numbers have again increased. The 2003 post-hunting season population estimate was 37,920 animals (Sandrini 2004a).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effects on deer because no new activities would occur. Gradually increasing pine forest would provide additional cover, but forage quality and quantity would decrease.

Treatments proposed under Alternatives B, C, and D would affect deer foraging and security habitats. Within a three to five years of treatment, near-ground cover would increase in treated stands as pine regeneration and hardwood brush grow. Forage quality is likely to increase following prescribed burns. For several years after timber treatments, the availability of effective winter cover would be reduced. Under Alternative B, opening the Truck Trail to ATV use after July 1 (Alternative B) would substantially increase disturbance of this summer habitat. Restrictions on off-road motorized travel under Alternatives C and D would reduce disturbance and improve habitat. Increased activity during implementation of proposed activities could disturb wintering deer and lead to additional hunter traffic on roads that would not otherwise be cleared of snow, but application of design criteria such as requiring closure of gates during timber harvest (page 2-10) would reduce this effect.

Alternatives B, C, and D would result in substantial increases in foraging habitat. Under Alternative B, this habitat would increase by 37 percent as thinning of mature stands creates SS 4A. Alternative C would increase foraging habitat by 96 percent through thinning of mature stands, overstory removal creating SS 2, and patch cuts creating SS 1. Alternative D would increase foraging habitat by 114 percent as a result of fuel breaks creating open SS 4A stands.

Cover habitat would decrease by substantial amounts due to thinning and fuel breaks (40 percent decrease under Alternative B, 45 percent under Alternative C, and 33 percent under Alternative D). All action alternatives would contribute toward achievement of amended Forest Plan objectives for grasslands, meadows, and riparian habitat by removing encroaching pine from 376 acres of grasslands and riparian areas and creating meadows through 75 acres of patch cutting (objectives 205 and 213). All action alternatives would also contribute toward achievement of objectives for hardwoods by removing encroaching pine from 69 acres of aspen stands (objective 201).

In MA 5.4, all action alternatives would contribute toward achieving objectives for forage structural stages by increasing stages 2 and 4A, and for cover by decreasing stages 3C and 4C (objective 5.4-206). Alternatives B and C would not affect SS 5, but Alternative D would decrease occurrence of SS 5 further below the MA-wide objective. In MA 5.6, Alternative C would contribute toward achieving structural objectives by increasing SS 2 and 5 and decreasing 4C. Alternative C would move away from the MA-wide objective by decreasing 3A and increasing 4A. Contribution toward objectives for grasslands, meadows, riparian areas, and hardwoods and partial contribution toward objectives for structural stage distribution indicate that all alternatives are likely to maintain or enhance habitat for white-tailed deer (objective 238a).

Cumulative: Fire suppression and pine encroachment have decreased habitat diversity throughout the Dean project area. Beneficial effects have resulted from removal of commercial timber, thinning of pine and oak brush, prescribed burns, and wildfires by creating more meadow openings and setting back forest succession. The action alternatives would provide additional foraging areas through reduction of pine overstory and removal of encroaching pine in meadows, grasslands, hardwood stands, and riparian areas, and would therefore not contribute to the cumulative effect of reduction of foraging habitat and diversity of vegetation.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that white-tailed deer are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Species of Local Concern (SOLC)

Region 2 defines SOLC as species that are documented or suspected to be at risk at a local scale within Region 2 but do not meet the criteria for regional sensitive species designation. SOLC need to be addressed during project design and effects evaluated. Risk analyses are completed only for those species that occur in the project area or whose habitat may be impacted by the project. **Table 3-31** displays Black Hills SOLC.

Table 3-31. Species of Local Concern

Common Name	Scientific Name	Habitat Present	Species Recorded
Invertebrates			
Atlantis fritillary	*Speyeria atlantis pahasapa*	No	No
Tawny crescent	*Phyciodes batesii*	Yes	Yes

Common Name	Scientific Name	Habitat Present	Species Recorded
Callused vertigo	*Vertigo arthuri*	Yes	No
Mystery vertigo	*Vertigo paradoxa*	Yes	No
Frigid ambersnail	*Catinella gelida*	No	No
Striate disc	*Discus shimekii*	No	No
Birds			
Sharp-shinned hawk	*Accipiter striatus*	Yes	Yes
Cooper's hawk	*Accipiter cooperii*	Yes	No
Broad-winged hawk	*Buteo platypterus*	Yes	No
Northern saw-whet owl	*Aegolius acadicus*	Yes	No
Pygmy nuthatch	*Sitta pygmaea*	Yes	No
American dipper	*Cinclus mexicanus*	No	No
Black-and-white warbler	*Mniotitla varia*	Yes	No
Mammals			
Northern myotis	*Myotis septentrionalis*	Yes	No
Small-footed myotis	*Myotis ciliolabrum*	Yes	No
Long-eared myotis	*Myotis evotis*	Yes	No
Long-legged myotis	*Myotis volans*	Yes	No
Northern flying squirrel	*Glaucomys sabrinus*	Yes	No
Meadow jumping mouse	*Zapus hudsonius campestris*	Yes	Yes
Mountain goat	*Oreamnos americanus*	No	No
Bighorn sheep	*Ovis canadensis*	No	No

Tawny Crescent

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

The tawny crescent occurs in all counties in the Black Hills (Ferris 1971, Marrone 2002). It is found in open meadows, stream bottoms, roads, trails, and riparian woodlands (Stefanich 2001). It is also found in mesic forest corridors across an ecotone between mixed-grass meadows or prairie grasslands and adjacent woodlands (Royer and Marrone 1992). Adults nectar on a variety of forbs, including dogbane, leafy spurge and various composite flowers. Tawny crescent larvae appear to depend on asters as a food source, although the specific host species, and their relationship remain unclear (Stefanich 2001).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Forest succession would continue, favoring pine expansion and subsequent loss of habitat (e.g. openings dominated by grass and forbs, including larval host plants). Risk of wildfire and mountain pine beetle outbreaks would gradually increase. Stand-replacing events would have one- to two-year negative impacts on butterfly habitat but would ultimately benefit this species through habitat expansion.

Alternatives B, C, and D could cause individual butterfly mortality due to management activities. Impacts are slightly more likely to occur under Alternative C due to the larger area treated. Alternative D would have the greatest positive effect due to reduction of stand density to low levels in fuel breaks. One- to two-year habitat reduction or disturbance may occur due to logging, mechanical fuel reduction, thinning, prescribed burning, and road construction in or near meadow areas. Proposed treatments would mostly benefit this species by decreasing extent of pine cover in meadow and grasslands, improving condition of these habitats (212 acres under all action alternatives).

Cumulative: Forest succession, fire suppression, and pine encroachment have decreased meadow communities throughout the Dean project area. Conversely, beneficial impacts have or will result from past, current and future removal of commercial timber, thinning of pine and oak brush, prescribed burns, and wildfires by creating more meadow openings and retarding forest succession. Riparian and upland meadow habitats have been negatively impacted in some areas due to periodic overutilization and bank trampling by livestock. In other locations, moderate livestock grazing has improved butterfly habitat by decreasing grass cover and encouraging forbs such as aster. Proposed activities would generally add to positive cumulative effects by enhancing openings and riparian habitat and reducing pine stand density.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Amendment FEIS. The Phase 2 Amendment FEIS determined that the species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards grassland and riparian management objectives. All action alternatives in the Dean project would comply with amended Forest Plan standards and guidelines and contribute to objectives for riparian habitat (213, 214, and 215) and grasslands (205). Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Callused Vertigo and Mystery Vertigo

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

These snail species are addressed together because they are often found in the same colonies. Habitat characteristics are similar. They are found in wet, relatively undisturbed forest, primarily on north aspects with deciduous litter (Frest and Johannes 2002). Essential habitat features include a limestone or schist substrate, shaded forest floor, organic surface litter, downed logs, and mesic site conditions. They are associated with spruce, pine, hardwood, and riparian ecosystems (Frest and Johannes 2002). They are found in the central and northern Black Hills and the Bear Lodge Mountains. Neither species has been documented within the Dean project area.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Forest succession that favors pine expansion may protect the mesic microclimate around some colonies and dry up other areas due to pine water uptake and rain interception. Impacts would be variable and site-specific. Risk of stand-replacing wildfire and beetle infestation would gradually increase. These events could eliminate snail colonies due to site drying.

There are no known colonies of these species in the project area, but if unknown colonies do exist, management activities proposed under Alternatives B, C, and D could cause individual mortality. Mesic microclimate conditions may dry out, adversely impacting colonies. Habitat loss or disturbance may occur from prescribed burning and mechanical fuel reduction in mesic areas. Nevertheless, all alternatives would have overall beneficial impacts by decreasing pine cover and enhancing riparian and hardwood habitats where colonies are more likely to occur. amended Forest Plan standards and site-specific design criteria (pages 2-7, 2-9, 2-10) would minimize disturbance of soil in mesic sites and the potential for negative impacts on snail colonies.

Cumulative: Forest succession, fire suppression, and pine encroachment have decreased riparian and hardwood communities throughout the Dean project area. Conversely, beneficial impacts have resulted or will result from past, current and future removal of commercial timber, thinning of pine and oak brush, prescribed burns, and wildfires by creating more meadow openings and setting back forest succession. Some mesic sites have been negatively impacted due to periodic overutilization and trampling by livestock. With application of design criteria to avoid known snail colonies and disturbance of mesic soils, proposed activities are unlikely to add to negative cumulative effects and would act against the cumulative loss of quality hardwood and riparian habitats.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that these species are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Sharp-shinned Hawk

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

The sharp-shinned hawk breeds in dense forests from Alaska through Canada and throughout the United States (Udvardy and Ferrand 1994). During migration and winter, this species can be found in a variety of habitats in the continental United States (Udvardy and Ferrand 1994). In the Black Hills they were suggested to be "probably fairly common" (Pettingill and Whitney 1965), although currently they seem to occur in very low densities (Panjabi 2003). They have been documented using spruce, pine and aspen cover types (Panjabi 2003). An association between nesting and young seral stages with dense canopies has been noted (Stephens and Anderson 2003). They have been documented on the Bearlodge District and there is a documented nest in a birch/aspen stand within the Dean project area. This bird preys on small birds and mammals.

Analysis of Effects

Direct and Indirect: There would be no direct impacts under Alternative A because no new activities would occur. Potential nesting habitat (dense, young forest, structural stages 3B and 3C) would gradually decrease. Foraging habitat may decrease as well as open habitats decline. Risk of stand-replacing events such as wildfires and mountain pine beetle outbreaks would gradually increase; these events would reduce sharp-shinned hawk habitat.

Alternatives B, C, and D could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Amended Forest Plan standard 3204 would minimize this risk by protecting raptor nests. Alternative B would decrease potential nesting habitat by approximately 31 acres. Alternative C would decrease this habitat by 83 acres. Under Alternative D, fewer acres overall would be treated, but potential nesting habitat would decrease by 167 acres due to fuel break construction. Treatments prescribed under all alternatives to create young stands would eventually result in potential nesting habitat. Foraging habitat would likely remain stable, with logging and prescribed burning providing a variety of structural stages and cover types for a diversity of prey species.

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that sharp-shinned hawk is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Cooper's Hawk and Broad-winged Hawk

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

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Nesting habitat (i.e., mature, dense forest) would likely increase over time in the absence of fire or insect infestation. Foraging habitat would decrease as riparian corridors and open habitats become overgrown with pine. Young, dense stands would mature, and the availability of diverse foraging habitats would decline. Stand-replacing wildfire could eliminate habitat.

Alternatives B, C, and D could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Amended Forest Plan standard 3204 would minimize this risk by protecting raptor nests. Alternative B would decrease potential nesting habitat by 927 acres (12 percent), Alternative C by 2,448 acres (32 percent), and Alternative D by 2,792 acres (36 percent). Much of this habitat would be thinned, meaning its potential for use as nesting habitat may again increase as the stands grow. Under Alternative D, potential nesting habitat in fuel breaks (including 97 acres of existing late-succession stands) would be lost for decades due to the low density of the proposed treatment. Broad-winged hawk foraging habitat is the same as nesting habitat and would therefore also decrease. Foraging habitat for Cooper's hawk is more diverse and would remain stable or increase with logging, thinning, and prescribed burning; these treatments would provide a variety of habitats for a range of prey species.

Cumulative: Past and ongoing management actions have affected potential habitat for these species by reducing stand density, which has both decreased nesting habitat and reduced risk of stand loss to wildfire or insect infestation. Fire suppression has minimized loss of dense stands but also caused loss of openings and diverse habitats necessary for prey species. Proposed activities would add to the loss of dense, mature stands, though Alternative B would add less through treatments to develop more late-succession stands and Alternative D would add more to the cumulative effect by reducing density more for a longer period of time. Proposed burning and meadow/riparian enhancement would act against the loss of open and diverse habitats for prey species.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that these species are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives, particularly structural stage objectives. Alternative D would have the highest risk to persistence because it would reduce late-succession forest by 97 acres. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Saw-whet Owl

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

The following information is derived from Johnson and Anderson (2003). Saw-whet owls occur from the southern boundary of Alaska across most of Canada and into the northern tier of states from Maine to Minnesota. The Rocky Mountains, the Cascade Range, Coastal Range, and the Sierra Mountains all support year-round populations. In the Black Hills, seasonal migration between high and low elevation habitat is likely. Saw-whet owls can be found in more dense coniferous forests and dense riparian woodlands. This owl nests in cavities excavated by flickers or other large woodpeckers. Nests tend to be in mature forests (structural stages 4C and 5), while dense sapling-pole sized stands (3B and 3C) are preferred for roosting. This species preys on birds and small mammals, particularly deer mice.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Nesting habitat would increase over time unless disturbed by fire or insect infestation. Foraging habitat would remain nearly stable, although riparian corridors and open

habitats would decline. Stand-replacing fire could reduce habitat. Beetle outbreaks may reduce some dense forest habitat, but would also increase snags available for roosting.

Alternatives B, C, and D could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities or if occupied nest snags are cut. Snags would generally not be cut unless they pose a hazard to workers (design criteria, page 2-10). Amended Forest Plan standard 3204 would also minimize this risk by protecting identified nests. Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. There is currently good distribution of snags within the project area and cutting of standing dead trees is prohibited, thus contributing toward this objective. The Phase 2 Forest Plan Amendment FEIS determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. The contribution of this project to Forest-wide structural stage objectives is discussed starting on page 3-72.

Alternatives B and D would decrease potential nesting habitat by about 36 percent, while Alternative C would decrease it by about 42 percent (Table 3-20 through Table 3-23, SS 4C and 5). Much of this habitat would be thinned, meaning its potential for use as nesting habitat may again increase as the stands grow. This would take place more quickly on the 597 acres proposed for enhancement of mature, dense stands under Alternative B, as this treatment would thin stands specifically to enhance and develop these characteristics. Under Alternative D, potential nesting habitat in fuel breaks (including 97 acres of existing late-succession stands) would be lost for decades due to the low density of the proposed treatment.

Foraging habitat would likely remain stable or increase under all alternatives, with logging, thinning, and prescribed burning providing a variety of prey in diverse habitats. All alternatives would maintain the existing 87 acres of roosting habitat (Table 3-20 through Table 3-23, pine SS 3B and 3C), though Alternatives B and C would thin this habitat, moving it from 3C to 3B. This may reduce the suitability of this habitat for saw-whet owl roosting. Observation indicates that many other stands in the project area contain inclusions of dense, pole-size pine, but the amount has not been quantified.

Cumulative: Past timber harvest and thinning have reduced stand density. These same activities, along with fire suppression, have increased pine cover, prevented loss of mature stands to fire and pathogens, and promoted tree growth. Firewood cutting and other activities have decreased availability of large snags. Foraging habitat has probably remained fairly stable, as these birds forage in a variety of habitats. Proposed activities would add to cumulative effects of timber harvest, particularly Alternative D, which would reduce stand density the most for the longest period of time. Alternative B would add to cumulative effects but would also promote development of additional habitat suitable for saw-whet owl nesting. In other respects, all action alternatives would counteract cumulative effects through enhancement of habitat diversity.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that northern saw-whet owl is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Pygmy Nuthatch

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

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Nesting and foraging habitat (open, mature forest, SS 4A, 4B, and open-canopy 5) would decrease in the absence of fire or beetle infestation. Snag habitat would probably increase over time, although stands may be too dense to provide suitable nesting habitat. Fire and beetle infestation risk would increase over time. Stand-replacing fire would reduce habitat; beetle outbreaks would probably increase suitable habitat by creating snag habitat and thinning pine stands.

Alternatives B, C, and D could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities or if occupied nest snags are cut. Snags, including those over 20 inches in diameter, would generally not be cut unless they pose a hazard to workers (design criteria, page 2-10; amended Forest Plan standard 2301a). Amended Forest Plan standard 3204 would also minimize this risk by protecting identified nests. Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. There is currently good distribution of snags within the project area and cutting of standing dead trees is prohibited, thus contributing toward this objective. The Phase 2 Forest Plan Amendment FEIS determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. The contribution of this project to Forest-wide structural stage objectives is discussed starting on page 3-72.

Alternatives B and D would increase potential nesting and foraging habitat by 6 percent and Alternative C would decrease it by 13 percent (Table 3-20 through Table 3-23, SS 4A and 4B). Prey species would likely increase (Cerovski 2002, Dykstra 1999). Included in this total for Alternative B is enhancement of mature, open-canopy pine stands on 416 acres. This treatment's emphasis on retention of the largest trees and development of open-canopy late-succession characteristics would provide suitable habitat for pygmy

nuthatch. Observed open-canopy areas of the existing 382 acres of late-succession pine forest also provide suitable habitat for this species, though the extent of this habitat has not been quantified. Only Alternative D would affect late-succession habitat (a 90-acre reduction due to fuel break treatments). All action alternatives would increase the acreage of stands with "very large" tree size (see page 3-75). This increase is not due to an actual increase in number of individual large trees, but an increase in the acres occupied by stands with an average tree diameter of at least 9 inches and, of those trees, an average diameter of at least 16 inches. The increase would be caused by proposed thinning, which would remove smaller trees, thus increasing average stand diameter. Thinning would increase suitability of these stands for pygmy nuthatch by moving the stands towards open-canopy conditions with large-diameter trees.

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Black-and-white Warbler

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

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

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Warbler habitat may decrease over time as forest succession favors pine and contributes to loss of aspen, riparian, and oak woodland habitat. Risk of wildfire and mountain pine beetle outbreaks would gradually increase. The impacts of wildfire would be negative in the short term (about five years) and then mostly positive as aspen and oak habitat benefit from decrease of pine cover. Likewise, beetle outbreaks would reduce pine and allow hardwoods to expand, increasing warbler habitat.

Alternatives B, C, and D include the potential for individual mortality due to management activities. Indirect impacts include potential habitat loss or disturbance that may occur from logging, thinning, prescribed burning and road construction in mixed pine and aspen or oak habitat. Proposed treatments would have mostly beneficial impacts by decreasing pine cover and encouraging the growth and expansion of aspen, riparian, and oak habitats. Hardwood

enhancement projects are proposed on 500 acres and would improve potential warbler habitat. Logging and mechanical treatments may also increase insect numbers and thus foraging opportunities (Dykstra et al. 1999). Prescribed burning may have negative impacts for one to two years but overall benefits to foraging habitat (Cerovski 2002).

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that black-and-white warblers are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

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

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

The northern myotis ranges across most of eastern North America. It has been documented across the Black Hills region (Higgins et al. 2000, Cerovski et al. 2004). The northern myotis is found in wooded riparian zones in badlands and prairies to higher elevation coniferous and deciduous woodlands (Schmidt 2003). Hibernacula for this species include mines and caves. Day roosts have been reported in buildings, under shingles, underneath bark, inside tree cavities, and in caves, mines, and quarries. They have been documented using ponderosa pine snags as summer/maternity roosts in the Black Hills (Tigner and Dowd Stukel 2003). Moths and beetles make up most of this bat's diet (Schmidt 2003). This species has not been documented in the project area.

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

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

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

The long-legged myotis is common across the western United States. Its range extends across much of western North America from southeastern Alaska into central Mexico (Schmidt 2003c). This species is considered to be the most common and widely distributed member of the genus *Myotis* and has been documented across the Black Hills Region (Schmidt 2003c). It is primarily associated with montane forest, and forages over meadows, ponds, streams, and open mesic habitats of the Black Hills. Hibernacula include mines and caves. Day and maternity roosts have been documented rock crevices, buildings, under the bark of trees and in snags (Schmidt 2003c). Ponderosa pine snags are used as summer/maternity roosts in the Hills. Moths appear to comprise the majority of this species' diet, and it is known to feed on the spruce budworm moth (Schmidt 2003c). This species has not been documented in the Dean project area.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Forest succession and fire suppression would gradually limit foraging opportunities by creating dense forests and decreasing riparian areas, which are not suitable foraging habitat. Risk of stand-replacing fire and mountain pine beetle outbreaks would increase over time. These events may destroy roost trees and foraging habitat but would also create large numbers of snags and may improve foraging habitat due to reduction in pine cover.

Alternatives B, C, and D include potential for individual mortality due to management activities. Roosting habitat may decrease as a result of logging, thinning, road construction, and prescribed burning. Foraging habitat would increase as a result of thinning and burning. Insect prey numbers would probably increase after prescribed burns (Cerovski 2002). Proposed riparian enhancement treatments would improve foraging habitat.

Snags would generally not be cut unless they pose a hazard to workers (design criteria, page 2-10). Amended Forest Plan standard 3204 would also minimize this risk by protecting identified nests. Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. There is currently good distribution of snags within the project area and cutting of standing dead trees is prohibited, thus contributing toward this objective. The Phase 2 Forest Plan Amendment FEIS determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. The contribution of this project to Forest-wide structural stage objectives is discussed starting on page 3-72.

Cumulative: Past and ongoing timber harvest and other actions have probably contributed to a decrease in occurrence of large snags. Fire suppression has contributed to reduction of non-pine habitats and encroachment of riparian areas. With application of design criteria to minimize cutting of snags, proposed activities are unlikely to add to negative cumulative effects and would

act against the cumulative effects of fire suppression by enhancing riparian and other non-pine habitats.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that these bat species are likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Northern Flying Squirrel

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

The northern flying squirrel occupies forested areas in much of Canada and parts of the western United States, with a separate population in the Black Hills of South Dakota and Wyoming (Higgins et al. 2000). They inhabit mature, dense woodland habitats dominated by conifers or mixed conifer and deciduous forest. Anecdotal evidence suggests that, in the Black Hills, flying squirrels are habitat generalists and can be found in open pine habitat adjacent to more densely vegetated hardwood habitats (Krueger pers. comm. 2006). They are likely benefit from any hardwood enhancement, as they have been documented in aspen stands (Krueger pers. comm. 2006) and riparian hardwood stands (personal observation). This squirrel nests in a leaf nest or tree cavity and is considered uncommon in Wyoming (Cerovski et al. 2004). It feeds on lichens, fungi, conifer cones, fruit, buds, arthropods, bird eggs, and nestling birds (Cerovski et al. 2004).

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Forest succession would gradually increase dense forests with numerous snags. Risk of stand-replacing fire and mountain pine beetle outbreaks would also increase. Impacts of wildfire would include loss of snags and dense forests, but fire and beetles would also create snags and allow aspen stands to expand.

Alternatives B, C, and D include potential for individual mortality due to management activities. Preferred pine habitat would decrease as a result of logging, thinning, road construction, and prescribed burning, but aspen would benefit from prescribed fire and riparian enhancement treatments. Alternative B would decrease preferred pine habitat by 927 acres (12 percent), Alternative C by 2,448 acres (32 percent), and Alternative D by 2,792 acres (36 percent). Much of this habitat would be thinned, meaning its potential for use as flying squirrel habitat may again increase as the stands grow. Under Alternative D, potential habitat in fuel breaks (including 97 acres of existing late-succession stands) would probably be lost for decades due to the low density of the proposed treatment.

Snags would generally not be cut unless they pose a hazard to workers (design criteria, page 2-10). Prescribed burning can both destroy and create snags. Proposed burning is expected to create more snags than are lost, but most of the created snags would probably be of relatively small diameter since burns are not designed to kill large overstory trees. Alternatives B, C, and D would decrease open road density, which could protect snags from firewood cutters. There is currently good distribution of snags within the project area and cutting of standing dead trees is prohibited, thus contributing toward this objective. The Phase 2 Forest Plan Amendment FEIS

determined that future snags would be provided through the diversity of structural stages that would result from structural stage objectives. The contribution of this project to Forest-wide structural stage objectives is discussed starting on page 3-72.

Cumulative: Past and ongoing management actions have affected potential habitat for flying squirrels by reducing stand density, which may have decreased preferred habitat while also reducing risk of stand loss to wildfire or insect infestation. Fire suppression has minimized widespread loss of dense stands. Proposed activities would add to the loss of dense, mature stands, though Alternative B would add less through treatments to develop more late-succession stands and Alternative D would add more to the cumulative effect by reducing density more for a longer period of time. Proposed burning and meadow/riparian enhancement would act against the loss of diverse foraging habitats.

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Meadow Jumping Mouse

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

Meadow jumping mice occur across portions of Alaska east through much of Canada and in the eastern United States as far south as Georgia and Alabama (Higgins et al. 2000). Within the United States its western boundary extends to the eastern foothills of the Rocky Mountains (Higgins et al. 2000). The Bearlodge jumping mouse is a separate subspecies that occurs in the Black Hills of northeastern Wyoming and is considered rare in the state (Cerovski et al. 2004). This species is associated with marshy areas and moist grasslands near streams, coniferous and deciduous forests, mixed shrublands and riparian shrublands (Cerovski et al. 2004). It feeds on buds, grasses, seeds, fungi, leaves, fruit, and insects.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct impacts because no new activities would occur. Pine forest would continue to expand over time, threatening willow and aspen communities. Diversity of vegetation species and structure would gradually decrease, negatively impacting this species. Increased risk of stand-replacing fire and insect infestation could lead to short-term (less than 5-year) negative impacts and ultimately beneficial effects on riparian habitat. Insect infestation would enhance understory development of hardwoods, shrubs, forbs, and grasses, diversifying foraging habitat.

Alternatives B, C, and D include the slight potential for individual mortality due to management activities. Proposed activities may have beneficial impacts by enhancing riparian habitat due to reductions in conifers and oak brush. Reducing pine would also lead to the development and expansion of hardwood stands and grasslands near riparian areas, benefiting mouse habitat. Prescribed burning and logging may have one- to two-year negative impacts on riparian habitat by reducing hiding cover.

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

Population viability is appropriately evaluated at the Forest scale because the project area is too small for a meaningful analysis. The likelihood of persistence was evaluated in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that this species is likely to persist on the Forest over the next 50 years if standards and guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with amended Forest Plan direction. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Emphasis Species – Game Species

Rocky Mountain Elk

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

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

The Wyoming Game and Fish Department does not have a rigorous Black Hills elk population estimate or population model. The best estimate is that 1,500 to 2,000 elk occur in the Bear Lodge Mountains and the Wyoming part of the Black Hills; it is apparent that the population is increasing, but the rate of expansion is unknown (Sandrini 2004c). Elk are common in the Dean project area in spring, summer, and early fall. There is a fall hunting season.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effects on elk because no new activities would occur. Stands would continue to mature in the absence of natural events. The resulting habitat would provide additional elk cover, but forage availability and quality would decrease over time.

Under Alternatives B, C, and D, implementation of the proposed treatments would alter suitable habitat. New roads would be constructed under Alternatives B and C. Besides removal of potential elk cover, the use of these roads could displace elk from otherwise suitable habitats. Potential displacement would be limited to the life of the project, since newly constructed roads would be stored after completion of the project. Treatments proposed under Alternatives B, C,

and D would affect elk foraging and security habitats. Initially, cover would decrease somewhat in proposed treatment areas. Preferred habitat would increase as a result of pine removal from hardwood stands and prescribed burning. Timber harvest, thinning, and burning would benefit elk by providing high quality, low-growing forage. Timber harvest has been shown to increase forage and browse production (Pase and Hurd 1957, Alexander 1987, Uresk and Severson 1989). Any new roads that are not effectively closed after use would decrease adequate escape and security cover. Proposed treatments would reduce cover temporarily, but understory species and pine regeneration are likely to respond rapidly so that horizontal screening cover would be restored and increased within about five years. Elk would be more vulnerable to hunters and other predators over the short term. Forage quality is likely to increase following prescribed burns.

Opening the Truck Trail to ATV traffic during summer and fall is proposed under Alternative B. It is likely that opening the Truck Trail would effectively open other roads not intended for use. Most roads are effectively closed to passenger vehicles, but ATVs can and do breach many closures. Alternatives B and C would substantially decrease this effect elsewhere in the project area through restriction of off-road motorized travel, while under Alternatives A and D off-road use would continue to impact elk habitat.

Cumulative: Fire suppression, livestock grazing, and management favoring pine have decreased forage available for elk in the Black Hills. Nevertheless, the Black Hills elk population has increased in recent years (USDA Forest Service 2004b). Ongoing and foreseeable modifications to allotment management plans are expected to alleviate existing riparian overuse problems. Proposed activities would generally act against cumulative effects by reintroducing fire and enhancing non-pine vegetation communities. All alternatives would conserve elk habitat in accordance with amended Forest Plan objective 217.

Mule Deer

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

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

Mule deer population across the Wyoming portion of the Black Hills grew rapidly between 1997 and 2000. It then decreased in 2001 due to poor reproduction and recruitment brought on by climatic conditions and disease. From 2002 to the present, mule deer numbers have increased. The 2003 post-hunting season population estimate was 22,911 animals (Sandrini 2004b). There is a fall hunting season.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effects on deer because no new activities would occur. Stands would continue to mature in the absence of natural events. The

resulting habitat would provide additional cover, but forage availability and quality would decrease over time.

Under Alternatives B, C, and D, implementation of the proposed treatments would alter suitable habitat. New roads would be constructed under Alternatives B and C. Besides removal of potential cover, the use of these roads may displace deer from otherwise suitable habitats. Potential displacement would be limited to the life of the project if closure of newly constructed roads after use is effective. Treatments proposed under these alternatives would affect deer foraging and security habitats. Within a few years of treatment, near-ground cover would increase in treated stands as pine regeneration and hardwood brush grow. Forage quality is likely to increase following prescribed burns. For several years after timber treatments, the availability of effective winter cover would be reduced.

Opening of the Truck Trail to ATV use after July 1 (Alternative B) would substantially decrease the value of this summer habitat. It is likely that opening the Truck Trail would effectively open other roads not intended for use. Most roads are effectively closed to passenger vehicles, but ATVs can and do breach many closures. Alternatives B and C would substantially decrease this effect elsewhere in the project area through restriction of off-road motorized travel, while under Alternatives A and D off-road use would continue to impact elk habitat.

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

Merriam's Turkey

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

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

Turkey populations have been increasing across the Forest (USDA Forest Service 2004b). There are no population estimates for turkey in the Wyoming part of the Black Hills. However, the Wyoming Game and Fish Department has used winter counts and harvest statistics to determine trend as an index of population size. High winter counts, high harvest statistics, and favorable weather conditions during nesting all indicate that the turkey population has increased since 1996. Weather during the spring and early summer of 2001 was less favorable for turkeys, and productivity declined. Area managers feel the population is currently robust (Sandrini 2002d). Weather conditions during the last few years probably increased productivity as evidenced by brood size during late summer and winter flock counts. This species is common in the project area. There are spring and often fall hunting seasons.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on turkeys because no new activities would occur. Forest would continue to mature and spread in the absence of natural events. Mature stands would continue to provide suitable turkey habitats. Alternatives B, C, and D would alter areas of suitable turkey habitats, including roost trees, thermal cover, and foraging habitats. Increased human presence associated with treatment activities may temporarily displace turkeys from otherwise suitable habitats. Fast-moving fire may impact newly hatched poults, but losses are negligible once poults can fly (Hurst 1978). Prescribed burns would be conducted before May 1 to minimize the likelihood of nest destruction (design criteria, page 2-5).

Alternative C would alter the most roosting habitat and Alternative B the least, but roost trees would not be a limiting factor under any alternative due to the extent of mature pine forest across the project area. Following implementation of treatments, turkey foraging habitats may improve over existing conditions because treatments such as prescribed fire are likely to cause an increase in the diversity of understory vegetation. Closure of the area to off-road motorized travel under Alternatives B and C would reduce disturbance of nesting birds. All alternatives would conserve turkey habitat in accordance with amended Forest Plan objective 217.

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

Brook Trout

This discussion of brook trout is tiered to the Phase 2 Amendment FEIS, pages III-309 through III-310. The Phase 2 Amendment FEIS addresses three trout species. Brook trout is the only one of these found or potentially occurring in the project area.

Brook trout is an important game species. This species was transplanted to the Black Hills in the 19th century (USDA Forest Service 2004b). It needs cold, clean headwater streams and lakes and represents aquatic and riparian habitat. Brook trout are well distributed forestwide and most suitable habitat is currently occupied (USDA Forest Service 2004b). Harvest regulations combined with habitat management have maintained populations. Brook trout population trend Forestwide appears stable to slightly increasing (USDA Forest Service 2004b).

Streamflows in the headwaters of Redwater Creek are generally insufficient to support trout, except in beaver ponds (Wyoming Game and Fish Department 1996). North Redwater Creek has been stocked periodically with brook trout fingerlings since 1947; the last stocking occurred in 1994. Hemler Reservoir was stocked with brook trout from 1964 through 1974, and then chemically treated in 1976 to eradicate black bullheads. Brook trout were again stocked periodically in Hemler Reservoir from 1979 through 1987, and in 1993. There are currently no brook trout in Hemler Reservoir.

Analysis of Effects

Direct and Indirect: Alternative A would have no direct effect on brook trout because no new activities would occur. Alternatives B, C, and D would have no direct effect because no instream activities are proposed and no trout are present in Hemler Reservoir. These alternatives may result in increases in sediment, though with implementation of BMPs and other design criteria

any increases are expected to be minor and last less than two years. Proposed vegetation management could result in a temporary increase in water yield, which, if measurable, would benefit this species. Dredging of Hemler Reservoir and Redwater Pond may improve habitat conditions for brook trout. Management activities to promote hardwoods may increase the abundance of beaver and subsequently beaver ponds that would provide suitable habitat.

Cumulative: Recent increase in beaver activity, especially in the Bear Lodge Mountains, is likely to benefit trout and other fish. Livestock grazing, mining, water diversion, road construction, and motorized vehicle use in wet areas have had negative effects on fish habitat. No additional habitat fragmentation or permanent degradation is foreseeable that would further restrict the distribution of brook trout or appreciably reduce their ability to interact and reproduce in the project area. All alternatives would conserve brook trout habitat in accordance with amended Forest Plan objective 217.

Migratory Birds

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

The highest priority (Level 1) bird species listed in the Wyoming Partners in Flight (PIF) Bird Conservation Plan for forest, montane riparian, and aspen habitat groups include northern goshawk and bald eagle. These species are discussed above. The US Fish and Wildlife Service's Birds of Conservation Concern (BCC) publication (USFWS 2002) partitions North America into 37 bird conservation regions (BCRs). The Black Hills is included in BCR 17 (Badlands and Prairies). Of the 24 bird species found in BCR 17, eleven are duplicated on the Regional Forester's sensitive species list and are evaluated above if they have potential to occur in the Black Hills. Nine species are not expected to occur in the Black Hills due to lack of habitat. A summary of all 20 species can be found in the project record. The four remaining species (golden eagle, prairie falcon, black-billed cuckoo, and red-naped sapsucker) or their habitats have potential to occur in the Dean project area and are evaluated below.

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

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

Removal of encroaching pine from meadows as proposed under Alternatives B, C, and D would have a negligible positive effect on potential foraging habitat due to the small extent of the treatments that would enhance open conditions. Proposed prescribed fire could also have a small positive effect by enhancing prey habitat. No other vegetation treatments or access proposals would have any effect on the eagle or its habitat. Any golden eagle nests found during project implementation would be protected (amended Forest Plan standard 3204).

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

Observations of prairie falcons in the Black Hills are primarily along the perimeter of the forest, where high cliffs provide nest sites adjacent to open grasslands for hunting (Panjabi 2003). This species has been observed on the Bearlodge District (district files). There have been no documented occurrences within the Dean project area.

Removal of encroaching pine from meadows as proposed under Alternatives B, C, and D would have a negligible positive effect on potential foraging habitat due to the small extent of the treatments that would enhance open conditions. Proposed prescribed fire could also have a small positive effect by enhancing prey habitat. No other vegetation treatments or access proposals would have any effect on the prairie falcon or its habitat. Any raptor nests found during project implementation would be protected (amended Forest Plan standard 3204).

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

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

Nest trees and nesting habitat for this species may be decreased by the removal of commercial trees (at least nine inches in diameter) in the proposed cutting areas. This bird prefers to nest in aspen trees, however, which are not proposed for cutting. Prescribed burning and hardwood restoration may benefit this species by enhancing and expanding aspen stands and increasing insect populations (Cerovski 2002). No other vegetation treatments or travel management proposals would have any effect on red-naped sapsucker or its habitat.

Black-billed Cuckoo *(Coccyzus erythropthalmus)* – The black-billed cuckoo breeds from Alberta and Montana east to the maritime provinces and south to northern Texas, Arkansas, and South Carolina. It winters in South America. This species favors a variety of wooded or brushy habitat, avoiding extremely dense woods (DeGraff et al. 1991). It forages among leaves for caterpillars, insects, spiders, and fruit. Nests are usually in groves of trees, forest edges, moist thickets, or overgrown pastures (Peterjohn et al. 1995).

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

The Dean project area may provide suitable habitat in drainages forested with hardwoods, meadow edges, and open pine stands. Non-commercial treatments proposed under all alternatives to increase structural diversity in oak stands could have a negligible, temporary negative effect on potential nesting habitat. Conifer thinning treatments and prescribed fire could have a small positive effect on black-billed cuckoo habitat by increasing understory production and diversity.

3.5 SOCIAL ENVIRONMENT

This section describes the affected environment and environmental consequences for each alternative to the Social Environment (Travel and Recreation Use, Visuals, Special Uses, Heritage, and Social and Economic).

3.5.1 TRAVEL and RECREATION USE

Affected Environment

The Dean project area provides abundant dispersed recreation opportunities and several miles of snowmobile trails. Recreation use appears to be heaviest during big game hunting seasons. The project area has many roads, but most are closed to motorized vehicles year-round. The number, location, and type of roads within the area directly affect recreation use. This also applies to areas open and closed to off-road motorized use.

Tourists also enjoy and use the Dean project area, primarily to view scenery along the main road corridors that access the interior of the Bear Lodge Mountains. NFSR 843 is used in the summer as the main access route to the Cook Lake Recreation Area from the east side of the Bear Lodge Mountains.

Direct and Indirect Effects

No changes are proposed to the road system under Alternative A. Motorized and non-motorized recreational activities would remain unchanged from existing conditions. Approximately 30 percent of classified and unclassified roads would remain open to motorized travel by the public. About 70 percent of Forest roads would remain closed to motorized travel year-round. ATV use within the project area may increase, in part due to designation of certain roads as part of the Wyoming State ATV program. Trespass issues associated with ATV users would continue to occur on private lands. At the same time, ATVs and off-road vehicles from private lands may access NFS lands from points that are not open to the general public, creating new trails or roads.

Under Alternatives B and C, motorized access would decrease as roads are decommissioned and as off-road, cross-country travel is prohibited. Under Alternative B, the Truck Trail would be available from July 1 to December 15 for motorized vehicles less than 50 inches in width. Under Alternatives B and C, non-motorized recreationists may find the woods more peaceful because of road decommissioning and limits on off-road travel. Proposed road closures would reduce vehicle noise and improve conditions for bird and wildlife watching. Some hunters may find themselves displaced from favorite motorized hunting spots, but those who prefer a quieter, walk-in hunting experience would benefit.

Motorized access would remain the same under Alternative D and there would be no additional restrictions on off-road motorized vehicle use. New user-created roads would probably be developed over time across the analysis area.

Closure or decommissioning of roads could affect both motorized and non-motorized recreation, depending on the method used. For example, a road that is recontoured to match the surrounding landscape may be difficult to walk, while a road that is covered in slash to prevent motorized access without being recontoured could still be used by hikers but not mountain bikers.

Since there are no developed recreational facilities in the project area, the proposed timber harvest, fuel reduction, and prescribed burning activities would be more of a nuisance or temporary disruption than a negative or beneficial effect to the recreational user. Because of safety concerns, users may not be able to access certain areas while logging, chipping, and burning operations are underway. After prescribed burns, users who walk through the area within the first few months may get black soot on their clothes and shoes. Some users would object to cutting of mature trees and the evidence of management activities. In the longer term, proposed activities would indirectly many benefit recreational activities by creating new browse for wildlife or new openings in the forest that would allow better viewing of wildlife and scenery.

Other activities directly related to the proposed treatments, such as log hauling and slash treatments, could directly affect recreational activities. Under all action alternatives, it would be necessary to haul logs on some of the NFSRs that are part of the snowmobile trail system in winter. The District would work with local snowmobile user groups to find acceptable alternate trail routes. All roads used for log hauling would be busier than normal during harvest and follow-up activities. Since most of the roads in the project area have only one lane, visitors may have to pull off the road or back up to a turnout to allow passage of larger vehicles. Many Forest visitors already expect to occasionally meet large vehicles because of timber sales, rock hauling, and movement of cattle and horse trailers.

Method of harvest and slash disposal may affect firewood gatherers, hunters, and other recreational users. For example, machine piling of slash increases ease of access for hunters and hikers, but sometimes the piles are too high for safe removal of firewood. Slash that is lopped and left on the ground, on the other hand, impedes walking but is safer for firewood gathering. After cutting but before disposal, the appearance of slash piles and dispersed slash would be objectionable to some. Proposed activities would change the appearance of parts of the project area. Hunters may favor the change if removal of understory vegetation increases sight distance, while others may enjoy more dense vegetation.

Proposed activities may indirectly affect some special use permits. Outfitter-guide permits could be affected as logging and burning activities temporarily displace wildlife. Permit holders may need to expend more time and effort finding game. Livestock grazing may be deferred temporarily after prescribed burns. Other special use permits would not be affected by the proposed activities.

Cumulative Effects

The cumulative effects area for recreation as a whole is National Forest System lands in the project area. Past, present, and future actions are described starting on page 3-1. The cumulative effects area for motorized recreation is NFS lands in the Bear Lodge Mountains.

Both closure and improvement of roads over the years has decreased opportunities for some types of motorized recreation, such as driving on rough, challenging roads. Construction and improvement of roads have increased opportunities for recreational driving and provided easy mountain bike routes and access for non-motorized recreation, but these same actions have

decreased solitude and remoteness. By decreasing open road mileage, Alternatives B, C, and D would add to cumulative effects of road closures on motorized recreation opportunities and decrease cumulative effects on non-motorized recreation. Alternative A would not change the cumulative effects of roads in the project area.

As the demand for motorized recreation has increased, conflicts between motorized and non-motorized users have also become more common. Area closures proposed under Alternatives B and C would reduce the potential for conflict, decreasing this cumulative effect and potentially improving the recreational experience for non-motorized users within the project area and motorized users elsewhere on the district.

Proposed closures and restrictions may displace motorized recreation to other areas of the district. Approximately 85 percent of NFS lands in the Bear Lodge Mountains are currently open to off-road motorized vehicles. The area closure proposed under Alternatives B and C would reduce this to 74 percent. By reducing opportunities for off-road motorized recreation in the project area, Alternatives B and C would add incrementally to the cumulative effect of restrictions on users while reducing the cumulative effects of motorized recreation on other resources in the project area. Motorized use could be displaced to other areas or could be concentrated on open roads.

3.5.2 SCENERY

Affected Environment

Landscape Character

Landscape character gives a geographic area its visual image and consists of a combination of physical, biological, and cultural attributes. Landscape character reflects the distinct landscape attributes that exist throughout an area. This project is located within the Mountainous/Mixed Forest Landscape Character Unit – Laccolith Mountains Portion. Landscape use patterns in this area have a primarily natural appearance. Evidence of management activities, primarily recreational, is subtle in this area. Suppression of wildland fires has resulted in a denser forest, which is helping to hide other activities (roads, etc.) (USDA Forest Service 1996a).

Management of this area includes timber harvest, grazing, and other activities. Although these activities are occurring and have occurred in the past, they are subtle and for the most part not visually dominant. Inyan Kara, the Black Buttes, Sundance Mountain, the Bear Lodge Mountains, Green Mountain, Devils Tower, and the Little Missouri Buttes make up the western belt of igneous mountains on the northern edge of the Black Hills. A number of land uses occur in the Mountainous/Mixed Forest Landscape Character Unit.

Dean project area is in the eastern part of the Bear Lodge Mountains. The landscape is a transition zone, ranging from flat-topped ridges and steep canyon walls in the eastern portion of the project area to rolling ridges dissected by numerous shallow drainages at the higher elevations of the project area. The landscape is essentially made up of three parallel ridges, extending from higher elevation in the southwest to lower elevations in the northeast, with the northernmost ridge extending the farthest to the east. The tops of the ridges are generally flat. Along many portions of these ridges, the upper third of the slope is steep (nearly vertical). The mountains/ridges extend up from 300 to 600 feet above the prairie to the east; these ridges, both inside and outside the project area, dominate the view of westbound travelers on Interstate 90.

Within the project area, existing, natural-appearing openings range from approximately 15 to 30 acres in size. Just outside the project area to east are natural openings up to 100 acres in size, primarily on south-facing slopes, that roll across the landscape. Within these large openings are islands of trees two to eight acres in size, generally on north-facing slopes. This area is the interface between forest and prairie.

Ponderosa pine and oak cover drier, south-facing slopes, while aspen and birch are found on the moister, north-facing slopes. In spring and fall, hardwoods present a flush of vibrant colors across the landscape.

Scenic Class

Scenic Class measures the relative value of discrete landscape areas having similar characteristics of scenic attractiveness and landscape visibility. Scenic Class is used to compare the value of scenery with the value of other resources. The components of Scenic Class are Scenic Attractiveness (which is based on human perceptions of the intrinsic beauty of landform, water characteristics, vegetative pattern, and cultural land use) and Landscape Visibility (which is based on the distance zones from the observer and the concern level for scenery).

Higher Scenic Class indicates the importance of maintaining scenic value. Scenic Class values can range from 1 to 4, with 1 being highest and 4 lowest. About two-thirds of the Dean project area is designated as Scenic Class 2, with the remaining third divided between Classes 3 and 4.

Scenic Attractiveness

Scenic Attractiveness is defined by classifying the landscape into degrees of variety. This determines which landscapes are most important and those that are of lesser value from the standpoint of scenic quality. The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value. The combination of valued landscape elements such as landform, water characteristics, vegetation, and cultural features are used in determining the measure of scenic attractiveness.

Scenic attractiveness classifications are: Class A (Distinctive), Class B (Typical), and Class C (Indistinctive). Approximately 20 percent of the Dean area is in Class A, 29 percent, and 51 percent in Class C.

Landscape Visibility

Landscape Visibility indicates the portions of landscapes visible from travelways and use areas. These areas are important to constituents for their scenic quality, aesthetic values, and landscape merits. Travelways and use areas are identified and classified during the Forest-wide planning process in order to determine which observer locations, and their importance, to use in the landscape visibility analysis. Sensitivity Level 1 travelways that lead to important scenic features, residential areas, resorts, recreation areas, unique natural phenomena, wilderness trailheads, national parks, state and county parks, attract higher percentage of users having high concern for scenic quality, thus increasing the importance of those travelways.

There are no Sensitivity Level 1 travelways in the Dean project area. There are two outside the area: Interstate 90 and Wyoming State Highway 111. In the project area, the south-facing ridge north of North Redwater Creek is highly visible from Interstate 90 (in the near background) and is also visible from State Highway 111.

The project area includes three Sensitivity Level 2 travelways: NFSRs 831, 833, and 843.1. The latter provides recreation access from the east to Cook Lake Recreation Area. NFSR 843.1 is maintained for passenger cars.

Scenic Integrity Objectives

Scenic Integrity Objectives are management objectives adopted from Scenic Class values. Scenic Integrity is a measure of the degree to which a landscape is visually perceived to be "complete." The highest Scenic Integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal. SIOs range from High to Unacceptably Low. Approximately one percent of the Dean project area has an SIO of High, 55 percent Moderate, and 44 percent Low.

Existing Scenic Integrity

Existing Scenic Integrity represents the current status of a landscape. It is based on visual changes that detract from the scenic quality of the area. Direct human alterations may be included if they have become accepted over time as positive landscape character values. Existing scenic integrity is the current visual state, which is measured in degrees of deviation from the natural appearance of the landscape character type. These ratings give an indication of the present level of visual quality and visual evidence of management activities. The frame of reference for measuring achievement of scenic integrity levels is the valued attributes of the existing landscape character unit being viewed. In natural or natural-appearing character, this is limited to natural or natural-appearing vegetative patterns, features of water and rock, and landforms.

The project area is noted for dense conifer stands in gently rolling terrain, meadows that follow streams and intermittent streams, and stands of aspen and other hardwood trees. Forested areas are predominantly populated by ponderosa pine communities on south aspects and mixed pine/hardwood communities on north aspects. Water features are limited to narrow streams and a few small ponds. Apparent human alterations in the form of roads have generally been accepted over time as part of the positive cultural landscape character attributes. Vegetation alterations in the form of various tree cutting prescriptions are common throughout the area. The existing scenic integrity of the Dean area is generally Moderate to High, depending upon viewing location and distance.

Environmental Effects

Direct Effects and Indirect Effects

Alternative A – No Action

Pine would continue to encroach on other vegetation types, reducing visual variety. Most of the project area would continue to have a natural appearance to the casual observer. If increasing fire hazard resulted in an intense fire, effects could be evident for many years in the form of scorch marks on trees and pockets of fire-killed vegetation.

Effects Common to Alternatives B, C, and D

Prescribed burns would move the forest toward a more "park-like" appearance, with tree boles more evident, little dead vegetation, and a variety of tree sizes. Depth of view into the stands would be enhanced, reducing the strong contrast of open space and closed space. Where prescribed fire is conducted in meadows, encroachment by pine trees would be reduced and these

open meadow ecosystems would continue to provide an important visual and ecological element of diversity in the landscape. These areas could offer opportunities to observe wildlife that seek out new grasses and plants that are rejuvenated after a fire in the landscape. Past low-intensity prescribed fires in and near the project area have had few negative impacts on scenery. Within one year, any obvious evidence of burning has been covered by new vegetation. Proposed burns are expected to have similar results.

Mechanical fuel treatments would result in evident color changes (fresh cut versus weathered) in the immediate foreground. Quantity of material to be treated and how well it is distributed over the landscape would determine how easily these treatments can meet the assigned Scenic Integrity Objective. Large quantities of material with limited dispersion usually meet a Low Scenic Integrity Objective in the foreground. Moderate or low quantities with good dispersion and no piles usually meet a Moderate Scenic Integrity Objective in the foreground.

Proposed oak and hardwood restoration treatments are intended to remove competition among species and maintain, or increase, vegetative diversity, which is an integral part of the landscape character. Removal of competing conifers would provide hardwood and meadow communities the greatest opportunity to thrive. The area treated is the transition zone from hardwoods to conifers and from forested to non-forested areas. These treatments would maintain a natural-appearing forest edge. Stumps would be evident in the treated areas when viewed in the immediate foreground. These treatments would generally meet a Moderate to High Scenic Integrity Objective.

Patch clear cuts mimic natural openings in form and scale and blend in to the natural character of the landscape. Stumps would be evident in the treated areas when viewed in the immediate foreground. This treatment method would generally meet a Moderate to High Scenic Integrity Objective.

Byproducts of vegetative treatments would include tops, limbs, and small trees. Even after red needles fall, slash generally still dominates the landscape as light reflects off the dry limbs. Slash remains visually dominant until snow crushes it down, it decays or is overtopped by vegetation, or until it is chipped, mulched, or burned.

Piled slash would generally be burned within one or two years. Burning of slash depends on weather conditions that aid in containing the fire to the immediate area. Once the dried slash is burned, burn marks are evident on the ground. Normally, these burn marks are no longer visible once new vegetation grows up the following spring. Black scorch marks may be evident on the boles of adjacent trees, from less than one foot to three feet in height. These marks would fade over time, and at three years should blend in with the bark. Often shrubs are stimulated and begin to grow in these areas, depending upon the amount of tree cover. Areas burned with low-intensity fire often meet a High Scenic Integrity Objective within one to two growing seasons.

The quantity of slash, along with the treatment method, determines what level of scenic integrity can be achieved. Normally slash left to await a crushing snowfall will only meet a Low Scenic Integrity Objective. Piling and burning slash can meet a range of High to Low Scenic Integrity Objectives.

Some proposed activities would be visible from Interstate 90. These activities would, however, take place over a period of time and would not result in any lines or textures that would appear uncharacteristic. In addition, the project area is at a sufficient distance from the interstate that changes would not be evident. The possible exception is the fuel breaks proposed under

Alternative D. In some locations, the edges of fuel breaks could appear as an abrupt transition between forest and open areas. Adherence to design criteria (starting on page 2-9) would decrease this possible effect so that SIOs are met.

Alternative B

New road construction would occur under this alternative. Soil would be displaced, creating cuts and fills to establish a roadway prism. Most road locations would not be highly visible, with the exception of NFSRs 832.2B1 and 844.1A1. When the trees are removed, these roads will be evident. Skyline logging from these roads could displace soil, resulting in vertical lines up the hillsides.

Those treatments retaining more large trees would generally blend into the characteristic landscape best. Treatments that leave the fewest large trees would be the most visible. Mature stand enhancement treatments would blend in well, while shelterwood seed cuts would be more obvious. How well commercial treatments blend into the characteristic landscape, and meet the assigned Scenic Integrity Objective, is based on slope, aspect, and vegetation remaining on the site. Reducing soil disturbance, spacing trees unevenly, and cleaning up slash can result in an appearance that is in harmony with the landscape character, often resulting in achievement of a higher Scenic Integrity Objective.

Commercial thinning could result in a uniform appearance of the remaining forest stand (both in size and spacing). The vertical lines of the remaining tree boles would be more evident. When understory thinning occurs in conjunction with the commercial thin, screening would be reduced and views into the forest would increase. Thinning the understory would further increase the emphasis and visibility of the larger-diameter trees. Understory grasses and shrubs would be more evident, offering seasonal variety of light and color. The visibility of larger-diameter trees would add variety of color, light, and texture. When more large trees remain on the landscape, evidence of thinning is reduced and the result can be a natural appearance. In the foreground and middleground, textural differences would be the most evident. In the background, textural changes may be evident, but form, lighting, and color differences may be the most evident. Commercial thin treatments would generally meet a Moderate to High Scenic Integrity Objective.

Shelterwood seed cuts would appear as open areas with scattered large trees. In the foreground, the opening in the forest canopy and the seedlings across the forest floor would be evident. In the middleground and background, the form, or shape, of the unit would be most evident in the winter months when snow is present on the ground, creating a strong contrast from the darker surrounding forest. When snow is not present, form and color would be most evident. These units have the greatest potential to appear out of scale and character with natural vegetative patterns, and thus affect the visual character of an area. With the diversity of sizes of natural openings, up to approximately 100 acres just to the east of the project area, seed cut treatments could meet a Moderate Scenic Integrity Objective if the size of the unit does not exceed the natural openings by more than 10 percent. If the units do not borrow from the shape and size of the natural openings, a Scenic Integrity Objective higher than Very Low would not usually be met. A Very Low Scenic Integrity Objective does not meet minimum amended Forest Plan guidelines for this project area.

Alternative C

Effects of this alternative would be similar to those of Alternative B. There would be no mature stand enhancement treatments and there would be an increase in shelterwood seed cuts and overstory removal treatments. These treatments would result in a more open and managed

appearing landscape, particularly where they would not occur in conjunction with precommercial thinning or other treatments that would transition between untreated forest and overstory removals. Within this landscape character, large overstory removals on north-facing slopes are generally out of scale. The vegetation pattern created by these treatments would be adjusted through a transition zone along the outer edges and the addition of leave islands to recapture and mimic the natural patterns (design criteria, page 2-6).

How well proposed precommercial thinning treatments would blend into the characteristic landscape and meet the assigned Scenic Integrity Objectives would depend on slope, aspect, soil disturbance, residual tree spacing, and slash clean-up. By minimizing soil disturbance, spacing residual trees unevenly, and cleaning up slash, a higher Scenic Integrity Objective can be achieved. Evidence of vegetation management would generally not be visible even when these landscapes are snow-covered.

Alternative D

Fuel breaks along roads would generally be in drainage bottoms. This treatment would appear similar to a combination of commercial and precommercial thinning. Fuel breaks would create a more open setting of hardwoods, shrubs, and meadows. To create a more natural-appearing treatment that would blend into the landscape, fuel break width would vary (design criteria, page 2-6).

Fuel breaks around private land would follow land ownership boundaries, traversing the landscape and creating open areas and textural differences in the vegetation that would be readily apparent on the landscape.

Cumulative Effects

Alternative A

Existing Scenic Integrity within the project area would not appreciably change in the next five to 10 years, but aesthetic appeal may decrease over time as open space diminishes and the forest becomes thick with small-diameter trees. Visibility into the forest would diminish. Forest vegetation could appear as "walls" along a trail, a highway, or adjacent to private land. Aspen and other hardwood stands would decrease over time.

In the long term, as forested stands move away from the desired condition, visual diversity and variety would likely be reduced. Dense understory would limit views into the landscape while hardwood and meadow components would be reduced. Natural changes in the landscape, such as from fire, insect activity, and disease, could change character from a landscape with a forest overstory to one that would likely contain large open areas, hillsides with fire-killed trees, and stands of young trees.

Alternatives B, C, and D

The cumulative effects area for visual resources is the project area. Past, present, and foreseeable future activities are listed starting on page 3-1.

Past and ongoing and foreseeable future activities in the project have included vegetation treatments and have created road and trail corridors. Due to the varied topography, only the northern and eastern portions of the project area are visible in the middleground and background from Interstate 90 and State Highway 111. Areas of past vegetation treatment cannot easily be seen or discerned at these distances, but vegetation treatments proposed under these alternatives

would occur in areas north of NFSR 843.1 that are visible. At the distance and angle from which the area is viewed, these treatments would appear to be adjacent to areas of high vegetation diversity on the eastern edge of the forest. The action alternatives would result in a slightly altered appearance of these locations.

Along the three NFSRs that traverse the project area, the majority of the proposed treatments would be visible in the foreground and middleground distance zones. The forest would have a slightly altered appearance from these roads under Alternative B, moderately altered under Alternative C, and heavily altered under Alternative D.

3.5.3 LANDS and SPECIAL USES

Affected Environment

The main access road into the project area, NFSR 843 (Redwater Road), is also a Crook County road. There are no easements for private use of NFSRs in the project area. The Forest Service has acquired rights-of-way from two private landowners for NFSRs that cross private lands in the project area. Other special uses in the project area include two outfitter and guide permits, a ditch bill easement, and a cultivation permit.

Environmental Consequences

Travel management changes could affect motorized outfitting and guide opportunities. Alternatives B and C could reduce motorized opportunities for these outfitters as a result of the proposed off-road closure. The existing permits do not, however, guarantee any right to motorized off-road travel, and dispersed campsites would still be available for use. Alternatives A and D would have no effect on these permits.

3.5.4 HERITAGE

Affected Environment

Heritage resources or cultural resources are both broad terms referring to properties and traditional lifeway values resulting from human occupation and use. A cultural property may be the physical remains of archaeological, historic, or architectural sites, and/or a place of traditional cultural use. Because these resources are nonrenewable and easily damaged, laws and regulations exist to help protect them.

The National Historic Preservation Act (NHPA) and its implementing regulations require that federal agencies consider the effects of their undertakings on historic properties. The term 'historic' in this context refers to cultural properties that have been determined eligible for inclusion in the National Register of Historic Places (NRHP). Historic sites may be the result of aboriginal use (prior to Euro-American influence) or historic period use. These sites may represent a single event or a complex system. Sites must meet the criteria outlined in 36 CFR 60.4 to qualify for the National Register. Additionally, federal agencies must consider American Indian traditional use, belief systems, religious practices, and lifeway values as directed by the Archaeological Resources Protection Act of 1979 (ARPA), the NHPA, the Native American

Graves Protection and Repatriation Act (NAGPRA), and the American Indian Religious Freedom Act (AIRFA).

The Dean project area contains numerous archaeological and historical sites that represent various aspects of occupation in the Black Hills. Human use in this area dates back at least 10,000 years. Numerous tribes have roots in the Black Hills, including the Kiowa, Kiowa-Apache, Crow, Arapaho, Shoshone, Cheyenne, and Lakota, among others. American Indian sites include open campsites, stone tool quarry sites, and rock shelter locations. There are no known spiritual and traditional use sites or sites potentially considered to be Traditional Use Properties within the Dean analysis area, but several such areas exist outside the Dean project vicinity and within the northern Black Hills area, including Inyan Kara and Devils Tower (the Bear's Lodge or Mato-tipila) (Rom et al. 1996).

Historic land use in this area has occurred since the 1800s in the form of homesteading, trapping, livestock grazing, and mining. This activity primarily took the form of ranching from homesteads found along the better streams. Logging has had an impact in the region, but only small historic logging camps or sawmills occur in the immediate surrounding area. The same is true for mining: limited mineral exploration occurred in the area, but it left no outstanding traces on the land. Remnants and anomalous foundations found in the area today could relate to either the logging or mining frontiers, or to ranching activity (e.g., cowboy line camps). Mining, hunting, horsepacking, OHV use, and other recreational uses continue to be popular in this area.

Specific areas of concern for the heritage resource program include the protection of Class I (eligible) and Class II (unevaluated) archeological/historical sites, appropriate consultation with local American Indian groups, and the protection of spiritual sites, Traditional Cultural Properties (TCPs), recent and historic graves, and Euro-American cemeteries. No TCPs were identified within the Dean project area during this analysis. Sites consist of historic sawmills and habitation sites, historic period scribings on sandstone, prehistoric lithic scatters and quarries, and historic period artifact scatters. Protection measures for these sites are keyed to determinations of each site's eligibility for inclusion in the National Register of Historic Places. Heritage sites determined eligible or heritage sites with an undetermined eligibility are of concern. Ineligible sites are dropped from management concerns, and determinations of effect on these properties are not addressed in this analysis.

A total of seven sites that are considered to be eligible for the National Register of Historic Places were located within the Dean project area, consisting of prehistoric lithic scatters and quarry or lithic procurement sites. These sites were reviewed for potential effects created by the proposed Dean project.

Environmental Consequences

Heritage resource effects were qualitatively assessed through a presence/absence determination of significant cultural resources and mitigation measures to be employed during commercial harvest, prescribed fire (broadcast burning), fuel break construction and/or fuel reduction activities, and road construction and reconstruction.

Alternative A

Direct and Indirect Effects: The no action alternative would not directly affect any significant heritage resources. There are seven historic properties that could be indirectly affected by Alternative A. These sites consist of prehistoric lithic scatters and quarry or lithic procurement

sites. The potential for damage due to stand-replacing wildfire is greatest with Alternative A, as it proposes no fuel reduction work and does not provide for mitigation efforts for site protection.

Alternative B

Direct and Indirect Effects: There are seven sites that could be directly affected by Alternative B. All consist of prehistoric lithic scatters and quarry or lithic procurement sites. Under Alternative B, these sites could be affected by road pre-use maintenance prior to log hauling, road decommissioning, silvicultural thinning treatments, wildlife oak removal treatments, fuels chipping and mulching, or a combination of these treatments. All action alternatives would be directed by site-specific design criteria to protect and/or avoid all historic sites located within various treatment areas. Design criteria also require coordination with the district archaeologist prior to and during layout or prior to treatment in order to ensure protection and/or avoidance of the sites. Indirect effects on cultural resources may include increased visitation and/or vandalism to sites due to the proximity of proposed vegetative treatment activities to known sites and the increase of traffic to and through harvest units containing these sites. Effects on cultural resources from prescribed burning would be minor. Prescribed fire and thinning activities have the potential to expose previously unrecorded sites.

Alternative C

Direct and Indirect: Alternative C could directly affect the same seven sites as Alternative B. Under Alternative C, these sites could be affected by road pre-use maintenance prior to log-hauling, road decommissioning, silvicultural commercial thin with POL removal and seed cut/overstory removal treatments, wildlife oak removal treatments, broadcast burning, or a combination of these treatments. This alternative would be directed by site-specific design criteria to protect and/or avoid all historic sites located within various treatments. Design criteria would also require coordination with the district archaeologist prior to during layout or prior to treatment in order to ensure protection and/or avoidance of the sites. There is a potential for indirect effects to sites due to the proximity of proposed vegetative treatment activities to known sites and the increase of traffic to and through harvest units containing these sites. Effects on cultural resources from prescribed burning would be minor. Prescribed fire and thinning activities have the potential to expose previously unrecorded sites.

Alternative D

Direct and Indirect Effects: Six sites could be directly affected by Alternative D. All consist of prehistoric lithic scatters and quarry or lithic procurement sites. Under Alternative D, these sites could be affected as described under Alternatives B and C, with the exception of effects from logging, skidding, or log landings because this alternative contains no commercial silvicultural treatments. This alternative would be directed by site-specific design criteria to protect and/or avoid all historic sites located within various treatments. Design criteria would also require coordination with the district archaeologist prior to during layout or prior to treatment in order to insure protection and/or avoidance of the sites. Indirect effects to heritage resources would be the same as for the proposed action.

Cumulative Effects

The cumulative effects analysis area is all National Forest System lands within the project area. Past, present, and future actions are described starting on page 3-1 of this chapter. All of the activities described previously may have a cumulative effect on heritage resources in the form of

increased soil erosion, increased visitor use and traffic, and vandalism. Cumulative effects of these types are difficult to quantify, but may be avoided or minimized through the implementation of appropriate, site-specific treatments, when deemed necessary through the consultation process with the State Historic Preservation Officer and the Advisory Council on Historic Preservation. **Table 3-32** summarizes the anticipated effects to heritage resources.

Table 3-32. Heritage Resources

PAST ACTIONS	Heritage resource effects from road building, fire suppression, timber harvesting, residential development, and recreation use; risk to resources increased in areas where tree densities and fuel loads remained at unnatural levels.
PRESENT ACTIONS	Potential heritage resource effects from recreation, firewood collection, and other activities as areas become more frequented with population increase.
PROPOSED ACTIONS	Fuel treatments could result in minor effects to unknown and NRHP-eligible sites; potential discovery and protection of unknown resources uncovered during treatments.
FUTURE ACTIONS	Similar effects as described under proposed actions.
CUMULATIVE EFFECTS	Efforts to reduce fuels and wildfire risk across the landscape would reduce the risk to heritage resources; the proposed project would not result in significant cumulative effects with the implementation of site-specific design criteria and mitigation. Alternatives C and D would contribute the most to heritage resources cumulative effects in the next five to ten years (by treating the highest number of acres), while the no action alternative would contribute the least in the same time period and the most in the time beyond ten years.

It is recognized that heritage resources may be present in the subsurface but with no surface manifestations. Therefore, if treatment activities result in unanticipated discovery of heritage resources, all operations must cease and the district or forest archaeologist notified immediately. Any heritage resources located during project implementation would be protected based on the recommendations of the district or forest archaeologist and the Wyoming SHPO. All sites would be evaluated under the terms specified in 36 CFR 60.4, 36 CFR 800, and applicable Forest guidelines (amended Forest Plan guidelines 4102, 6101, and 6106).

Traditional Use

Existing information about heritage and cultural values is often inadequate. Ongoing inventories tend to be project-specific rather than part of the general program. Obtaining information about sacred places from some American Indian groups is difficult because Forest Service styles of communication and negotiation are often incompatible with these cultures, and revealing sacred values and identifying sacred places to outsiders may be thought to imperil the values in need of protection.

The extent of traditional plant use is poorly known for the entire Black Hills. It is possible that unidentified traditional use plant species are located in the project area. Future identification of traditional-use plants could result in a greater perceived need for access.

Access

For areas that may contain traditional use sites, access needs would be high for traditional groups using the area. This is particularly true for tribal elders, who may have difficulty accessing areas for physical reasons. The ability to access Tradition Cultural Properties, Sacred sites, traditional use areas, or traditional plant-gathering areas is guaranteed under the American Indian Freedom of Religion Act (AIRFA) and under Executive Order 13007, and the Agency must not impede access to such locations.

Consultation

The Heritage Resource report was sent to the Wyoming State Historic Preservation Office for comment and eligibility determinations for the heritage resources located within the project area. Likewise, the reports were also sent to Tribal Historic Preservation Offices for their review and comment. Additional consultation may be conducted as needed. Follow-up contact will be made with Tribal representatives to determine if additional information on the environmental document is needed.

Environmental Justice

Executive Order 12898 (February 11, 1994) directs Federal agencies to focus attention on the human health and environmental conditions in minority communities and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

During the course of this analysis, no alternative resulted in any identifiable effects or issues specific to any minority or low-income population or community. The agency has considered all input from persons or groups regardless of age, race, income status, or other social and economic characteristics.

Civil Rights

No civil rights effects associated with age, race, creed, color, national origin, or sex have been identified.

3.5.5 ECONOMICS

The following is a summary of the analysis used to calculate a variety of financial measures describing the alternatives in this EIS. The Quick-Silver program was used to perform the analysis (QS Version 5.004.45, USDA Forest Service, North Central Experiment Station, February 16, 2000). The financial analysis was done both from a short-term and long-term perspective. The complete analysis resides in the Dean project file.

The objective of the analysis is to provide a relative comparison of the costs and revenues associated with implementing the four alternatives being analyzed. There are costs and benefits associated with activities occurring in the Dean project area that are not included in this analysis (e.g., recreation management, fuelwood gathering). This analysis does not include these activities because they occur across the District and Forest and they are not directly related to the proposed action. The action alternatives will not significantly change these other items.

This EIS discusses three action alternatives for managing the Dean project area for the next ten to fifteen years. The financial analysis includes those actions connected to the vegetation treatment for fire and fuels reduction needs and related actions that are planned over this management timeframe. The only benefits included in the analysis were the revenues generated from the volume of timber and products other than logs harvested per alternative. This analysis does not include revenues generated in the local and regional economies related to wages, equipment and supplies purchased, and taxes paid.

The action alternatives described in this EIS are consistent with national initiatives and policy such as the National Fire Plan, Healthy Forest Initiative, and direction provided by the Forest Plan, Phase 2 Amendment, and associated economic assumptions. Any future project proposals will receive a separate environmental analysis, including financial and/or economic analysis, as appropriate. **Table 3-33** displays the financial measures summarized by alternative.

Table 3-33. Financial Measures by Alternative

	Alternative A	Alternative B		Alternative D
Present Net Value (PNV)	NA	$575,146	$1,190,244	$1,667,599
Benefit/Cost Ratio (B/C)	NA	1.90	1.99	2.68
Benefits (PV)	NA	$1,214,739	$2,397,154	$2,663,166
Costs (PV)	NA	$639,593	$1,206,911	$995,566

3.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

There are no **irreversible commitments** of resources associated with any of the alternatives analyzed.

Irretrievable commitments of resources include the following:

Soil productivity and **timber productivity** would be lost where road construction is planned under Alternatives B and C (about 5.66 miles).

3.7 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics. Actions under Alternatives B, C, and D would be implemented using design criteria that protect **soil productivity**. Any decrease in long-term soil productivity resulting from actions would be negligible.

As provided for by the amended Forest Plan, minimum management requirements guide implementation of the action alternatives. Adherence to these requirements ensures that long-term productivity of the land is not impaired by short-term uses. Monitoring specified in this EIS and the amended Forest Plan validates that the management requirements and mitigation are effective in protecting long-term productivity.

3.8 UNAVOIDABLE ADVERSE EFFECTS

The following is a description of adverse effects that are unavoidable with implementation of action alternatives. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

Wildlife habitat for certain species would be adversely affected to varying levels with implementation of the action alternatives. The wildlife section of Chapter 3 of this EIS discloses those effects.

Air quality would be adversely affected on a temporary/seasonal basis as a result of proposed prescribed burning and dust from roads and activities.

Travel and recreation use on the part of some members of the public would experience some adverse effects in terms of what users are currently accustomed to doing versus changes resulting from implementation of the various alternatives.

Scenic quality would be affected adversely for some observers by the various levels of vegetation treatment and other actions proposed.

Fire/fuels hazard would be increased in the next five to ten years in some areas as a result of slash created by vegetation treatment. With proposed disposal treatments, this hazard would be reduced or eliminated. There exists a higher potential for catastrophic wildfire under Alternative A versus the action alternatives.

Soils could be eroded where vegetation and soils are disturbed. Compaction could occur where vehicles and equipment are used. Adherence to site-specific design criteria would minimize this effect.

Previously unknown or unrecorded heritage resources could be disturbed or destroyed where human or natural activities take place. If previously unknown heritage resources are discovered during project activities, project staff would stop ground-disturbing actions at the site and notify the District or Forest archaeologist before activities are resumed. See *Design Criteria Applicable to All Activities* starting on page 2-9.

Forest insects and disease would continue within the project area at endemic levels.

4 INDEX

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6 GLOSSARY

90th percentile weather
Weather conditions (temperature, humidity, wind, etc.) that represent the upper 90th percentile of observations.

Active crown fire
A crown fire in which the entire fuel complex becomes involved, but the crowning phase remains dependent on heat released from the surface fuels for continued spread.

Basal area
The cross-sectional area of all stems in a stand measured at breast height and expressed in square feet per acre.

Best Management Practice
The set of practices in the Forest Plan which, when applied during implementation of a project, ensures that water related beneficial uses are protected and that State water quality standards are met. BMPs can take several forms. Some are defined by State regulation or memoranda of understanding between the Forest Service and the States. Others are defined by the Forest interdisciplinary planning team for application Forest-wide. Both of these kinds of BMPs are included in the Forest Plan as Forest-wide Standards. A third kind is identified by the interdisciplinary team for application to specific management areas; these are included as Management Area Standards in the appropriate management areas. A fourth kind, project level BMPs, are based on site specific evaluation and represent the most effective and practicable means of accomplishing the water quality and other goals of the specific area involved in the project. These project level BMPs can either supplement or replace the Forest Plan standards for specific projects.

Biological Assessment
An analysis conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under section 7 of the Endangered Species Act. The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species" (FSM 2670.5.2).

Biological Evaluation
A documented Forest Service review of Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed, or sensitive species" (FSM 2670.5.3).

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.

Broadcast burning
A type of prescribed burning where contiguous blocks are burned at the same time. The goal is to have fire burn across most or all of the surface within the block

Canopy
The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Canopy bulk density
The mass of available canopy fuel per unit canopy volume.

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

Canopy fuels
The live and dead foliage, live and dead branches, and lichen of trees and tall shrubs that lie above the surface fuels.

Channel morphology
The physical configuration of a stream channel: width, depth, shape, etc.

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.

Chipping
The process of feeding wood material (slash) into a chipper to produce chips, small pieces of wood.

Co-dominant
This term refers to trees that are approximately equal in height to the dominant trees in a stand.

Commercial thinning
Removing from a stand some 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.

Condition class
Class 1 - For the most part, fire regimes (return frequency/severity) in fire condition class are within historical ranges. Thus the risk of losing key ecosystem components from the occurrence of fire remains relatively low. Maintenance management such as prescribed fire, mechanical treatments, or preventing the invasion of non-native weeds, is required to prevent these lands from becoming degraded.

Class 2 - Fire regimes on these lands have been moderately altered from their historical range by either increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified in these lands. To restore their historical fire regimes, these lands may require some level of restoration through prescribed fire, mechanical or chemical treatments, and the subsequent reintroduction of native plants.

Class 3 - These lands have been significantly altered from their historical range. Because fire regimes have been extensively altered, risk of losing key ecosystem components from fire is high. Consequently, these lands verge on the greatest risk of ecological collapse. To restore their historical fire regimes – before prescribed fire can be utilized to manage fuel or obtain other desired benefits – these lands may require multiple mechanical or chemical restoration treatments, or reseeding. These lands should have the highest priority for treatment.

Council on Environmental Quality
An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cover habitat
Cover is a general term that includes thermal and hiding cover. Thermal cover provides moderation of daytime highs in summer months and nighttime lows in winter months, helping animals maintain energy reserves despite extreme temperatures. Hiding cover provides security from human disturbance by screening animals from audible and visual disturbance and is most important along roads.

Cover type
The vegetative species that dominates a site.

Critical habitat
Under the Endangered Species Act: (1) The specific areas within the geographic area occupied by a federally listed species on which physical and biological features are found that are essential to the conservation of the species and that may require special management or protection; and (2) The specific areas outside the geographic area occupied by a listed species that are determined to be essential for the conservation of the species.

Crown base height
The vertical distance from the ground to the bottom of the live crown of an individual tree, or the average distance in a stand.

Crown bulk density
The mass of available fuel per unit crown volume.

Crown fire
Any fire that burns canopy fuels.

Crown fire hazard
A physical situation (based on fuels, weather, and topography) with potential for causing harm or damage because of crown fire.

Crowning index
The open 20-foot wind speed at which active crown fire is possible for the specified fire environment.

Crush
Break slash into smaller pieces by driving over it with mechanical equipment.

Cull
Trees, logs, or lumber rejected because they do not meet certain specifications of usability or grad.

Cultural (heritage) resources
The physical remains of human activity (such as artifacts, ruins, burial mounds, or petroglyphs) and conceptual content or context (such as a setting for legendary, historic, or prehistoric events or a sacred area of native people) of an area of prehistoric or historic occupation.

Cumulative effects
The combined effects resulting from sequential actions on a given area, including past, present, and reasonably foreseeable actions.

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.

Direct attack
Fire suppression activities that take place immediately adjacent to the flaming front.

Direct effects
Effects that are caused by an action and occur at the same place and time.

Dominant
Trees that are the tallest in a stand.

Duff
Partially decomposed organic matter lying beneath the litter layer and above the mineral soil. It includes the fermentation and humus layers of the forest floor.

Ecosystem
A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake).

Edge habitat
The interface between two distinct habitat types. Elements of both habitats are typically present, increasing diversity.

Endemic
Naturally occurring in a particular location.

Environmental Assessment
A concise public document for which a federal agency is responsible that serves to: (1) Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) Aid an agency's compliance with NEPA when no environmental impact statement is necessary; and 3) Facilitate preparation of an environmental impact statement when one is necessary.

Ephemeral stream
A stream or portion of a stream that flows only in direct response to precipitation, receiving little or no water from springs and no long continued supply from snow or other sources, and whose channel is at all times above the water table.

Fire behavior
The manner in which a fire reacts to fuel, weather, and topography.

Fire frequency
The recurrence of fire in a given area over time. Sometimes stated as number of fires per unit time in designated area or how often fire burns a given area, often expressed in terms of fire return intervals.

Fire event
For the purposes of fuels analysis, a wildfire with a probability of occurrence that is modeled using representative weather inputs (usually the 90th percentile) for the purpose of effects analysis to compare alternatives.

Fire frequency (fire return interval)
A general term referring to the recurrence of fire in a given area over time. Sometimes stated as number of fires per unit time in designated area or how often fire burns a given area, often expressed in terms of fire return intervals.

Fire hazard
A fuel complex, defined by volume, type, condition, arrangement, and location, that determines the ease of ignition and the resistance to control. A physical situation (fuels, weather, and topography) with potential for causing harm or damage because of wildland fire.

Fire intensity
The rate of heat release per unit length of fire front, including the additional heat released from postfrontal flaming and smoldering combustion.

Fire intensity level
A measure of fire behavior used in the Interagency Initial Attack Assessment Model (IIAA). It is based on the calculated flame length: FIL 1: 0-2 feet, FIL 2: 2-4 feet, FIL 3: 4-6 feet, FIL 4: 6-8 feet, FIL 5: 8-12 feet, FIL 6: greater than 12 feet. FIL is used in the IIAA model as an indicator of fire danger for dispatch purposes, to categorize rate of spread, and in the assessment of fire effects. Each FIL has an associated suppression cost.

Fire management plan
A strategic plan that defines a program to manage wildland and prescribed fires and documents the fire management program in the approved land use plan. This plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, prevention plans, and operational wildland fire use plans.

Fire regime
A generalized description of the role fire plays in an ecosystem. It is characterized by fire frequency, seasonality, intensity, duration and scale (patch size), as well as regularity or variability.

Fire risk
The probability of an ignition occurring as determined from historical fire record data.

Fire rotation
The length of time necessary for an area equal in size to the project area to burn.

Fire severity
A qualitative measure of the immediate effects of fire on the ecosystem. Relates to the extent of mortality and survival of plant and animal life both above and below ground and to loss of organic matter.

Fire suppression
All work and activities connected with fire-extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

Firebreak
A natural or constructed barrier to stop or check fires that may occur, or to provide a control line from which to work.

Fireline intensity
The rate of heat release in the flaming front per unit length of fire front. Can be converted to flame length. (FL = 0.45*(I0.46)). This expression is commonly used to describe the power of wildland fires.

Flame length
The height of flames at the flaming front.

Floodplain
The land bordering a stream, built up of sediments from overflow of the stream and

subject to inundation when the stream is at flood stage.

Foliar moisture content
Moisture content (dry weight basis) of live foliage, expressed as a percent. Effective foliar moisture content incorporates the moisture content of other canopy fuels such as lichen, dead foliage, and live and dead branch wood.

Foraging habitat
Areas used by wildlife to obtain food.

Fuel
The loose surface litter on the soil surface, for example, fallen leaves or twigs, needles, bark, cones, branches, grasses, shrub and tree reproduction, downed logs, stumps, seedlings, and forbs interspersed with or partially replacing the litter.

Fuel break
A natural or manmade change in fuel characteristics that affects fire behavior so that fires burning into them can be more readily controlled.

Fuel characteristics
Factors that make up fuels such as compactness, loading, horizontal continuity, vertical arrangement, chemical content, size, shape, and moisture content.

Fuel continuity
The degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed thus affecting a fire's ability to sustain combustion and spread. This applies to aerial fuels as well as surface fuels.

Fuel load(ing)
The oven-dry weight of fuel per unit area, generally expressed in tons per acre.

Fuel model
A tool to estimate fire behavior based on the amount and type of fuel per acre and the vegetative structure of the stand.

Fuel management
Management activities undertaken to alter the amount of fuel in treatment units.

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

Fuel wood
Wood used for conversion to some form of energy, for example, in residential use or in cogeneration plants.

Geographic Information System
A type of computer program used to store and analyze geographic data.

Ground fuel
Fuels that lie beneath surface fuels, such as organic soils, duff, de-composing litter, buried logs, roots, and the below-surface portion of stumps.

Habitat capability
The estimated ability of an area to support wildlife, fish or plant populations.

Habitat effectiveness
The percentage of available habitat that is usable by wildlife during the non-hunting season. This concept assumes that some portion of suitable habitat is not used to the fullest extent because of human disturbance. For example, big game species tend to avoid using otherwise suitable habitats near open roads.

Hand thinning
Removal of live or dead vegetation primarily by hand labor. For example, using chain saws to thin understory vegetation.

Hardwoods
Broadleaf trees or shrubs.

Hazardous fuel reduction
Removal of accumulations of fuel that could contribute to uncontrollable fire behavior.

Herbicide
A chemical compounds used to kill undesirable vegetation.

Hydrophobic soil
Soil that does not absorb water. High intensity fires can alter soil chemistry so that it is no longer capable of absorbing water, which quickly runs off the surface, often initiating excessive soil erosion.

ID team
A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

Indirect attack
Fire suppression activities that take place some distance from the flaming front. This method is typically used when fire behavior is too intense for direct attack.

Indirect effects
Secondary effects which occur in locations other than the initial action or significantly later in time.

Infiltration
The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Intermediate
Trees that form an intermediate layer beneath the dominant tree canopy but above the understory.

Intermittent stream
A stream or a portion of a stream, that does not flow year-round but only when it (a) receives base flow solely during wet periods, or (b) receives groundwater discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. See also Ephemeral stream.

Ips
A genus of bark beetle that feeds beneath the bark of pines, typically killing branches, tops, or entire trees.

Jackpot fuels
Fuel accumulations that are substantially higher than in the surrounding stand. Such accumulations can initiate torching or crowning fire behavior.

Ladder fuel
Combustible material that provides vertical continuity between vegetation strata and allows fire to climb into crowns of trees or shrubs with relative ease.

Landscape-scale
An event that occurs across large tracts of land.

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

Large-scale wildfire
A stand-replacing wildfire, often covering large tracts of land and substantially changing the ecosystems it affects.

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

Litter
The top layer of the forest floor including freshly fallen leaves, needles, fine twigs, bark flakes, fruits, matted dead grass, and a variety of miscellaneous vegetative parts that are little altered by decomposition. Litter also accumulates beneath rangeland shrubs. Some surface feather moss and lichens are considered to be litter because their moisture response is similar to that of dead fine fuel.

Lop and scatter
A term used in treating fuels during and after harvesting is complete where the unmerchantable portions of the tree (usually the smaller top of a tree and the limbs) are cut off and scattered about to reduce slash concentrations.

Management area
An area for which a single set of management prescriptions is developed and applied.

Management area prescription
A set of standards and guidelines that apply to a specific management area.

Management indicator species
Species identified in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

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.

Mechanical fuel treatment
An activity that alters fuel loads using mechanical means.

Mechanized thinning
Removal of live or dead vegetation primarily by mechanized equipment.

Mitigation
Avoiding or minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action.

Mixed severity fire regime
Regime in which fires either cause selective mortality in dominant vegetation, depending on different species' susceptibility to fire, or vary between understory and stand replacement.

Monitoring
The periodic evaluation on a sample basis of management practices to determine how well objectives have been met and how closely management standards have been applied.

Nesting habitat
Habitats used by wildlife (birds) for nesting.

Noxious weeds
A plant specified by law as being especially undesirable, troublesome, and/or difficult to control.

Passive crown fire
A crown fire in which individual or small groups of trees torch out, but solid flaming in the canopy cannot be maintained except for short periods. Passive crown fire encompasses a wide range of crown fire behavior from the occasional torching of an isolated tree to a nearly active crown fire.

Patch clearcut

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

Peak flow
The highest annual flow in a stream.

Perennial streams
Streams that flow continuously throughout most years.

Piling and burning
A fuels treatment method comprised of piling fuel into piles that are burned. Piling may be accomplished by hand labor or with large machinery such as bulldozers, depending on terrain, accessibility, fuels, and other concerns.

Population viability
The ability of a population to persist through time.

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.

Prescription
Measurable criteria that define the conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and other required actions.

Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Prescribed fire
Any fire ignited by management actions to meet specific objectives. An approved written prescribed fire plan must exist and NEPA requirements must be met before ignition. This term replaces management ignited prescribed fire.

Pre-settlement fire regime
The time from about 1500 to the mid-to late-1800s when Native American populations had already been heavily affected by European presence but before extensive settlement by European-Americans in most parts of north America, before extensive conversion of wildlands for agricultural and other purposes, and before fires were effectively suppressed in many areas.

Project design standards
Standards that are used in developing a proposed action. These are intrinsic to an action, as opposed to mitigation, which is developed to reduce the effects of an action that is already complete.

Proposed action
In terms of NEPA, the project, activity, or action that a federal agency intends to implement or undertake and which is the subject of an environmental analysis.

Rate of spread
The relative speed with which a fire increases in size.

Regeneration
The process where trees reproduce themselves by either artificial (hand planting of small seedlings) or natural (by seed) means. Often used to refer to the young trees themselves.

Riparian area
A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. It is identified by soil characteristics and by distinctive vegetative communities that require free or unbounded water.

Road density
Miles of road per square mile of land.

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

Roads analysis
A Forest Service specific process that is an integrated ecological, social, and economic science-based approach to transportation planning and addresses existing and future road management options.

Recreation Opportunity Spectrum
Provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum divided into three classes:

Rural - The Rural class setting is characterized by moderate to high levels of use on developed sites, roads, trails, and water surfaces. Contact with other users is lower away from these areas. Controls such as signs and barriers exist but to a lesser degree than in the urban setting and they tend to be in harmony with the man-made environment. (Examples of the Urban and Rural settings include cities, villages, farms, ranches, parks, and campgrounds near heavily populated areas).

Roaded Natural - This setting has moderate levels of human activities and structures. Regimentation and controls are noticeable but tend to blend with the natural environment. There is an equal probability of encountering other users and experiencing isolation from humans. Opportunities for both motorized and non-motorized forms of recreation are possible. (Examples of the Roaded Natural Appearing setting include improved highways, developed campgrounds, small resorts, ski areas, livestock grazing, and timber harvesting operations).

Semi-primitive - Both the Semi-Primitive Motorized and Semi-Primitive Non-Motorized classes are characterized by predominately natural or natural-appearing landscapes. The size of these areas gives a strong feeling of remoteness from the more heavily used and developed areas. Within these settings, there are ample opportunities to practice wildland skills and to achieve feelings of self-reliance. The most significant difference between the semi-primitive motorized, and non-motorized settings is the presence of absence of motorized vehicles. In the non-motorized settings, the presence of roads is tolerated, provided they are closed to public use, they are used infrequently for resource protection and management, and the road standards and locations are visually appropriate for the physical setting. In many cases, old roads are acceptable as non-motorized travelways so long as they do not reflect misuse or poor stewardship of the land. These roads would have motorized use in the semi-primitive motorized class, especially by ORVs. (An example of a semi-primitive non-motorized setting would be a backcountry area or trail where few other visitors are encountered and motorized use is prohibited. A semi-primitive motorized setting would likewise have few encounters with other users but motorized use may occur).

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.

Scoping
An early and open process designed to identify the environmental issues and significant factors to be addressed in the analysis process.

Secondary cavity nester
A bird that nests in cavities in trees that are constructed by other (primary) cavity nesters. Such birds are typically not capable of constructing their own nest cavities.

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 species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

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

Silviculture
A scientific discipline devoted to management of forest resources.

Skidding
Moving logs from the stump to a collecting point.

Slash
The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning trees.

Snag
A standing dead tree usually greater than five feet in height and six inches in diameter at breast height.

Soil compaction
The process by which the soil grains are rearranged, resulting in a decrease in void space and causing closer contact with one another, thereby increasing bulk density.

Soil map unit
An area with similar soil types and properties delineated for mapping purposes.

Soil permeability
The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water move downward through saturated soil.

Species diversity The variety and variability among living organisms and the ecological complexes in which they occur.

Spotting (spot fires)
A process where embers from a fire are lifted or blown ahead of the flaming front and start new fires.

Standards and guidelines
An indication or outline of policy or conduct. Standards have specific, quantifiable measures, while guidelines provide more general direction and flexibility of management options.

Stand-replacing fire
Fires that kill or top-kill aboveground parts of the dominant vegetation, changing the aboveground structure substantially. Approximately 80 percent or more of the aboveground dominant vegetation is either consumed or dies because of fires.

Stem density
The number of trees per unit area, typically trees per acre.

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.

Stream flow regime
The pattern of water flow in a stream. Influenced by season, precipitation, and other factors.

Suppressed
Trees growing in the understory that are shaded by overstory (dominant and co-dominant) trees.

Surface fire
A fire spreading through surface fuels.

Surface fuels
Needles, leaves, grass, forbs, dead and down branches and boles, stumps, shrubs, and short trees.

System road
A road that is part of the official USFS transportation system.

Temporary roads
Those roads needed only for the purchaser or permittee's use. The Forest Service and the purchaser or permittee must agree to the location and clearing widths. Temporary roads are used for a single, short-term use, e.g., to haul timber from landings to Forest Development Roads, access to build water developments, etc. Temporary roads must be obliterated as part of a timber sale contract.

Torching
The transition of surface fire into the crown of a single tree, typically caused by ladder fuels, high flame lengths, or low crown base height. Torching often leads to crown fire behavior

Torching index
The open (20 foot) wind speed at which crown fire activity can initiate for the specified fire environment.

Tractor yarding
A method of moving logs to a landing on the ground using mechanical equipment such as a skidder.

Transitory range
Transitory range is an area that temporarily produces an increase in rangeland vegetation. These areas occur when the tree and sometimes shrub overstory are removed allowing the grass/forb component to take full advantage of available sunlight and moisture.

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.

Understory
The trees and other woody species that grow under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Values at risk
Include property, structures, physical improvements, natural and cultural resources, community infrastructure, and economic, environmental, and social values. They may be on- or off-site values.

Visual Management System
The VMS divides NFS lands into several visual categories based on variety class, sensitivity level, and distance zone. Variety classes are obtained by classifying the landscape into different degrees of variety. This determines those landscapes that are most important and those that are of lesser value from a standpoint of scenic quality. Sensitivity levels are a measure of the people's concern for the scenic quality of the Forest. Distance zones describe distances from which the landscape is viewed. The VMS is used to define VQOs.

Visual Quality Objective
A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.

Preservation: Only ecological changes are allowed to alter the natural landscape.

Retention: Human activities are not evident to the casual Forest visitor.

Partial Retention: Human activities may be evident, but must remain subordinate to the characteristic landscape.

Modification: Human activity may dominate the characteristic landscape, but should appear as natural when viewed as background.

Enhancement: A short-term management alternative that is done with the express purpose of increasing positive visual variety where little variety now exists.

Water influence zone
A zone located on either side of a stream that is 100 feet or height of the tallest tree, whichever is greater, in width. Special management requirements are applied to the WIZ.

Watershed
A region or land area drained by a single stream, river, or drainage network.

Wetland
1. A transitional area between aquatic and terrestrial ecosystems that is inundated or saturated for periods long enough to produce hydric soils and support hydrophytic vegetation.
2. A seasonally flooded basin or flat.

Wildland-urban interface
The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wildland fire
Any non-structure fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

7 PREPARERS

Interdisciplinary Team

Carol Agard	District Archeologist. Bachelor of Science, Anthropology, 1972, University of Oregon. Master of Science, Archeology, 1974, University of Oregon. Twenty years' Forest Service experience at the District and Forest levels in Oregon, South Dakota, and Wyoming.
Janis Bouma	ID Team Leader. Bachelor of Arts, Anthropology and Forestry, University of Montana, 1998. Master of Arts, Anthropology, University of Montana, 2001. Eight years' Forest Service experience at the District and Forest levels in Montana, Washington, and Wyoming in heritage resources management and planning. Fire experience in Type 1-4 incidents with USFS, including burned area emergency rehabilitation.
Susan Corey	Botany Technician. Bachelor of Science, Horticulture, University of Illinois-Urbana/Champagne, 1995. Bachelor of Science, Chemistry, University of Missouri-St. Louis, 1989. Four years of experience with the Forest Service and National Park Service at the zone and District levels in South Dakota, Wyoming, and Montana collecting data, implementing botanical resource strategies, and conducting botanical analysis. Six years of experience in botanical gardens, arboreta, and the nursery trade. Four years of research experience in the development of weed control products.
Tommy John	Soil Scientist, Rocky Mountain Regional Office. Bachelor of Science in Forest Management, University of Minnesota, 1974. Master of Science in Forestry and Soils, University of Minnesota, 1976. Twenty-nine years of experience with State, Tribal and Federal agencies.
Stephen Keegan	Landscape Architect. Bachelor of Science, Landscape Architecture & Environmental Studies, State University of New York (ESF), 1980. Bachelor of Science, Syracuse University, 1980. Associates of Arts, Humanities, State University of New York-Onondaga Community College, 1978. Twenty-two years of Forest Service experience at the Forest and zone level in Oregon, South Dakota, Montana, and Idaho conducting Scenic Resource Assessments for vegetation and fuels management, watershed analyses, recreation construction and reconstruction, and burned area emergency rehabilitation. Fire experience in Type 1-4 incidents with USFS; experience as chief and assistant fire chief for City and Rural Fire Departments in New York, Idaho, Oregon, and South Dakota.

Steve Kozel	District Ranger. Bachelor of Science, Wildlife and Fisheries Science, South Dakota State University, 1985. Master of Science, Zoology and Physiology, University of Wyoming, 1987. Seventeen years of Forest Service experience in Idaho and Wyoming.
Elizabeth Krueger	Environmental Coordinator. Bachelor of Science, Forest Resources, University of Minnesota, 1990. Sixteen years of Forest Service experience at the District, zone, and Forest levels in South Dakota and Wyoming, planning and conducting environmental documentation of timber, fuels, and other projects and participating in long-term planning efforts. Author and co-author of studies of flying squirrel in the Black Hills.
Dennis Mauch	Fire/Fuels Specialist. Thirty years of Forest Service experience including 14 years in timber sale preparation, three years as District fire crew foreman, six years as District assistant fire management officer, and seven years as District fuels specialist. Achieved qualifications as incident commander type 4, water handling specialist, prescribed fire ignition specialist, engine boss, crew boss, crew representative, and prescribed fire behavior specialist. Experience also includes seven years as prescribed burn preparer and fire behavior instructor. Fire behavior training through Advanced Fire Behavior Calculations (S 490), Forest Fuels Appraisal, R2 Fuels Management, Preparing Prescribed Burns, Smoke Management Techniques, Fire Ecology of the Rocky Mountain Region, Applied Fire Effects, and Forest Vegetation Simulator-Fire/Fuels Extension.
Steve Mott	Silviculturist. Bachelor of Science, Forest Management, Iowa State University, 1970. Thirty-four years of Forest Service experience in Regions 2 and 4 on three districts in timber sale preparation, silviculture, timber sale planning, timber stand improvement and timber sale administration. Certified silviculturist since 1980.
Ernie Nauman	Civil Engineering Technician (retired). Bachelor of Science, Industrial Technology, Black Hills State University. Twenty-nine years of experience with the Forest Service as a Civil Engineering Technician surveying and designing roads, bridges and trails and administering construction contracts. Served as Project Engineer for roads, bridges, and trails projects from initial planning through the final construction phase.
John Rongstad	GIS Specialist. Masters Program, Cartography and Remote Sensing, Minnesota State University, 1987. Bachelor of Science, Geography with minors in Geology and Astronomy, Minnesota State University, 1985. Co-Director and GIS Coordinator for the Water Resources Center, Minnesota State University, for 11 years. Five years of Forest Service experience at the Black Hills National Forest, with primary assignments in

	managing and maintaining the vegetation, activity, and range GIS layers for the Forest.
Matt Stefanich	Wildlife Biologist. Bachelor of Science, Wildlife Option, Ball State University 1988. Master of Science, Zoology and Physiology, University of Wyoming 1995. Master's Thesis: Movements and habitat use of white-tailed deer in the northwestern Black Hills. Eight years of Forest Service experience at the District level in the Black Hills of South Dakota and Wyoming.
Scott Tangenberg	Hydrologist. Master of Science, Geology, University of Utah, 2000. Bachelor of Arts, Geology, University of Colorado at Boulder, 1997. Five years Forest Service experience at the District, zone, and Forest levels in South Dakota, Wyoming, Oregon, and Colorado conducting watershed evaluations for vegetation and fuels management, recreation, rangeland management, minerals, and burned area emergency rehabilitation.
DeWayne Thornburgh	Supervisory Forester. Bachelor of Science, Forest Management, Iowa State University. Sixteen years of experience as Forester and Forestry Technician in support of timber and vegetative management activities and project area planning.
Jeanette Timm	Recreation, Minerals, Lands Forester. Bachelor of Science, Forest Management, University of Kentucky, Lexington, 1989. Sixteen years of Forest Service experience at the District level in Kentucky, Alabama, Georgia, and Wyoming managing natural resources.
Julie Wheeler	Rangeland Management Specialist. Bachelor of Arts, Range Management, Chadron State College. Ten years of Forest Service experience in South Dakota, Nebraska, and Wyoming, including inventory and monitoring of rangeland resources, range analysis, grazing permit administration, allotment management planning, and integrated pest management.

8 RECIPIENTS OF PLANNING DOCUMENTS

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